

COMPLETE MONOGRAPH



2019 GROUP B PROPOSED CHANGES TO THE I-CODES ALBUQUERQUE COMMITTEE ACTION HEARINGS

April 28 - May 8, 2019
Albuquerque Convention
Center, Albuquerque, NM

2018-2019 Code Development Cycle, Group B (2019) Proposed Changes to the 2019 *International Codes*

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by

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INTRODUCTION

As utilized during the 2015 and 2016 Cycles and the 2018 Group A CAH, code change modifications will be submitted and presented for committee and public viewing at the Committee Action Hearing through the cdpACCESS system. Detailed instructions for modifications will be available at the cdpACCESS website. In addition, printed instructions will be supplied at the CAH hearings. See page vi for details on the modification submittal process.

The proposed changes published herein have been submitted in accordance with established procedures [Council Policy 28 Code Development (CP 28)] (see page xii) and are posted for review. The publication of these changes constitutes neither endorsement nor question of them but is in accordance with established procedures so that any interested individuals may make their views known to the relevant code committee and others similarly interested. In furtherance of this purpose, the committee will hold an open public hearing at the date and place shown below for the purpose of receiving comments and arguments for or against such proposed changes. Those who are interested in testifying on any of the published changes are expected to be represented at these hearings.

This compilation of code change proposals is available in electronic form only. ICC no longer prints and distributes this document. The compilation of code change proposals is posted on two locations on the ICC website: the customary posting which is linked from the [Code Development](#) webpage and from the [cdpACCESS](#) webpage.

2018 – 2019 CODE GROUPINGS

Codes to be considered in Group B Cycle:

- Administrative Provisions
- IBC – Structural
- IEBC
- IECC - Commercial
- IECC – Residential/ IRC – Residential
- IgCC (Chapter 1)
- IRC – Building

See page ix for the 2018 – 2019 ICC Code Development Schedule

2019 ICC COMMITTEE ACTION HEARINGS

These proposed changes will be discussed in public hearings to be held on April 28 – May 8, 2019 at the Albuquerque Convention Center, Albuquerque, NM. The code committees will conduct their public hearings in accordance with the schedule shown on page xlvi.

MEMBERSHIP COUNCILS/PMG ROUND TABLE PRIOR TO THE HEARINGS

Prior to the hearings, some of the Membership Councils will be holding meetings during the Saturday, April 27th /Sunday morning, April 28th time period. There will be a PMG round table Saturday, April 27th. This has been identified on the hearing schedule that was posted February 19th. Be sure to consult the [CAH Schedule](#) webpage for details as they become available.

ADVANCED REGISTRATION AND VOTING

Assembly floor motions will be allowed following the committee action, however, the motion will be voted online following the hearings. All ICC members will be allowed to vote online on assembly floor motions. ICC members in attendance will still be allowed to vote on procedural "points of order" in accordance with Section 5.4.7 of CP 28 (see page xxiv) **For identification purposes, all hearing participants must register. There is no cost to register or participate in the hearings.**

You are encouraged to advance register. [Click here](#) to register online.

The registration desk will be open in the lobby of the convention center according to the following schedule:

Sunday, April 28 th through Saturday, May 4 th	7:30 am to 5:00 pm
Sunday, May 5 th	9:30 am to 5:00 pm
Monday, May 6 th through Wednesday, May 8 th	7:30 am to 5:00 pm

CP 28 requires that ICC's membership records regarding ICC members reflect the eligible voters 30 days prior to the start of the Committee Action Hearings. This process includes new members as well as changes to voting status. This applies to all ICC Members - Governmental Members and non Governmental Members. Recent revisions to CP 28 require voter validation only once during each code development cycle (See new Section 9.1 below). Applicable CP 28 sections noted below:

5.7.4 Eligible Online Assembly Motion Voters: All members of ICC shall be eligible to vote on online assembly floor motions. Each member is entitled to one vote, except that each Governmental Member Voting Representative may vote on behalf of its Governmental Member. Individuals who represent more than one Governmental Member shall be limited to a single vote. Application, whether new or updated, for ICC membership must be received by the Code Council 30 days prior to the first day of the Committee Action Hearing. The ballot period will not be extended beyond the published period except as approved by the ICC Board.

9.1 Eligible Final Action Voters: Eligible Final Action voters include ICC Governmental Member Voting Representatives and Honorary Members in good standing who have been confirmed by ICC in accordance with the Electronic Voter Validation System. **Such confirmations are required to be revalidated once each code development cycle. After initial validation, changes to the list of GMVRs for the remainder of the code development cycle shall be made in accordance with Section 9.2.** Eligible Final Action voters in attendance at the Public Comment Hearing and those participating in the Online Governmental Consensus Vote shall have one vote per eligible voter on all Codes. Individuals who represent more than one Governmental Member shall be limited to a single vote.

9.2 Applications: Applications for Governmental Membership must be received by the ICC at least 30 days prior to the Committee Action Hearing in order for its designated representatives to be eligible to vote at the Public Comment Hearing or Online Governmental Consensus Vote. Applications, whether new or updated, for Governmental Member Voting Representative status must be received by the Code Council 30 days prior to the commencement of the first day of the Public Comment Hearing in order for any designated representative to be eligible to vote. An individual designated as a Governmental Member Voting Representative shall provide sufficient information to establish eligibility as defined in the ICC Bylaws. The Executive Committee of the ICC Board, in its discretion, shall have the authority to address questions related to eligibility.

As such, new membership applications as well as renewal applications must be received by ICC's Member Services Department by March 29, 2019. These records will be used to verify eligible voter status. Members are strongly encouraged to review their membership records for accuracy well in advance of the hearings so that any necessary changes are made prior to the March 29th deadline. For information on application for new membership and membership renewal, [click here](#) or call ICC Member Services at 1-888-ICC SAFE (422-7233)

ASSEMBLY ACTION PROCESS

Some important items to note regarding assembly consideration are CP 28 sections in parenthesis:

- After the committee decision on a code change proposal is announced by the moderator, anyone in the assembly may make a floor motion for assembly action (5.7.1).
- After a floor motion for assembly action is made and seconded, the moderator will accept the motion and notify the attendees that the motion will be considered via an online voting process by all ICC members (5.7.2 and 5.7.4). No additional testimony will be permitted.
- Assembly floor motions will be voted on via an online process following the hearing (5.7.2).
- The online voting process will include the ability to view the video of the hearing testimony, committee deliberations and committee action (5.7.3). Each member, including Governmental Member Voting Representatives, gets only one vote (5.7.4). A successful assembly action requires a majority of votes cast and will result in an automatic public comment (5.7.5).
- A code change proposal that receives a successful assembly action will be placed on the Public Comment Agenda for individual consideration. The initial motion at the Public Comment Hearing will be the committee's action (7.4).

2019 GROUP B CODE DEVELOPMENT COMMITTEE RESPONSIBILITIES

Some sections of the International Codes have a letter designation in brackets in front of them. Code change proposals submitted for such code sections that have a bracketed letter designation in front of them will be heard by the respective committee responsible for such code sections. Because different committees will meet in different years, some proposals for a given code will be heard by a committee in a different year than the year in which the primary committee for this code meets.

For instance, Section 1404.10.2 of the IBC has a [BS] in front of it, meaning that this section is the responsibility of the IBC – Structural Code Development Committee. However, the technical content of Chapter 14 is generally fire safety and as such, code change proposals are designated with the fire safety designation: IBC – FS. In this current 2019 Group B Cycle, there are 4 such IBC – FS proposals, to be heard by the IBC – Structural Code Development Committee. Be sure to consult the Cross Index of Proposed Code Changes on page xxxvi and the respective Tentative Order of Discussion for the individual committees.

A complete summary of the 2018 – 2019 Group A and Group B Code Development Committees' responsibilities can be viewed at the [ICC Website](#).

ANALYSIS STATEMENTS

Various proposed changes published herein contain an "analysis" that appears after the proponent's reason. These comments do not advocate action by the code committees or the voting membership for or against a proposal. The purpose of such comments is to identify pertinent information that is relevant to the consideration of the proposed change by all interested parties, including those testifying, the code committees and the voting membership. Staff analyses customarily identify such things as: conflicts and duplication within a proposed change and with other proposed changes and/or current code text; deficiencies in proposed text and/or substantiation; text problems such as wording defects and vagueness; background information on the development of current text; and staff's review of proposed reference standards for compliance with the Procedures. Lack of an analysis indicates neither support for, nor opposition to a proposal.

NEW REFERENCE STANDARDS

Proposed changes that include the addition of a reference to a new standard (a standard that is not currently referenced in the current edition of the I-Codes) will include in the proposal the number, title and edition of the proposed standard. This identifies to all interested parties the precise document that is being proposed and which would be included in the referenced standards chapter of the code if the proposed change is approved. Section 3.6.3.1.1 of CP 28 requires that a code change proposal will not be processed unless a consensus draft of the standard has been provided. Proponents of code changes which propose a new standard have been directed to provide copies of the standard to the code

development committee. An analysis statement will be posted on the ICC website providing information regarding standard content, such as enforceable language, references to proprietary products or services, and references to consensus procedure. The analysis statements for referenced standards will be posted on or before April 2, 2019. This information will also be published and made available at the hearings.

Proposed new reference standards must be completed and readily available prior to the 2019 Public Comment Hearing in accordance with Section 3.6.3.1.1 of CP28.

REFERENCED STANDARDS UPDATES

Updates to currently referenced standards in any of the 2018 Codes will be considered by the Administrative Code Development Committee in the 2019 Group B Cycle.

Note that based on recent changes to Section 3.6.3.1 of CP28, updates to existing referenced standards that are part of a code change proposal that includes technical revisions to code text to coordinate with such proposed standard(s) update are to be processed as proposed new standards in accordance with Sections 3.4 and 3.6.3.1.2 of CP28. Accordingly, drafts of the revisions would have needed to be supplied at the time of the code change submittal and the standard update will be required to be completed and published on or before the Public Comment Hearing for this 2019 Cycle, October 23, 2019.

It should be noted that, in accordance with Section 4.6 of CP 28, standards promulgators will have until December 1, 2020 to finalize and publish any updates to standards in the administrative update. If the standard update is not finalized and published by December 1, 2020, the respective I-Codes will be revised to reference the previously listed year edition of the standard.

Recent changes to CP28 allow standards developed by the ICC standards development process to be updated in their respective codes if they are complete and available by December 1, 2020 (See new Section 4.6.1 below).

4.6.1 Updating ICC Standards Referenced in the Codes. All standards developed by ICC and referenced by the Codes which are undergoing an update shall be announced by ICC to allow stakeholders to participate in the update process. Where the updated standard is completed and available by December 1 of the third year of the code cycle, the published version of the new edition of the Code which references the standard shall refer to the updated edition of the standard. If the standard is not available by the December 1st deadline, the edition of the standard as referenced by the newly published Code shall revert back to the reference contained in the previous edition and an errata to the Code issued.

ICC WEBSITE

This document is posted on the [ICC Website](#). While great care has been exercised in the publication of this document, errata to proposed changes may occur. Errata, if any, will be identified in updates posted prior to the Committee Action Hearing. Users are encouraged to periodically review the [ICC Website](#). Additionally, analysis statements for code changes which propose a new referenced standard will be updated and posted to reflect the staff review of the standard for compliance with Section 3.6 of the Procedures.

PROPONENT CONTACT INFORMATION

In accordance with procedures, proponents are under no obligation to provide an email address for their posted proposal. For most of the code change proposals, an email address for the proponent has been provided. In an effort to continue to provide for proponent's privacy and at the same time allow an initial contact between an interested party and the proponent, new to this 2019 Cycle we will be utilizing cdpACCESS to allow an interested party to initiate contact with the proponent without identifying the proponent's email address. The process is follows:

- Interested party logs into cdpACCESS and searches for the subject code change.
- Interested party locates the button "Contact the Proponent" to request that cdpACCESS contact the proponent, providing the interested party's name and email address.
- cdpACCESS uses the proponent email address on file and sends a notification to the proponent indicating the name of the interested party and their email address and that the interested party would like to discuss the code change.

- The interested party receives an email noting that the cdpACCESS system has sent the request to the proponent.
- It is up to the proponent to determine if they would like to respond and contact the interested party.
- The proponent is under no obligation to respond to the cdpACCESS request for contact or to contact the interested party. The proponent's contact information is not revealed to the interested party as part of this initial contact.

Screen shots for the process noted above are under development and will be posted on the [ICC website](#).

HEARING ORDER CHANGES AND TABLING OF PROPOSALS

The Code Change Agenda that places the code change proposals in a logical order for each hearing committee is shown at the beginning of the respective committee's group of code change proposals. In accordance with Section 5.4.4 of CP28, any attendee at the hearing is allowed make a motion to revise the hearing order at any time during the hearings except while a code change is being discussed, but usually as the first order of business at the hearing. Preference is given to grouping like subjects together, and moving items back to a later position on the agenda.

This motion is considered in order unless the proponent(s) of the moved code change proposals are in attendance and object to the move. If there is objection to the move, the motion is ruled out of order by the Moderator. This ruling is final and not debatable. If the motion is not ruled out of order, the motion is subject to a 2/3 vote of those present.

New for this Group A and B Code Change Cycle, a motion to table a code change proposal is allowed in accordance with Section 5.4.5 of CP28. Just as with a motion to move a code change proposal in the hearing order, this motion is in order only if there is no objection from the proponent(s) in attendance at the hearing. When the proponent(s) object, the motion to table is ruled out of order by the Moderator. The ruling is final and not subject to debate.

The motion to table must identify the location to where the code change proposal consideration will be resumed by either identifying a specific date and time within the timeframe of the Code Change Agenda for the group of code change proposals under consideration or by designating a specific location in the Code Change Agenda. If the motion to table is not ruled out of order, the motion is subject to a 2/3 vote of those present.

FLOOR MODIFICATIONS

With the implementation of the new cdpACCESS online system, CP 28 was revised to reflect that floor modifications would be submitted electronically at the Committee Action Hearing (CAH).

The only aspect of the modification process that has changed is the way the modification is submitted and viewed. It is required to be submitted electronically via cdpACCESS. All other aspects of the modification process are unchanged. As in the past, the proponent of the modification must be in attendance at the CAH to present the modification as part of his/her testimony.

Those who are submitting a modification for consideration by the respective Code Development Committee are required to sign a Copyright Release in order to have their modification(s) considered (Section 3.3.5.5 of CP 28). This feature is built into cdpACCESS similar to the way the release is executed for code change and public comment submittals.

The Chair rules the modification in or out of order. Note that this is a procedural ruling to determine if the modification is to be permitted to be considered at the hearing. It is not a technical ruling. The ruling is final, with no challenge allowed.

The modification proponent is required to identify the specific text of the code change proposal that is being revised and the revision itself. In this way, it is very similar to the public comment process and that is the way cdpACCESS was developed to process modifications.

Example:

Original code change proposal.

The original code change proposal requested the following change to Section 305.3 of the IPMC: (Note that the example is fictional.)

**PM10-18
305.13**

Proponent: John West representing self

Revise as follows:

305.3 Interior surfaces. All interior surfaces, including windows and doors, shall be maintained in good and clean condition. Peeling, chipping, flaking or abraded paint shall be repaired, removed or covered. Cracked or loose plaster, ~~decayed wood~~ and other defective surface conditions shall be corrected. Surfaces of porous materials made of or containing organic materials, such as but not limited to wood, textiles, paint, cellulose insulation, and paper, including paper-faced gypsum board, that have visible signs of mold or mildew shall be removed and replaced or remediated in an approved manner.

Exception: Porous materials that do not contain organic materials, such as clean unpainted bricks and concrete.

Proposed modification:

A modification to the code change proposal is proposed:

1. To add “and sanitary” after “clean” in the first sentence.
2. To add “or water permeable” after “porous” in the third sentence.
3. Delete “in an approved manner.” in the last sentence.
4. Delete the proposed new exception.

The cdpACCESS system will provide the text of the original code change proposal with the proposed change incorporated into the text. Using the cdpACCESS system, the proponent of the modification locates the original change in the system.

The proponent of the modification will need to manually install strikethrough (ex:” ~~delete~~) and underline (ex: add) formatting showing the additional revisions to the original proposal.

cdpACCESS will show the modification as follows:

PM10-18
305.13

Modification Proponent: Sam Sumter representing self

Modify the proposal as follows:

305.3 Interior surfaces. All interior surfaces, including windows and doors, shall be maintained in good, and clean and sanitary condition. Peeling, chipping, flaking or abraded paint shall be repaired, removed or covered. Cracked or loose plaster and other defective surface conditions shall be corrected. Surfaces of porous or water permeable materials made of or containing organic materials, such as but not limited to wood, textiles, paint, cellulose insulation, and paper, including paper-faced gypsum board, that have visible signs of mold or mildew shall be removed and replaced or remediated ~~in an approved manner.~~

~~**Exception:** Porous materials that do not contain organic materials, such as clean unpainted bricks and concrete.~~

Among the benefits of using cdpACCESS to submit modifications are:

- Modification proponents will be able to access the system in advance of the hearings to develop their modification (see “Detailed Steps of the Modification Submission Process via cdpACCESS” on the following pages).
- 20 hard copies of the modification for distribution to the committee are no longer required.
- You can preview your modification at any time by downloading a pdf via cdpACCESS.

OVERVIEW OF THE MODIFICATION PROCESS (see CP28 Section 5.5.2 on page xxiii)

1. Modification submitted electronically via cdpACCESS. As in the past, this submittal is required well in advance of the code change proposal being brought to the floor.

2. The code change proposal is brought to the floor by the Moderator.

IMPORTANT NOTE: ONCE A CODE CHANGE PROPOSAL IS BROUGHT TO THE FLOOR, ALL MODIFICATIONS MUST BE IN THE cdpACCESS SYSTEM. SEE NOTE 1.

3. Modification proponent suggests the modification from the floor at the hearing.

4. Modification posted to cdpACCESS for public viewing (including the hearing room via WiFi) and committee viewing.
5. Modification displayed on the screen in the hearing room.
6. Chair rules the modification in or out of order.
7. If ruled in order, testimony on the modification is initiated.

EDITORIAL CODE CHANGES - CODE CORRELATION COMMITTEE

In a typical code change cycle, there are code change proposals that are considered strictly editorial. Section 4.4 of CP 28 (see below) establishes a process by which the Code Correlation Committee (CCC) considers such proposals.

4.4 Editorial Code Change Proposals. When a code change proposal is submitted that proposes an editorial or format change that, in the opinion of the Secretariat, does not affect the scope or application of the code, the proposal shall be submitted to the Code Correlation Committee who shall deem the code change proposal as editorial or send the proposal back to the Secretariat to be considered by the appropriate code development committee. To be deemed editorial, such proposal shall require a majority vote of the Code Correlation Committee. Editorial proposals shall be published in the Code Change Agenda. Such proposals shall be added to the hearing agenda for consideration by the appropriate code development committee upon written request to ICC by any individual. The deadline to submit such requests shall be 14 days prior to the first day of the Committee Action Hearing. Code Correlation Committee proposals that are not added to a code development committee hearing agenda shall be published in the next edition of the code with no further consideration.

There are 14 such proposals in the current 2019 Cycle. The proposals are located after the last code change in the CAH Agenda and are identified by a code change prefix of CCC.

As noted in Section 4.4, anyone may request that either of these proposals be added to the hearing agenda. The deadline to make such a request is 11: 59 pm Pacific on Sunday, April 14, 2019 via email. Be sure to identify the code change number noted above. Such requests must be sent to:

Ed Wirtschoreck
Director, Codes
ewirtschoreck@iccsafe.org

2018/2019 ICC CODE DEVELOPMENT SCHEDULE

(February 10, 2017)

STEP IN CODE DEVELOPMENT CYCLE	DATE	
	2018 – Group A Codes IBC- E, IBC - FS, IBC -G, IFC, IFGC, IMC, IPC, IPMC, IPSDC, IRC – M, IRC- P, ISPSC, IWUIC, IZC	2019 – Group B Codes Admin, IBC-S, IEBC, IECC-C, IECC-R/IRC-E, IgCC (Ch. 1), IRC – B
2018 EDITION OF I-CODES PUBLISHED	Fall/2017 (except 2018 IgCC, see Group B Codes on page x)	
DEADLINE FOR RECEIPT OF APPLICATIONS FOR ALL CODE COMMITTEES	June 1, 2017 for the 2018/2019 Cycle. Call for committee posted in February /2017.	
DEADLINE FOR cdpACCESS ONLINE RECEIPT OF CODE CHANGE PROPOSALS	January 8, 2018 (Extended to January 11, 2018)	January 7, 2019
WEB POSTING OF “PROPOSED CHANGES TO THE I-CODES”	February 28, 2018*	March 4, 2019*
COMMITTEE ACTION HEARING (CAH)	April 15 – 23, 2018 Greater Columbus Convention Center Columbus, OH	April 28 – May 8, 2019 Albuquerque Convention Center Albuquerque, NM
ONLINE CAH ASSEMBLY FLOOR MOTION VOTE	Starts approx. two weeks after last day of the CAH. Open for 2 weeks.	Starts approx. two weeks after last day of the CAH. Open for 2 weeks.
WEB POSTING OF “REPORT OF THE COMMITTEE ACTION HEARING”	May 30, 2018	June 11, 2019
DEADLINE FOR cdpACCESS ONLINE RECEIPT OF PUBLIC COMMENTS	July 16, 2018	July 24, 2019
WEB POSTING OF “PUBLIC COMMENT AGENDA”	August 31, 2018*	September 4, 2019*
PUBLIC COMMENT HEARING (PCH) ANNUAL CONFERENCE DATES NOTED BY AC	October 24 – 31, 2018 Greater Richmond Convention Center Richmond, VA AC: October 21 – 23	October 23 – 30, 2019 Clark County, NV AC: October 20 - 22
ONLINE GOVERNMENTAL CONSENSUS VOTE (OGCV)	Starts approx. two weeks after last day of the PCH. Open for 2 weeks.	Starts approx. two weeks after last day of the PCH. Open for 2 weeks.
WEB POSTING OF FINAL ACTION	Following Validation Committee certification of OGCV and ICC Board confirmation.	Following Validation Committee certification of OGCV and ICC Board confirmation.

* Web posting of the “Proposed Changes to the I-Codes” and “Public Comment Agenda” will be posted no later than scheduled. ICC will make every effort to post these documents earlier, subject to code change/public comment volume and processing time.

2018 Group A Codes/Code committees:

- IBC-E: IBC Egress provisions. Chapters 10 and 11.
- IBC-FS: IBC Fire Safety provisions. Chapters 7, 8, 9 (partial), 14 and 26. Majority of IBC Chapter 9 is maintained by the IFC. See notes.
- IBC-G: IBC General provisions. Chapters 3 – 6, 12, 13, 27 – 33.
- IFC: The majority of IFC Chapter 10 is maintained by IBC-E. See notes.
- IFGC
- IMC
- IPC
- IPMC (code changes heard by the IPM/ZC (IPMC & IZC) code committee)
- IPSDC (code changes heard by the IPC code committee)
- IRC-M: IRC Mechanical provisions. Chapters 12 – 23 (code changes heard by the IRC - MP code committee)
- IRC-P: IRC Plumbing provisions. Chapters 25 – 33 (code changes heard by the IRC - MP code committee)
- ISPSC
- IWUIC (code changes heard by the IFC code committee)
- IZC (code changes heard by the IPM/ZC (IPMC & IZC) code committee)

2019 Group B Codes/Code committees:

- Admin: Chapter 1 of all the I-Codes except the IECC, IgCC and IRC. Also includes the update of currently referenced standards in all of the 2018 Codes, except the IgCC.
- IBC-S: IBC Structural provisions. IBC Chapters 15 – 25 and IEBC structural provisions. See notes.
- IEBC: IEBC Non-structural provisions. See notes.
- IECC-C: IECC Commercial energy provisions.
- IECC-R/IRC-E: IECC Residential energy provisions and IRC Energy provisions in Chapter 11.
- IgCC: Chapter 1 of the IgCC. Remainder of the code is based on the provisions of ASHRAE Standard 189.1 *Standard for the Design of High-Performance Green Buildings, Except Low-Rise Residential Buildings*. The 2018 IgCC is scheduled to be published in the Summer/2018.
- IRC-B: IRC Building provisions. Chapters 1 – 10.

A 2020 Group C cycle is not scheduled.

Notes:

- Be sure to review the document entitled “2018/2019 Code Committee Responsibilities” which will be posted. This identifies responsibilities which are different than Group A and B codes and committees which may impact the applicable code change cycle and resulting code change deadline. As an example, throughout Chapter 9 of the IBC (IBC- Fire Safety), there are numerous sections which include the designation “[F]” which indicates that the provisions of the section are maintained by the IFC code committee. Similarly, there are numerous sections in the IEBC which include the designation “[BS]”. These are structural provisions which will be heard by the IBC – Structural committee. The designations in the code are identified in the Code Committee Responsibilities document.
- I-Code Chapter 1: Proposed changes to the provisions in Chapter 1 of the majority of the I-Codes are heard in Group B (see Admin above for exceptions). Be sure to review the brackets ([]) of the applicable code.
- Definitions. Be sure to review the brackets ([]) in Chapter 2 of the applicable code and the Code Committee Responsibilities document to determine which code committee will consider proposed changes to the definitions.
- Proposed changes to the ICC Performance Code will be heard by the code committee noted in brackets ([]) in the section of the code and in the Code Committee Responsibilities document

2018 - 2019 STAFF SECRETARIES

GROUP A (2018)

IBC – Egress Chapters 10, 11	IBC – Fire Safety Chapters 7, 8, 9, 14, 26	IBC – General Chapters 1-6, 12, 13, 27- 34	IFC	IFGC
Kim Paarlberg Indianapolis, IN Ext 4306 kpearlberg@iccsafe.org	Michelle Britt Chicago Regional Office Ext 4284 mbritt@iccsafe.org Kermit Robinson Western Regional Office Ext 3317 krobinson@iccsafe.org	Kermit Robinson Western Regional Office Ext 3317 krobinson@iccsafe.org Allan Bilka Central Regional Office Ext 4326 abilka@iccsafe.org	Beth Tubbs Northbridge, MA Ext 7708 btubbs@iccsafe.org Keith Enstrom Chicago Regional Office Ext 4342 kenstrom@iccsafe.org	Gregg Gress Chicago Regional Office Ext 4343 ggress@iccsafe.org
IMC	IPC/IPSDC	ICC Performance	IPMC	IRC Mechanical
Gregg Gress Chicago Regional Office Ext 4343 ggress@iccsafe.org	Fred Grable Chicago Regional Office Ext 4359 fgrable@iccsafe.org	Beth Tubbs Northbridge, MA Ext 7708 btubbs@iccsafe.org	Ed Wirtschoreck Chicago Regional Office Ext 4317 ewirtschoreck@iccsafe.org	Gregg Gress Chicago Regional Office Ext 4343 ggress@iccsafe.org
IRC Plumbing	ISPSC	IWUIC	IZC	
Fred Grable Chicago Regional Office Ext 4359 fgrable@iccsafe.org	Fred Grable Chicago Regional Office Ext 4359 fgrable@iccsafe.org	Keith Enstrom Chicago Regional Office Ext 4342 kenstrom@iccsafe.org	Ed Wirtschoreck Chicago Regional Office Ext 4317 ewirtschoreck@iccsafe.org	

GROUP B (2019)

ADMINISTRATIVE Chapter 1 All Codes except the IECC, IgCC, and IRC	IBC-Structural Chapters 15-25 IEBC Structural	IECC-Commercial Commercial Chapters C1- C5	IECC/IRC – Residential IECC Residential Chapters R1 – R5, IRC Chapter 11	IEBC
Kim Paarlberg Indianapolis, IN Ext 4306 kpearlberg@iccsafe.org	Lawrence Novak Chicago Regional Office Ext 4405 lnovak@iccsafe.org Ed Wirtschoreck Chicago Regional Office Ext 4317 ewirtschoreck@iccsafe.org	Michelle Britt Chicago Regional Office Ext 4284 mbritt@iccsafe.org	Michelle Britt Chicago Regional Office Ext 4287 mbritt@iccsafe.org	Beth Tubbs Northbridge, MA Ext 7708 btubbs@iccsafe.org Keith Enstrom Chicago Regional Office Ext 4342 kenstrom@iccsafe.org
ICC Performance	IRC-Building			
Beth Tubbs Northbridge, MA Ext 7708 btubbs@iccsafe.org	Allan Bilka Central Regional Office Ext 4326 abilka@iccsafe.org Kim Paarlberg Indianapolis, IN Ext 4306 kpearlberg@iccsafe.org			



CP #28-05 CODE DEVELOPMENT

Approved: 9/24/05
Revised: 1/22/2019

1.0 Introduction

- 1.1 **Purpose of Council Policy:** The purpose of this Council Policy is to prescribe the Rules of Procedure utilized in the continued development and maintenance of the International Codes (Codes).
- 1.2 **Objectives:** The ICC Code Development Process has the following objectives:
 - 1.2.1 The timely evaluation and recognition of technological developments pertaining to construction regulations.
 - 1.2.2 The open discussion of code change proposals by all parties desiring to participate.
 - 1.2.3 The final determination of Code text by public officials actively engaged in the administration, formulation or enforcement of laws, ordinances, rules or regulations relating to the public health, safety and welfare and by honorary members.
 - 1.2.4 The increased participation of all parties desiring to participate through an online submittal and voting process that includes opportunities for online collaboration.
- 1.3 **Code Publication:** The ICC Board of Directors (ICC Board) shall determine the title and the general purpose and scope of each Code published by the ICC.
 - 1.3.1 **Code Correlation:** The provisions of all Codes shall be consistent with one another so that conflicts between the Codes do not occur. A Code Scoping Coordination Matrix shall determine which Code shall be the primary document, and therefore which code development committee shall be responsible for maintenance of the code text where a given subject matter or code text could appear in more than one Code. The Code Scoping Coordination Matrix shall be administered by the Code Correlation Committee as approved by the ICC Board. Duplication of content or text between Codes shall be limited to the minimum extent necessary for practical usability of the Codes, as determined in accordance with Section 4.5.
- 1.4 **Process Maintenance:** The review and maintenance of the Code Development Process and these Rules of Procedure shall be by the ICC Board. The manner in which Codes are developed embodies core principles of the organization. One of those principles is that the final content of the Codes is determined by a majority vote of the governmental and honorary members. It is the policy of the ICC Board that there shall be no change to this principle without the affirmation of two-thirds of the governmental and honorary members responding.
- 1.5 **Secretariat:** The Chief Executive Officer shall assign a Secretariat for each of the

Codes. All correspondence relating to code change proposals and public comments shall be addressed to the Secretariat. The Secretariat shall have the authority to facilitate unforeseen situations which arise in the implementation of this council policy. Staff shall maintain a record of such actions.

- 1.6 Recording:** Individuals requesting permission to record any meeting or hearing, or portion thereof, shall be required to provide the ICC with a release of responsibility disclaimer and shall acknowledge that ICC shall retain sole ownership of the recording, and that they have insurance coverage for liability and misuse of recording materials. Equipment and the process used to record shall, in the judgment of the ICC Secretariat, be conducted in a manner that is not disruptive to the meeting. The ICC shall not be responsible for equipment, personnel or any other provision necessary to accomplish the recording. An unedited copy of the recording shall be forwarded to ICC within 30 days of the meeting. Recordings shall not otherwise be copied, reproduced or distributed in any manner. Recordings shall be returned to ICC or destroyed upon the request of ICC.

2.0 Code Development Cycle

- 2.1 Intent:** The code development cycle shall consist of the complete consideration of code change proposals in accordance with the procedures herein specified, commencing with the deadline for submission of code change proposals (see Section 3.5) and ending with publication of the Final Action on the code change proposals (see Section 10.4).

- 2.2 New Editions:** The ICC Board shall determine the schedule for publishing new editions of the Codes. Each new edition shall incorporate the results of the code development activity since the previous edition.

- 2.3 Supplements:** The results of code development activity between editions may be published.

- 2.4 Interim Code Amendments:** All revisions to the International Codes shall be processed in accordance with other sections of this Council Policy except for Emergency Actions by the ICC Board complying with Section 2.4.1 and Interim Critical Amendments (ICA) complying with Section 2.4.2.

- 2.4.1 Emergency Actions by the ICC Board:** Emergency actions by the ICC Board are limited to those issues representing an immediate threat to health and safety that warrant a more timely response than allowed by the Code Development Process schedule.

2.4.1.1 Initial Request: A request for an emergency action shall be based upon perceived immediate threats to health and safety and shall be reviewed by the Codes and Standards Council for referral to the ICC Board for action with their analysis and recommendation.

2.4.1.2 Board and Member Action: In the event that the ICC Board determines that an emergency amendment to any Code or supplement thereto is warranted, the same may be adopted by the ICC Board. Such action shall require an affirmative vote of at least two-thirds of the ICC Board.

The ICC membership shall be notified within ten days after the ICC Boards' official action of any emergency amendment. At the next Annual Business Meeting, any emergency amendment shall be presented to the members for ratification by a majority of the Governmental Member Voting Representatives and Honorary Members present and voting.

All code revisions pursuant to these emergency procedures and the

reasons for such corrective action shall be published as soon as practicable after ICC Board action. Such revisions shall be identified as an emergency amendment.

Emergency amendments to any Code shall not be considered as a retro-active requirement to the Code. Incorporation of the emergency amendment into the adopted Code shall be subjected to the process established by the adopting authority.

2.4.2 Interim Critical Amendments (ICA)

2.4.2.1 Submittal. Anyone may propose an ICA by providing the following information:

- a) Name of submitter
- b) Contact information
- c) Submitters representation
- d) Date
- e) Relevant section(s) and code edition(s) under consideration
- f) Proposed modifications with text changes identified using underlines for new text and strikethroughs for deleted text
- g) A statement that substantiates the need for proposed changes and why the proposed submission is of such a critical nature in accordance with Section 2.4.2.3 that it cannot be left to be addressed during the next code development cycle.
- h) Written endorsement of the proposed ICA by not less than two members of the Code Development Committee(s) responsible for maintaining the affected code section(s)

2.4.2.2 Preliminary Review. An ICA will only be processed if the Codes and Standards Council determines that the proposed ICA appears to be of a critical nature requiring prompt action based on the criteria specified in Section 2.4.2.3. If processed, the question of critical nature shall be further considered by the responsible Code Development Committee(s) and the Codes and Standards Council. The text of a proposed ICA shall be processed as submitted or shall be changed with the approval of the submitter. The Codes and Standards Council shall process their preliminary “critical nature” determination within 45 days of the ICA submission.

2.4.2.3 Determination of Critical Nature. Qualification for critical nature shall be based on one or more of the following factors:

- a) The proposed ICA corrects an error or an omission that was overlooked during a regular code development process.
- b) The proposed ICA resolves a conflict within an individual code or a conflict involving two or more ICC codes.
- c) The proposed ICA mitigates a previously unknown hazard.

2.4.2.4 Code Development Committee. A proposed ICA that meets the provisions in Sections 2.4.2.2 and 2.4.2.3 shall be submitted to the Code Development Committee(s) responsible for the affected section(s) for a ballot and comment period of 30 calendar days. The committee(s) shall be separately balloted on both the technical merit of the ICA and whether the ICA satisfies the critical nature criteria. Negative votes in the initial ballot, if any, shall require a reason statement and shall be circulated to the full committee(s) to allow initial ballot votes to be changed.

A committee recommendation for approval shall require an affirmative vote of at least three-fourths of members who voted, on both technical merit and critical nature. The following shall be omitted from the three-fourths vote calculation:

- a) Committee members who have abstained.
- b) Committee members whose negative ballots do not include a statement conveying the reason for casting a negative vote.
- c) Committee members who do not return their ballots prior to the announced ballot return deadline.

In addition to the three-fourths majority described above, the number of affirmative votes shall be not less than 50% of all committee members who are eligible to vote. Committee members eligible to vote shall be the total number of individuals who are members of the committee on the date of ballot distribution and shall not be adjusted based on abstentions or ballots that were not returned.

ICAs that achieve the required number of affirmative votes on both technical merit and critical nature are approved for further processing in accordance with Sections 2.4.2.5 through 2.4.2.9. ICAs that do not achieve the required number of affirmative votes on both technical merit and critical nature are rejected.

2.4.2.5 Publication of Proposed ICA for Public Comment. An ICA that is approved in accordance with Section 2.4.2.4 shall be published by ICC in appropriate media with a notice inviting public comments on the proposed ICA. The public comment period shall be open for at least 30 calendar days from the date of posting of the notice. When a proposed ICA revises text that was changed in the most recent code development cycle, the ICA public comment notice shall also be directly provided to submitters of proposals and public comments to the affected section in the most recent code development cycle.

2.4.2.6 Additional Code Development Committee Review. All public comments shall be circulated to the responsible Code Development Committee(s) for a 30-calendar day ballot and comment period allowing an opportunity for committee members to change votes taken prior to the public comment period. If any votes are changed to negative, negative votes shall be circulated to the full committee, followed by a final ballot following the voting procedures Section 2.4.2.4.

Approved ICAs shall be forwarded to the Codes and Standards Council with a staff report that includes all public comments, ballots, committee member comments on ballots and concurrence by staff on which code editions should be affected by the ICA.

2.4.2.7 Action of the Codes and Standards Council. The Codes and Standards Council shall review the material submitted in accordance with Section 2.4.2.6 at the next Codes and Standards Council meeting. Approval of an ICA shall require an affirmative vote of at least two-thirds of the Codes and Standards Council members who cast a vote at the meeting.

2.4.2.8 Effective Date and Publication. ICAs that are approved by the Codes and Standards Council shall become effective 30 calendar days after approval, or

in the case of an appeal in accordance with Section 2.4.2.9, 30 calendar days after a decision by the ICC Board upholding a Codes and Standards Council decision to issue an ICA.

An ICA shall apply to code editions specified by the ICC Codes and Standards Council, and ICC staff shall, by an appropriate method, publish approved ICAs and ensure that approved ICAs are distributed with future sales of affected codes. ICAs shall be distributed as a separate document and shall not be incorporated into the text of a published code until such time that the ICA has been approved by the full code development process, following submittal as a proposal in accordance with Section 2.4.2.11.

2.4.2.9 Appeals. A decision of the Codes and Standards Council to approve an ICA shall be appealable to the ICC Board in accordance with Council Policy 1.

2.4.2.10 Applicability. ICAs shall not be considered retroactive requirements.

2.4.2.11 Subsequent Processing. An approved ICA shall automatically become a code change proposal from the Codes and Standards Council in the following code cycle.

2.5 Code Development Record. The code development record shall include the official documents and records developed in support of the given code development cycle. This includes the following:

1. Code Change Agenda (Section 4.8)
2. Audio and video recording of the Committee Action Hearing (Section 5.1)
3. The Online Assembly Floor Motion Ballot (Section 5.7.3)
4. Report of the Committee Action Hearing (Section 5.8)
5. Public Comment Agenda (Section 6.6)
6. Public Comment Hearing results (Section 7.5.8.10)
7. Audio and video recording of the Public Comment Hearing (Section 7.1)
8. The Online Governmental Consensus Ballot (Section 8.2)
9. Final Action results (Section 10.4)
10. Errata to the documents noted above

The information resulting from online collaboration between interested parties shall not be part of the code development record.

3.0 Submittal of Code Change Proposals

3.1 Intent: Any interested person, persons or group may submit a code change proposal which will be duly considered when in conformance to these Rules of Procedure.

3.2 Withdrawal of Proposal: A code change proposal may be withdrawn by the proponent (WP) at any time prior to membership action on the consent agenda at the Public Comment Hearing or prior to testimony on the code change proposal on the individual consideration agenda at the Public Comment Hearing. All actions on the code change proposal shall cease immediately upon the withdrawal of the code change proposal.

3.3 Form and Content of Code Change Submittals: Each code change proposal shall be submitted separately and shall be complete in itself. Each submittal shall contain the following information:

3.3.1 Proponent: Each code change proposal shall include the name, title, mailing

address, telephone number, and email address of the proponent. Email addresses shall be published with the code change proposals unless the proponent otherwise requests on the submittal form.

3.3.1.1 If a group, organization or committee submits a code change proposal, an individual with prime responsibility shall be indicated.

3.3.1.2 If a proponent submits a code change proposal on behalf of a client, group, organization or committee, the name and mailing address of the client, group, organization or committee shall be indicated.

3.3.2 Code Reference: Each code change proposal shall relate to the applicable code sections(s) in the latest edition of the Code.

3.3.2.1 If more than one section in the Code is affected by a code change proposal, appropriate proposals shall be included for all such affected sections.

3.3.2.2 If more than one Code is affected by a code change proposal, appropriate proposals shall be included for all such affected Codes and appropriate cross referencing shall be included in the supporting information.

3.3.3 Multiple Code Change Proposals to a Code Section. A proponent shall not submit multiple code change proposals to the same code section. When a proponent submits multiple code change proposals to the same section, the proposals shall be considered as incomplete proposals and processed in accordance with Section 4.3. This restriction shall not apply to code change proposals that attempt to address differing subject matter within a code section.

3.3.4 Text Presentation: The text of the code change proposal shall be presented in the specific wording desired with deletions shown struck out with a single line and additions shown underlined with a single line.

3.3.4.1 A charging statement shall indicate the referenced code section(s) and whether the code change proposal is intended to be an addition, a deletion or a revision to existing Code text.

3.3.4.2 Whenever practical, the existing wording of the text shall be preserved with only such deletions and additions as necessary to accomplish the desired change.

3.3.4.3 Each code change proposal shall be in proper code format and terminology.

3.3.4.4 Each code change proposal shall be complete and specific in the text to eliminate unnecessary confusion or misinterpretation.

3.3.4.5 The proposed text shall be in mandatory terms.

3.3.5 Supporting Information: Each code change proposal shall include sufficient supporting information to indicate how the code change proposal is intended to affect the intent and application of the Code.

3.3.5.1 Purpose: The proponent shall clearly state the purpose of the code change proposal (e.g. clarify the Code; revise outdated material; substitute new or revised material for current provisions of the Code; add new requirements to the Code; delete current requirements, etc.)

3.3.5.2 Reasons: The proponent shall justify changing the current Code provisions, stating why the code change proposal is superior to the current provisions of the Code. Code change proposals which add or

delete requirements shall be supported by a logical explanation which clearly shows why the current Code provisions are inadequate or overly restrictive, specifies the shortcomings of the current Code provisions and explains how such code change proposals will improve the Code.

3.3.5.3 Substantiation: The proponent shall substantiate the code change proposal based on technical information and substantiation. Substantiation provided which is reviewed in accordance with Section 4.2 and determined as not germane to the technical issues addressed in the code change proposal may be identified as such. The proponent shall be notified that the code change proposal is considered an incomplete proposal in accordance with Section 4.3 and the proposal shall be held until the deficiencies are corrected. The proponent shall have the right to appeal this action in accordance with the policy of the ICC Board. The burden of providing substantiating material lies with the proponent of the code change proposal. Supporting documentation may be provided via a link to a website provided by the proponent and included in the reason statement. The reason statement shall include the date the link was created. All substantiating material published by ICC is material that has been provided by the proponent and in so publishing ICC makes no representations or warranties about its quality or accuracy.

3.3.5.4 Bibliography: The proponent shall submit a bibliography of any substantiating material submitted with the code change proposal. The bibliography shall be published with the code change proposal and the proponent shall make the substantiating materials available for review at the appropriate ICC office and during the public hearing. Supporting documentation may be provided via a link to a website provided by the proponent and included in the bibliography. The reason statement shall include the date the link was created.

3.3.5.5 Copyright Release: The proponent of code change proposals, floor modifications and public comments shall sign a copyright release developed and posted by ICC.

3.3.5.6 Cost Impact: The proponent shall indicate one of the following regarding the cost impact of the code change proposal:

- 1) The code change proposal will increase the cost of construction;
- 2) The code change proposal will decrease the cost of construction; or
- 3) The code change proposal will not increase or decrease the cost of construction.

The proponent shall submit information which substantiates such assertion. This information will be considered by the code development committee and will be included in the published code change proposal. Supporting documentation may be provided via a link to a website provided by the proponent and included in the cost substantiation statement. The cost substantiation statement shall include the date the link was created.

Any proposal submitted which does not include the requisite cost impact information shall be considered incomplete and shall not be

processed.

3.4 Online Submittal: Each code change proposal and all substantiating information shall be submitted online at the website designated by ICC. Two copies of each proposed new referenced standard in hard copy or one copy in electronic form shall be submitted. Additional copies may be requested when determined necessary by the Secretariat to allow such information to be distributed to the code development committee. Where such additional copies are requested, it shall be the responsibility of the proponent to send such copies to the respective code development committee.

3.5 Submittal Deadline: ICC shall establish and post the submittal deadline for each cycle. The posting of the deadline shall occur no later than 120 days prior to the code change deadline. Each code change proposal shall be submitted online at the website designated by ICC by the posted deadline. The submitter of a code change proposal is responsible for the proper and timely receipt of all pertinent materials by the Secretariat.

3.6 Referenced Standards: In order for a standard to be considered for reference or to continue to be referenced by the Codes, a standard shall meet the following criteria:

3.6.1 Code References:

3.6.1.1 The standard, including title and date, and the manner in which it is to be utilized shall be specifically referenced in the Code text.

3.6.1.2 The need for the standard to be referenced shall be established.

3.6.2 Standard Content:

3.6.2.1 A standard or portions of a standard intended to be enforced shall be written in mandatory language.

3.6.2.2 The standard shall be appropriate for the subject covered.

3.6.2.3 All terms shall be defined when they deviate from an ordinarily accepted meaning or a dictionary definition.

3.6.2.4 The scope or application of a standard shall be clearly described.

3.6.2.5 The standard shall not have the effect of requiring proprietary materials.

3.6.2.6 The standard shall not prescribe a proprietary agency for quality control or testing.

3.6.2.7 The test standard shall describe, in detail, preparation of the test sample, sample selection or both.

3.6.2.8 The test standard shall prescribe the reporting format for the test results. The format shall identify the key performance criteria for the element(s) tested.

3.6.2.9 The measure of performance for which the test is conducted shall be clearly defined in either the test standard or in Code text.

3.6.2.10 The standard shall not state that its provisions shall govern whenever the referenced standard is in conflict with the requirements of the referencing Code.

3.6.2.11 The preface to the standard shall announce that the standard is promulgated according to a consensus procedure.

3.6.3 Standard Promulgation:

3.6.3.1 Code change proposals with corresponding changes to the code text which include a reference to a proposed new standard or a proposed update of an existing referenced standard shall comply with this section.

3.6.3.1.1 Proposed New Standards. In order for a new standard to be considered for reference by the Code, such standard shall be submitted in at least a consensus draft form in accordance with Section 3.4. If the proposed new standard is not submitted in at least consensus draft form, the code change proposal shall be considered incomplete and shall not be processed. The code change proposal shall be considered at the Committee Action Hearing by the applicable code development committee responsible for the corresponding proposed changes to the code text. If the committee action at the Committee Action Hearing is either As Submitted or As Modified and the standard is not completed, the code change proposal shall automatically be placed on the Public Comment Agenda with the recommendation stating that in order for the public comment to be considered, the new standard shall be completed and readily available prior to the Public Comment Hearing. If the committee action at the Committee Action Hearing is Disapproval, further consideration on the Public Comment Agenda shall include a recommendation stating that in order for the public comment to be considered, the new standard shall be completed and readily available prior to the Public Comment Hearing.

3.6.3.1.2 Update of Existing Standards. Code change proposals which include technical revisions to the code text to coordinate with a proposed update of an existing referenced standard shall include the submission of the proposed update to the standard in at least a consensus draft form in accordance with Section 3.4. If the proposed update of the existing standard is not submitted in at least consensus draft form, the code change proposal shall be considered incomplete and shall not be processed. The code change proposal, including the update of the existing referenced standard, shall be considered at the Committee Action Hearing by the applicable code development committee responsible for the corresponding changes to the code text. If the committee action at the Committee Action Hearing is either As Submitted or As Modified and the updated standard is not completed, the code change proposal shall automatically be placed on the Public Comment Agenda with the recommendation stating that in order for the public comment to be considered, the updated standard shall be completed and readily available prior to the Public Comment Hearing. If the committee action at the Committee Action Hearing is Disapproval, further consideration on the Public Comment Agenda shall include a recommendation stating that in order for the public comment to be considered, the updated standard shall be completed and readily available prior to the Public Comment Hearing.

Updating of standards without corresponding code text changes shall be accomplished administratively in accordance with Section 4.6.

3.6.3.2 The standard shall be developed and maintained through a consensus process such as ASTM or ANSI.

4.0 Processing of Code Change Proposals

4.1 Intent: The processing of code change proposals is intended to ensure that each proposal complies with these Rules of Procedure and that the resulting published code change proposal accurately reflects that proponent's intent.

- 4.2 Review:** Upon receipt in the Secretariat's office, the code change proposals will be checked for compliance with these Rules of Procedure as to division, separation, number of copies, form, language, terminology, supporting statements and substantiating data. Where a code change proposal consists of multiple parts which fall under the maintenance responsibilities of different code committees, the Secretariat shall determine the code committee responsible for determining the committee action in accordance with Section 5.6 and the Code Scoping Coordination Matrix (see Section 1.3.1).
- 4.3 Incomplete Code Change Proposals:** When a code change proposal is submitted with incorrect format, without the required information or judged as not in compliance with these Rules of Procedure, the Secretariat shall notify the proponent of the specific deficiencies and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the Secretariat receives the corrected code change proposal after the final date, the proposal shall be held over until the next code development cycle. Where there are otherwise no deficiencies addressed by this section, a code change proposal that incorporates a new referenced standard shall be processed with an analysis of the referenced standard's compliance with the criteria set forth in Section 3.6.
- 4.4 Editorial Code Change Proposals.** When a code change proposal is submitted that proposes an editorial or format change that, in the opinion of the Secretariat, does not affect the scope or application of the code, the proposal shall be submitted to the Code Correlation Committee who shall deem the code change proposal as editorial or send the proposal back to the Secretariat to be considered by the appropriate code development committee. To be deemed editorial, such proposal shall require a majority vote of the Code Correlation Committee. Editorial proposals shall be published in the Code Change Agenda. Such proposals shall be added to the hearing agenda for consideration by the appropriate code development committee upon written request to ICC by any individual. The deadline to submit such requests shall be 14 days prior to the first day of the Committee Action Hearing. Code Correlation Committee proposals that are not added to a code development committee hearing agenda shall be published in the next edition of the code with no further consideration.
- 4.5 Copy Editing Code Text:** The Chief Executive Officer shall have the authority at all times to make editorial style and format changes to the Code text, or any approved changes, consistent with the intent, provisions and style of the Code. Such editorial style or format changes shall not affect the scope or application of the Code requirements.
- 4.6 Updating Standards Referenced in the Codes:** Standards referenced by the Codes that do not require coordination with a code change proposal to the code text shall be updated administratively by the Administrative Code Development Committee in accordance with these full procedures except that the deadline for availability of the updated standard and receipt by the Secretariat shall be December 1 of the third year of each code cycle. The published version of the new edition of the Code which references the standard will refer to the updated edition of the standard. If the standard is not available by the December 1st deadline, the edition of the standard as referenced by the newly published Code shall revert back to the reference contained in the previous edition and an errata to the Code issued. Multiple standards to be updated may be included in a single proposal.
- 4.6.1 Updating ICC Standards Referenced in the Codes.** All standards developed by ICC and referenced by the Codes which are undergoing an update shall be announced by ICC to allow stakeholders to participate in the update process. Where the updated standard is completed and available by December 1 of the

third year of the code cycle, the published version of the new edition of the Code which references the standard shall refer to the updated edition of the standard. If the standard is not available by the December 1st deadline, the edition of the standard as referenced by the newly published Code shall revert back to the reference contained in the previous edition and an errata to the Code issued.

4.7 Preparation: All code change proposals in compliance with these procedures shall be prepared in a standard manner by the Secretariat and be assigned separate, distinct and consecutive numbers. The Secretariat shall coordinate related proposals submitted in accordance with Section 3.3.2 to facilitate the hearing process.

4.8 Code Change Agenda: All code change proposals shall be posted on the ICC website at least 30 days prior to the Committee Action Hearing on those proposals and shall constitute the agenda for the Committee Action Hearing. Any errata to the Code Change Agenda shall be posted on the ICC website as soon as possible. Code change proposals which have not been published in the original posting or subsequent errata shall not be considered.

5.0 Committee Action Hearing

5.1 Intent: The intent of the Committee Action Hearing is to permit interested parties to present their views including the cost and benefits on the code change proposals on the published agenda. The code development committee will consider such comments as may be presented in the development of their action on the disposition of such code change proposals. At the conclusion of the code development committee deliberations, the committee action on each code change proposal shall be placed before the hearing assembly for consideration in accordance with Section 5.7.

5.2 Committee: The Codes and Standards Council shall review all applications and make committee appointment recommendations to the ICC Board. The Code Development Committees shall be appointed by the ICC Board.

5.2.1 Chairman/Moderator: The Chairman and Vice-Chairman shall be appointed by the Codes and Standards Council from the appointed members of the committee. The ICC President shall appoint one or more Moderators who shall act as presiding officer for the Committee Action_Hearing.

5.2.2 Conflict of Interest: A committee member shall withdraw from and take no part in those matters with which the committee member has an undisclosed financial, business or property interest. The committee member shall not participate in any committee discussion or any committee vote on the matter in which they have an undisclosed interest. A committee member who is a proponent of a code change proposal shall not participate in any committee discussion on the matter or any committee vote. Such committee member shall be permitted to participate in the floor discussion in accordance with Section 5.5 by stepping down from the dais.

5.2.3 Representation of Interest: Committee members shall not represent themselves as official or unofficial representatives of the ICC except at regularly convened meetings of the committee.

5.2.4 Committee Composition: The committee may consist of representation from multiple interests. A minimum of thirty-three and one-third percent (33.3%) of the committee members shall be regulators.

5.3 Date and Location: The date and location of the Committee Action Hearing shall be announced not less than 60 days prior to the date of the hearing.

5.4 General Procedures: *The Robert's Rules of Order* shall be the formal procedure for the conduct of the Committee Action Hearing except as a specific provision of these Rules of Procedure may otherwise dictate. A quorum shall consist of a majority of the voting members of the committee.

5.4.1 Chair Voting: The Chairman of the committee shall vote only when the vote cast will break a tie vote of the committee.

5.4.2 Open Hearing: The Committee Action Hearing is an open hearing. Any interested person may attend and participate in the floor discussion and assembly consideration portions of the hearing. Only code development committee members may participate in the committee action portion of the hearings (see Section 5.6). Participants shall not advocate a position on specific code change proposals with committee members other than through the methods provided in this policy.

5.4.3 Presentation of Material at the Public Hearing: Information to be provided at the hearing shall be limited to verbal presentations and modifications submitted in accordance with Section 5.5.2. Each individual presenting information at the hearing shall state their name and affiliation, and shall identify any entities or individuals they are representing in connection with their testimony. Audio-visual presentations are not permitted. Substantiating material submitted in accordance with Section 3.3.5.3 and other material submitted in response to a code change proposal shall be located in a designated area in the hearing room and shall not be distributed to the code development committee at the public hearing.

5.4.4 Agenda Order: The Secretariat shall publish a Code Change Agenda for the Committee Action Hearing, placing individual code change proposals in a logical order to facilitate the hearing. Any public hearing attendee may move to revise the agenda order as the first order of business at the public hearing, or at any time during the hearing except while another code change proposal is being discussed. Preference shall be given to grouping like subjects together, and for moving items back to a later position on the agenda as opposed to moving items forward to an earlier position.

5.4.4.1 Proponent Approval: A motion to revise the agenda order is considered in order unless the proponent(s) of the moved code change proposals are in attendance in the hearing room and object to the move. Where such objections are raised, the motion to revise the hearing order shall be ruled out of order by the Moderator. The ruling of the Moderator shall be final and not subject to a point of order in accordance with Section 5.4.8. The motion to change the hearing order is not debatable.

5.4.4.2 Revised Agenda Order Approved: A motion to revise the agenda order is subject to a 2/3 vote of those present.

5.4.5 Tabling: Tabling of code change proposals shall be permitted. The motion to table is considered in order unless the proponent(s) of the tabled code change proposals are in attendance at the hearing and object to the tabling. Where such objections are raised, the motion to table shall be ruled out of order by the Moderator. The ruling of the Moderator shall be final and not subject to a point of order in accordance with Section 5.4.8. The motion to table is not debatable.

The motion to table must identify one of the following as to the location in the agenda when or where the code change proposal(s) will be considered:

1. To a specific date and time within the timeframe of the Code Change Agenda for the code change proposals under consideration, or
2. To a specific location in the Code Change Agenda for the code change proposals under consideration.

5.4.5.1 Tabling approved: A motion to table is subject to a 2/3 vote of those present.

5.4.5.2 Tabled code change proposals back to the floor: The Moderator shall bring the tabled code change proposal(s) back to the floor at the applicable time/agenda location in accordance with Section 5.4.5 Items 1 or 2. The testimony on the code change proposal shall resume at the point in the process where the tabling occurred.

5.4.6 Reconsideration: There shall be no reconsideration of a code change proposal after it has been voted on by the committee in accordance with Section 5.6.

5.4.7 Time Limits: Time limits shall be established as part of the agenda for testimony on all code change proposals at the beginning of each hearing session. Each person requesting to testify on a code change proposal shall be given equal time. In the interest of time and fairness to all hearing participants, the Moderator shall have limited authority to modify time limitations on debate. The Moderator shall have the authority to adjust time limits as necessary in order to complete the hearing agenda.

5.4.7.1 Time Keeping: Keeping of time for testimony by an individual shall be by an automatic timing device. Remaining time shall be evident to the person testifying. Interruptions during testimony shall not be tolerated. The Moderator shall maintain appropriate decorum during all testimony.

5.4.7.2 Proponent Testimony: The Proponent is permitted to waive an initial statement. The Proponent shall be permitted to have the amount of time that would have been allocated during the initial testimony period plus the amount of time that would be allocated for rebuttal. Where the code change proposal is submitted by multiple proponents, this provision shall permit only one proponent of the joint submittal to be allotted additional time for rebuttal.

5.4.8 Points of Order: Any person participating in the public hearing may challenge a procedural ruling of the Moderator or the Chairman. A majority vote of ICC Members in attendance shall determine the decision.

5.5 Floor Discussion: The Moderator shall place each code change proposal before the hearing for discussion by identifying the proposal and by regulating discussion as follows:

5.5.1 Discussion Order:

1. Proponents. The Moderator shall begin by asking the proponent and then others in support of the code change proposal for their comments.
2. Opponents. After discussion by those in support of a code change proposal, those opposed hereto, if any, shall have the opportunity to present their views.
3. Rebuttal in support. Proponents shall then have the opportunity to rebut

points raised by the opponents.

4. Re-rebuttal in opposition. Opponents shall then have the opportunity to respond to the proponent's rebuttal.

5.5.2 Modifications: Modifications to code change proposals may be suggested from the floor by any person participating in the public hearing. The person proposing the modification, or his/her designee, is deemed to be the proponent of the modification.

5.5.2.1 Submission. All modifications shall be submitted electronically to the ICC Secretariat in a format determined by ICC unless determined by the Chairman to be either editorial or minor in nature. The modification will be forwarded electronically to the members of the code development committee during the hearing and will be projected on the screen in the hearing room.

5.5.2.2 Criteria. The Chairman shall rule proposed modifications in or out of order before they are discussed on the floor. A proposed modification shall be ruled out of order if it:

1. changes the scope of the original code change proposal; or
2. is not readily understood to allow a proper assessment of its impact on the original code change proposal or the Code.

The ruling of the Chairman on whether or not the modification is in or out of order shall be final and is not subject to a point of order in accordance with Section 5.4.8.

5.5.2.3 Testimony. When a modification is offered from the floor and ruled in order by the Chairman, a specific floor discussion on that modification is to commence in accordance with the procedures listed in Section 5.5.1.

5.6 Committee Action: Following the floor discussion of each code change proposal, one of the following motions shall be made and seconded by members of the committee:

1. Approve the code change proposal As Submitted (AS) or
2. Approve the code change proposal As Modified with specific modifications (AM), or
3. Disapprove the code change proposal (D)

Discussion on this motion shall be limited to code development committee members. If a committee member proposes a modification which had not been proposed during floor discussion, the Chairman shall rule on the modification in accordance with Section 5.5.2.2. If a committee member raises a matter of issue, including a proposed modification, which has not been proposed or discussed during the floor discussion, the Moderator shall suspend the committee discussion and shall reopen the floor discussion for comments on the specific matter or issue. Upon receipt of all comments from the floor, the Moderator shall resume committee discussion.

The code development committee shall vote on each motion with the majority dictating the committee's action. Committee action on each code change proposal shall be completed when one of the motions noted above has been approved. Each committee vote shall be supported by a reason.

The code development committee shall maintain a record of its proceedings including the action on each code change proposal.

5.7 Assembly Consideration: At the conclusion of the committee's action on a code change proposal and before the next code change proposal is called to the floor, the Moderator shall ask for a motion from the public hearing attendees who may object to the committee's action. If a motion in accordance with Section 5.7.1 is not brought forward on the committee's action, the results of the Committee Action Hearing shall be established by the committee's action.

5.7.1 Assembly Floor Motion: Any attendee may raise an objection to the committee's action in which case the attendee will be able to make a motion to:

1. Approve the code change proposal As Submitted from the Floor (ASF), or
2. Approve the code change proposal As Modified from the Floor (AMF) with a specific modification that has been previously offered from the floor and ruled in order by the Chairman during floor discussion (see Section 5.5.2) or has been offered by a member of the Committee and ruled in order by the Chairman during committee discussion (see Section 5.6), or
3. Disapprove the code change proposal from the floor (DF).

5.7.2 Assembly Floor Motion Consideration: On receipt of a second to the floor motion, the Moderator shall accept the motion and the second and notify the attendees that the motion will be considered in an online ballot following the hearing in accordance with Section 5.7.3. No additional testimony shall be permitted.

5.7.3 Online Assembly Floor Motion Ballot: Following the Committee Action Hearing, all assembly floor motions which received a second shall be compiled into an online ballot. The ballot will include:

1. The code change proposal as published.
2. The committee action and reason from the Committee Action Hearing.
3. The floor motion, including modifications which are part of the floor motion.
4. Access to the audio and video of the Committee Action Hearing proceedings.
5. Identification of the ballot period for which the online balloting will be open.

5.7.4 Eligible Online Assembly Motion Voters: All members of ICC shall be eligible to vote on online assembly floor motions. Each member is entitled to one vote, except that each Governmental Member Voting Representative may vote on behalf of its Governmental Member. Individuals who represent more than one Governmental Member shall be limited to a single vote. Application, whether new or updated, for ICC membership must be received by the Code Council 30 days prior to the first day of the Committee Action Hearing. The ballot period will not be extended beyond the published period except as approved by the ICC Board.

5.7.5 Assembly Action: A successful assembly action shall be a majority vote of the votes cast by eligible voters (see Section 5.7.4). A successful assembly action results in an automatic public comment to be considered at the Public Comment Hearing (see Section 7.4).

5.8 Report of the Committee Action Hearing: The results of the Committee Action Hearing, including committee action and reason, online assembly floor motion vote results and the total vote count for each assembly floor motion shall be posted on the ICC website not less than 60 days prior to the Public Comment Hearing, except as approved by the ICC Board.

6.0 Public Comments

6.1 Intent: The public comment process gives attendees at the Public Comment Hearing an opportunity to consider specific objections to the results of the Committee Action Hearing and more thoughtfully prepare for the discussion for public comment consideration. The public comment process expedites the Public Comment Hearing by limiting the items discussed to the following:

1. Consideration of items for which a public comment has been submitted; and
2. Consideration of items which received a successful assembly action.

6.2 Deadline: The deadline for receipt of a public comment to the results of the Committee Action Hearing shall be announced at the Committee Action Hearing but shall not be less than 30 days subsequent to the availability of the Report of the Committee Action Hearing (see Section 5.8).

6.3 Withdrawal of Public Comment: A public comment may be withdrawn by the public commenter at any time prior to public comment consideration of that comment. A withdrawn public comment shall not be subject to public comment consideration. If the only public comment to a code change proposal is withdrawn by the public commenter prior to the vote on the consent agenda in accordance with Section 7.5.5, the proposal shall be considered as part of the consent agenda. If the only public comment to a code change proposal is withdrawn by the public commenter after the vote on the consent agenda in accordance with Section 7.5.5, the proposal shall continue as part of the individual consideration agenda in accordance with Section 7.5.6, however the public comment shall not be subject to public comment consideration.

6.4 Form and Content of Public Comments: Any interested person, persons, or group may submit a public comment to the results of the Committee Action Hearing which will be considered when in conformance to these requirements. Each public comment to a code change proposal shall be submitted separately and shall be complete in itself. Each public comment shall contain the following information:

6.4.1 Public comment: Each public comment shall include the name, title, mailing address, telephone number and email address of the public commenter. Email addresses shall be published with the public comments unless the commenter otherwise requests on the submittal form.

If a group, organization, or committee submits a public comment, an individual with prime responsibility shall be indicated. If a public comment is submitted on behalf a client, group, organization or committee, the name and mailing address of the client, group, organization or committee shall be indicated. The scope of the public comment shall be consistent with the scope of the original code change proposal, committee action or successful assembly action. Public comments which are determined as not within the scope of the code change proposal, committee action or successful assembly action shall be identified as such. The public commenter shall be notified that the public comment is considered an incomplete public comment in accordance with Section 6.5.1 and the public comment shall be held until the deficiencies are corrected. A copyright release in accordance with Section 3.3.5.5 shall be provided with the public comment.

6.4.2 Code Reference: Each public comment shall include the code change proposal number.

6.4.3 Multiple public comments to a code change proposal. A proponent shall not submit multiple public comments to the same code change proposal. When a proponent submits multiple public comments to the same code change proposal,

the public comments shall be considered as incomplete public comments and processed in accordance with Section 6.5.1. This restriction shall not apply to public comments that attempt to address differing subject matter within a code section.

6.4.4 Desired Final Action: In order for a public comment to be considered, the public comment shall indicate the desired Final Action as one of the following:

1. Approve the code change proposal As Submitted (AS), or
2. Approve the code change proposal As Modified by the committee modification published in the Report of the Committee Action Hearing (AM) or published in a public comment in the Public Comment Agenda (AMPC), or
3. Disapprove the code change proposal (D)

6.4.5 Supporting Information: The public comment shall include a statement containing a reason and justification for the desired Final Action on the code change proposal. Reasons and justification which are reviewed in accordance with Section 6.5 and determined as not germane to the technical issues addressed in the code change proposal or committee action may be identified as such. The public commenter shall be notified that the public comment is considered an incomplete public comment in accordance with Section 6.5.1 and the public comment shall be held until the deficiencies are corrected. The public commenter shall have the right to appeal this action in accordance with the policy of the ICC Board. A bibliography of any substantiating material submitted with a public comment shall be published with the public comment and the substantiating material shall be made available at the Public Comment_Hearing. Supporting documentation may be provided via a link to a website provided by the public commenter and included in the reason statement and bibliography. The reason statement shall include the date the link was created. All substantiating material published by ICC is material that has been provided by the proponent and in so publishing ICC makes no representations or warranties about its quality or accuracy.

6.4.6 Cost Impact: The proponent of the public comment shall indicate one of the following regarding the cost impact of the public comment to the code change proposal:

- 1) The net effect of the public comment and code change proposal will increase the cost of construction;
- 2) The net effect of the public comment and code change proposal will decrease the cost of construction; or
- 3) The net effect of the public comment and code change proposal will not increase or decrease the cost of construction.

The public commenter shall submit information which substantiates such assertion. This information will be considered at the Public Comment Hearing and will be included in the published public comment. Supporting documentation may be provided via a link to a website provided by the public commenter and included in the cost substantiation statement. The cost substantiation statement shall include the date the link was created.

Any public comment submitted which does not include the requisite cost impact information shall be considered incomplete and shall not be processed.

6.4.7 Online submittal: Each public comment and substantiating information shall be submitted online at the website designated by ICC. Additional copies may be requested when determined necessary by the Secretariat.

6.4.8 Submittal Deadline: ICC shall establish and post the submittal deadline for each cycle. The posting of the deadline shall occur no later than 120 days prior to the public comment deadline. Each public comment shall be submitted online at the website designated by ICC by the posted deadline. The submitter of a public comment is responsible for the proper and timely receipt of all pertinent materials by the Secretariat.

6.5 Review: The Secretariat shall be responsible for reviewing all submitted public comments from an editorial and technical viewpoint similar to the review of code change proposals (see Section 4.2).

6.5.1 Incomplete Public Comment: When a public comment is submitted with incorrect format, without the required information or judged as not in compliance with these Rules of Procedure, the public comment shall not be processed. The Secretariat shall notify the public commenter of the specific deficiencies and the public comment shall be held until the deficiencies are corrected, or the public comment shall be returned to the public commenter with instructions to correct the deficiencies with a final date set for receipt of the corrected public comment.

6.5.2 Duplications: On receipt of duplicate or parallel public comments, the Secretariat may consolidate such public comments for public comment consideration. Each public commenter shall be notified of this action when it occurs.

6.5.3 Deadline: Public comments received by the Secretariat after the deadline set for receipt shall not be published and shall not be considered as part of the public comment consideration. This deadline shall not apply to public comments submitted by the Code Correlation Committee. In order to correlate submitted public comments with action taken at the Committee Action Hearing on code change proposals that did receive a public comment, the Code Correlation Committee, in conjunction with staff processing of public comments, shall review the submitted public comments and submit the necessary public comments in order to facilitate the coordination of code change proposals. Such review and submittal shall not delay the posting of the Public Comment Agenda as required in Section 6.6.

6.6 Public Comment Agenda: The Committee Action Hearing results on code change proposals that have not received a public comment and code change proposals which received public comments or successful assembly actions shall constitute the Public Comment Agenda. The Public Comment Agenda shall be posted on the ICC website at least 30 days prior the Public Comment Hearing. Any errata to the Public Comment Agenda shall be posted on the ICC website as soon as possible. Code change proposals and public comments which have not been published in the original posting or subsequent errata shall not be considered.

7.0 Public Comment Hearing

7.1 Intent: The Public Comment Hearing is the first of two steps to make a final determination on all code change proposals which have been considered in a code development cycle by a vote cast by eligible voters (see Section 9.0). The second step, which follows the Public Comment Hearing, is the Online Governmental Consensus Vote that is conducted in accordance with Section 8.0.

7.2 Date and Location: The date and location of the Public Comment Hearing shall be announced not less than 60 days prior to the date of the hearing.

7.3 Moderator: The ICC President shall appoint one or more Moderators who shall act as presiding officer for the Public Comment Hearing.

7.4 Public Comment Agenda: The Public Comment Consent Agenda shall be comprised of code change proposals which have neither a successful assembly action nor public comment. The agenda for public testimony and individual consideration shall be comprised of proposals which have a successful assembly action or public comment (see Section 6.1).

7.5 Procedure: *The Robert's Rules of Order* shall be the formal procedure for the conduct of the Public Comment Hearing except as these Rules of Procedure may otherwise dictate.

7.5.1 Open Hearing: The Public Comment Hearing is an open hearing. Any interested person may attend and participate in the floor discussion.

7.5.2 Agenda Order: The Secretariat shall publish a Public Comment Agenda for the Public Comment Hearing, placing individual code change proposals and public comments in a logical order to facilitate the hearing. The proponents or opponents of any code change proposal or public comment may move to revise the agenda order as the first order of business at the public hearing, or at any time during the hearing except while another proposal is being discussed. Preference shall be given to grouping like subjects together and for moving items back to a later position on the agenda as opposed to moving items forward to an earlier position.

7.5.2.1 Proponent Approval: A motion to revise the agenda order is considered in order unless the proponent(s) of the moved code change proposals are in attendance at the hearing and object to the move. Where such objections are raised, the motion to revise the hearing order shall be ruled out of order by the Moderator. The ruling of the Moderator shall be final and not subject to a point of order in accordance with Section 5.4.8. The motion to change the hearing order is not debatable.

7.5.2.2 Revised Agenda Order Approved: A motion to revise the agenda order is subject to a 2/3 vote of those present.

7.5.3 Tabling: Tabling of code change proposals shall be permitted. The motion to table is considered in order unless the proponent(s) of the tabled code change proposals are in attendance at the hearing and object to the tabling. Where such objections are raised, the motion to table shall be ruled out of order by the Moderator. The ruling of the Moderator shall be final and not subject to a point of order in accordance with Section 5.4.8. The motion to table is not debatable.

The motion to table must identify one of the following as to the location in the agenda when or where the code change proposal(s) will be considered:

1. To a specific date and time within the timeframe of the Public Comment Agenda for the code change proposals under consideration, or
2. To a specific location in the Public Comment Agenda for the code change proposals under consideration.

7.5.3.1 Tabling approved: A motion to table is subject to a 2/3 vote of those present.

7.5.3.2 Tabled code change proposals back to the floor: The Moderator shall bring the tabled code change proposal(s) back to the floor at the applicable

time/agenda location in accordance with Section 7.5.3 Items 1 or 2. The testimony on the code change proposal shall resume at the point in the process where the tabling occurred.

- 7.5.4 Presentation of Material at the Public Comment Hearing:** Information to be provided at the hearing shall be limited to verbal presentations. Each individual presenting information at the hearing shall state their name and affiliation, and shall identify any entities or individuals they are representing in connection with their testimony. Audio-visual presentations are not permitted. Substantiating material submitted in accordance with Section 6.4.5 and other material submitted in response to a code change proposal or public comment shall be located in a designated area in the hearing room.
- 7.5.5 Public Comment Consent Agenda:** The Public Comment Consent Agenda (see Section 7.4) shall be placed before the assembly with a single motion for Final Action in accordance with the results of the Committee Action Hearing. When the motion has been seconded, the vote shall be taken with no testimony being allowed. A simple majority (50% plus one) based on the number of votes cast by eligible voters shall decide the motion. This action shall not be subject to the Online Governmental Consensus Vote following the Public Comment Hearing (see Section 8.0).
- 7.5.6 Public Comment Individual Consideration Agenda:** Upon completion of the Public Comment Consent Agenda vote, all code change proposals not on the Public Comment Consent Agenda shall be placed before the assembly for individual consideration of each item (see Section 7.4).
- 7.5.7 Reconsideration:** There shall be no reconsideration of a code change proposal after it has been voted on in accordance with Section 7.5.9.
- 7.5.8 Time Limits:** Time limits shall be established as part of the agenda for testimony on all code change proposals at the beginning of each hearing session. Each person requesting to testify on a code change proposal shall be given equal time. In the interest of time and fairness to all hearing participants, the Moderator shall have limited authority to modify time limitations on debate. The Moderator shall have the authority to adjust time limits as necessary in order to complete the hearing agenda.
 - 7.5.8.1 Time Keeping:** Keeping of time for testimony by an individual shall be by an automatic timing device. Remaining time shall be evident to the person testifying. Interruptions during testimony shall not be tolerated. The Moderator shall maintain appropriate decorum during all testimony.
- 7.5.9 Discussion and Voting:** Discussion and voting on code change proposals being individually considered shall be in accordance with the following procedures and the voting majorities in Section 7.6:
 - 7.5.9.1 Proponent testimony:** The Proponent of a public comment is permitted to waive an initial statement. The Proponent of the public comment shall be permitted to have the amount of time that would have been allocated during the initial testimony period plus the amount of time that would be allocated for rebuttal. Where a public comment is submitted by multiple proponents, this provision shall permit only one proponent of the joint submittal to waive an initial statement.

- 7.5.9.2 Points of Order:** Any person participating in the public hearing may challenge a procedural ruling of the Moderator. A majority vote of ICC Members in attendance shall determine the decision.
- 7.5.9.3 Eligible voters:** Voting shall be limited to eligible voters in accordance with Section 9.0.
- 7.5.9.4 Allowable Final Action Motions:** The only allowable motions for Final Action are Approval as Submitted (AS), Approval as Modified by the committee (AM) or by one or more modifications published in the Public Comment Agenda (AMPC), and Disapproval (D).
- 7.5.9.5 Initial Motion:** The code development committee action shall be the initial motion considered.
- 7.5.9.6 Motions for Modifications:** Whenever a motion under consideration is for Approval as Submitted or Approval as Modified, a subsequent motion and second for a modification published in the Public Comment Agenda may be made (see Section 6.4.4). Each subsequent motion for modification, if any, shall be individually discussed and voted before returning to the main motion. A two-thirds majority based on the number of votes cast by eligible voters shall be required for a successful motion on all modifications.
- 7.5.9.7 Voting:** After dispensing with all motions for modifications, if any, and upon completion of discussion on the main motion, the Moderator shall then ask for the vote on the main motion. The vote on the main motion shall be taken electronically with the vote recorded and each vote assigned to the eligible voting member. In the event the electronic voting system is determined not to be used by ICC, a hand/standing count will be taken by the Moderator. If the motion fails to receive the majority required in Section 7.6, the Moderator shall ask for a new motion.
- 7.5.9.8 Subsequent Motion:** If the initial motion is unsuccessful, a motion for either Approval as Submitted or Approval as Modified by one or more published modifications is in order. A motion for Disapproval is not in order. The vote on the main motion shall be taken electronically with the vote recorded and each vote assigned to the eligible voting member. In the event the electronic voting system is determined not to be used by ICC, a hand/standing count will be taken by the Moderator. If a successful vote is not achieved, Section 7.5.9.9 shall apply.
- 7.5.9.9 Failure to Achieve Majority Vote at the Public Comment Hearing.** In the event that a code change proposal does not receive any of the required majorities in Section 7.6, the results of the Public Comment Hearing for the code change proposal in question shall be Disapproval. The vote count that will be reported as the Public Comment Hearing result will be the vote count on the main motion in accordance with Section 7.5.9.7.
- 7.5.9.10 Public Comment Hearing Results:** The result and vote count on each code change proposal considered at the Public Comment Hearing shall be announced at the hearing. In the event the electronic voting system is not utilized and a hand/standing count is taken in accordance with Sections 7.5.9.7 and 7.5.9.8, the vote count will not

be announced if an individual standing vote count is not taken. The results shall be posted and included in the Online Governmental Consensus Ballot (see Section 8.2).

7.6 Majorities for Final Action: The required voting majority for code change proposals individually considered shall be based on the number of votes cast of eligible voters at the Public Comment Hearing shall be in accordance with the following table:

Committee Action	Desired Final Action		
	AS	AM/AMPC	D
AS	Simple Majority	2/3 Majority	Simple Majority
AM	2/3 Majority	Simple Majority to sustain the Committee Action or; 2/3 Majority on each additional modification and 2/3 Majority on entire code change proposal for AMPC	Simple Majority
D	2/3 Majority	2/3 Majority	Simple Majority

8.0 Online Governmental Consensus Vote

8.1 Public Comment Hearing Results: The results from the Individual Consideration Agenda at the Public Comment Hearing (see Sections 7.5.6 and 7.5.9.10) shall be the basis for the Online Governmental Consensus Vote. The ballot shall include the voting options in accordance with the following table:

Committee Action	Public Comment Hearing result and Voting Majority	Online Governmental Consensus Ballot and Voting Majority	
AS	AS: Simple Majority	AS: Simple Majority	D: Simple Majority
	AMPC: 2/3 Majority	AMPC: 2/3 Majority	D: Simple Majority
	D: Simple Majority	AS: Simple Majority	D: Simple Majority
AM	AS: 2/3 Majority	AS: 2/3 Majority	D: Simple Majority
	AM: Simple Majority	AM: Simple Majority	D: Simple Majority
	AMPC: 2/3 Majority	AMPC: 2/3 Majority	D: Simple Majority
	D: Simple Majority	AM: Simple Majority	D: Simple Majority
D	AS: 2/3 Majority	AS: 2/3 Majority	D: Simple Majority
	AMPC: 2/3 Majority	AMPC: 2/3 Majority	D: Simple Majority
	D: Simple Majority	AS: 2/3 Majority	D: Simple Majority

8.2 Online Governmental Consensus Ballot: The ballot for each code change proposal considered at the Public Comment Hearing will include:

1. The Public Comment Hearing result and vote count.
2. The allowable Online Governmental Consensus Vote actions in accordance with Section 8.1.
3. Where the Public Comment Hearing result is As Submitted (AS) or Disapproval (D), the original code change proposal will be presented.
4. Where the Public Comment Hearing result is As Modified by the committee (AM) or As Modified by one or more Public Comments (AMPC), the original code change and approved modification(s) will be presented.
5. The committee action taken at the Committee Action Hearing.
6. ICC staff identification of correlation issues.
7. For those who voted at the Public Comment Hearing, the ballot will indicate how they voted, unless an electronic vote count is not taken in accordance with Section

7.5.9.10.

8. An optional comment box to provide comments.
9. Access to the Public Comment Agenda which includes: the original code change, the report of the committee action and the submitted public comments.
10. Access to the audio and video of the Committee Action and Public Comment Hearing proceedings.
11. Identification of the ballot period for which the online balloting will be open.

8.3 Voting process: Voting shall be limited to eligible voters in accordance with Section 9.0. Eligible voters are authorized to vote during the Public Comment Hearing and during the Online Governmental Consensus Vote; however, only the last vote cast will be included in the final vote tabulation. The ballot period will not be extended beyond the published period except as approved by the ICC Board.

8.3.1 Participation requirement: A minimum number of participants to conduct the Online Governmental Consensus Vote shall not be required unless the code change proposal(s) were not voted upon utilizing the electronic voting devices at the Public Comment Hearing and the resulting vote was not assigned to each eligible voting member in accordance with Sections 7.5.9.7 and 7.5.9.8 . If this occurs, a minimum number of participants shall be required for those code change proposal(s) based on an assessment of the minimum number of votes cast during the entire Public Comment Hearing and the Online Governmental Consensus Vote shall determine the final on action on the code change proposal(s) in accordance with Section 10.1.

9.0 Eligible Final Action Voters

9.1 Eligible Final Action Voters: Eligible Final Action voters include ICC Governmental Member Voting Representatives and Honorary Members in good standing who have been confirmed by ICC in accordance with the Electronic Voter Validation System. Such confirmations are required to be revalidated once each code development cycle. After initial validation, changes to the list of GMVRs for the remainder of the code development cycle shall be made in accordance with Section 9.2. Eligible Final Action voters in attendance at the Public Comment Hearing and those participating in the Online Governmental Consensus Vote shall have one vote per eligible voter on all Codes. Individuals who represent more than one Governmental Member shall be limited to a single vote.

9.2 Applications: Applications for Governmental Membership must be received by the ICC at least 30 days prior to the Committee Action Hearing in order for its designated representatives to be eligible to vote at the Public Comment Hearing or Online Governmental Consensus Vote. Applications, whether new or updated, for Governmental Member Voting Representative status must be received by the Code Council 30 days prior to the commencement of the first day of the Public Comment Hearing in order for any designated representative to be eligible to vote. An individual designated as a Governmental Member Voting Representative shall provide sufficient information to establish eligibility as defined in the ICC Bylaws. The Executive Committee of the ICC Board, in its discretion, shall have the authority to address questions related to eligibility.

10.0 Tabulation, certification and posting of results

10.1 Tabulation and Validation: Following the closing of the online ballot period, the votes received will be combined with the vote tally at the Public Comment Hearing to determine the final vote on the code change proposal. If a hand/standing count is utilized per Subsection 7.5.9.7 or 7.5.9.8, those votes of the Public Comment Hearing will not be

combined with the online ballot. ICC shall retain a record of the votes cast and the results shall be certified by a validation committee appointed by the ICC Board. The validation committee shall report the results to the ICC Board, either confirming a valid voting process and result or citing irregularities in accordance with Section 10.2.

10.2 Voting Irregularities: Where voting irregularities or other concerns with the Online Governmental Consensus Voting process which are material to the outcome or the disposition of a code change proposal(s) are identified by the validation committee, such irregularities or concerns shall be immediately brought to the attention of the ICC Board. The ICC Board shall take whatever action necessary to ensure a fair and impartial Final Action vote on all code change proposals, including but not limited to:

1. Set aside the results of the Online Governmental Consensus Vote and have the vote taken again.
2. Set aside the results of the Online Governmental Consensus Vote and declare the Final Action on all code change proposals to be in accordance with the results of the Public Comment Hearing.
3. Other actions as determined by the ICC Board.

10.3 Failure to Achieve Majority Vote: In the event a code change proposal does not receive any of the required majorities for Final Action in Section 8.0, Final Action on the code change proposal in question shall be Disapproval.

10.4 Final Action Results: The Final Action on all code change proposals shall be published as soon as practicable after certification of the results. The results shall include the Final Action taken, including the vote tallies from both the Public Comment Hearing and Online Governmental Consensus Vote, as well the required majority in accordance with Section 8.0. ICC shall maintain a record of individual votes for auditing purposes, however, the record shall not be made public. The exact wording of any resulting text modifications shall be made available to any interested party.

11.0 Code Publication

11.1 Next Edition of the Codes: The Final Action results on code change proposals shall be the basis for the subsequent edition of the respective Code.

11.2 Code Correlation: The Code Correlation Committee is authorized to resolve technical or editorial inconsistencies resulting from actions taken during the code development process by making appropriate changes to the text of the affected code. The process to resolve technical or editorial inconsistencies shall be conducted in accordance with CP#44 Code Correlation Committee.

12.0 Appeals

12.1 Right to Appeal: Any person may appeal an action or inaction in accordance with Council Policy 1 Appeals. Any appeal made regarding voter eligibility, voter fraud, voter misrepresentation or breach of ethical conduct must be supported by credible evidence and must be material to the outcome of the final disposition of a code change proposal(s).

The following actions are not appealable:

1. Variations of the results of the Public Comment Hearing compared to the Final Action result in accordance with Section 10.4.
2. Denied requests to extend the voter balloting period in accordance with Sections 5.7.4 or 8.3.

3. Lack of access to the internet based online collaboration and voting platform to submit a code change proposal, to submit a public comment or to vote.
4. Code Correlation Committee changes made in accordance with Section 11.2.

13.0 Violations

13.1 ICC Board Action on Violations: Violations of the policies and procedures contained in this Council Policy shall be brought to the immediate attention of the ICC Board for response and resolution. Additionally, the ICC Board may take any actions it deems necessary to maintain the integrity of the code development process.

Section revised in January 22, 2019 revision to CP-28:

9.1

Sections revised in October 20, 2018 revision to CP-28:

2.4

2.4.1

2.4.1.1

2.4.1.2

2.4.2

2.4.2.1

2.4.2.2

2.4.2.3

2.4.2.4

2.4.2.5

2.4.2.6

2.4.2.7

2.4.2.8

2.4.2.9

2.4.2.10

2.4.2.11

Sections revised in July 27, 2018 revision to CP-28:

4.6.1

Sections revised in December 8, 2017 revision to CP-28:

3.3.5.5

8.3.1

Sections revised in September 9, 2017 revision to CP-28:

3.2

3.3.5.3

3.3.5.4

3.3.5.6

3.6.3.1.1

3.6.3.1.2

4.6

5.4.4

5.4.4.1

5.4.4.2

5.4.5

5.4.5.1

5.4.5.2

5.5.2
5.5.2.2
6.4.5
6.4.6
7.5.2
7.5.2.1
7.5.2.2
7.5.3
7.5.3.1
7.5.3.2
7.5.9.10
8.2 – Number 7
11.2

2019 GROUP B ICC CODE DEVELOPMENT CYCLE CROSS INDEX OF PROPOSED CODE CHANGES

Some of the proposed code changes include sections that are outside of the scope of the chapters or the code listed in the table of 2018-2019 Staff Secretaries on page xi. This is done in order to facilitate coordination among the International Codes which is one of the fundamental principles of the International Codes.

Listed in this cross index are proposed code changes that include sections of codes or codes other than those listed on page viii. For example, IEBC Section 705.3 is proposed for revision in code change S5-19 which is to be heard by the IBC Structural Committee. Chapter 7 of the IEBC is typically the responsibility of the IEBC Code Committee as listed in the table of 2018-2019 Staff Secretaries. It is therefore identified in this cross index. Another example is Section 302.3.3 of the International Fuel Gas Code. The International Fuel Gas Code is normally maintained by the IFGC Committee, but Section 302.3.3 will be considered for revision in proposed code change S184-19 which will be placed on the IBC-S Committee agenda. In some instances, there are other subsections that are revised by an identified code change that is not included in the cross index. For example most sections of the IECC – Residential Provisions have revisions to the duplicate section in Chapter 11 of the IRC as noted in each code change proposal. Another example is that all sections of Chapter 1 of every code are designated ADM unless specifically noted in the respective Code listing. This was done to keep the cross index brief enough for easy reference.

This information is provided to assist users in locating all of the proposed code changes that would affect a certain section or chapter. For example, to find all of the proposed code changes that would affect Chapter 2 of the IBC, locate IBC Chapter 2 in the Cross Index of proposed codes changes, then go proposed code changes in the portion of the monograph for the respective proposed change group. For example, the Cross Index indicates that the definition of STORAGE RACKS is contained within proposed code change S161-19. The IBC-Structural portion of the monograph will contain proposed code change S161-19 for your review. While care has been taken to be accurate, there may be some omissions in this list.

Letter prefix: Each proposed change number has a letter prefix that will identify where the proposal is published. The letter designations for proposed changes and the corresponding publications are as follows:

PREFIX	PROPOSED CHANGE GROUP (see monograph table of contents for location)
ADM	Administrative
E	International Building Code - Means of Egress
EB	International Existing Building Code
CE	International Energy Conservation Code – Commercial
RE	International Energy Conservation Code – Energy
F	International Fire Code
FG	International Fuel Gas Code
FS	International Building Code - Fire Safety
G	International Building Code – General
M	International Mechanical Code
PC	ICC Performance Code
P	International Plumbing Code
PSD	International Private Sewage Disposal Code
RE	International Residential Code - Building
S	International Building Code – Structural
SP	International Swimming Pool and Spa Code
WUIC	International Wildland-Urban Interface Code

INTERNATIONAL BUILDING CODE	
Section #	Code Change #
Chapter 1	SEE ADM CODE CHANGE PROPOSALS
110.7	S93-19
Chapter 2	
BOND BREAK	S195-19
[A] CHANGE OF OCCUPANCY	ADM2-19 Part I, ADM3-19 Part I
DESIGN DISPLACEMENT	S148-19
DETAILED PLAIN CONCRETE STRUCTURAL WALL	S142-19
DRAINAGE SPACE	S195-19
FABRICATED ITEM	S93-19
IMPACT PROTECTIVE SYSTEM (New)	S110-19
INDIVIDUAL TRUSS MEMBER (New)	S168-19
INSULATED VINYL SIDING (New)	FS4-19
NAILABLE SUBSTRATE (New)	FS2-19
ORDINARY PRECAST STRUCTURAL WALL	S142-19
ORDINARY REINFORCED CONCRETE STRUCTURAL WALL	S142-19
ORDINARY STRUCTURAL PLAIN CONCRETE WALL	S142-19
PERMANENT INDIVIDUAL TRUSS MEMBER DIAGONAL BRACING (<i>PITMDB</i>) (New)	S168-19
PERMANENT INDIVIDUAL TRUSS MEMBER RESTRAINT (<i>PITMR</i>) (New)	S168-19
[BS]PORCELAIN TILE	FS1-19
QUALITY ASSURANCE COORDINATOR	S85-19
[A]REPAIR	ADM4-19
SPECIAL STRUCTURAL WALL	S148-19
STORAGE RACKS	S161-19
STORAGE RACKS, STEEL CANTILEVERED (New)	S161-19
TEMPORARY SPECIAL EVENT STRUCTURE (New)	S200-19
[A] TOWNHOUSE	ADM5-19 Part I
TOWNHOUSE UNIT (NEW)	ADM5-19 Part I
VENTILATED DRAINAGE SPACE	S195-19
Chapter 15	
1511.2	EB75-19
Chapter 31	

3111.3.1	S34-19 Part II
3103.1.1 (New)	S200-19
3103.5 (New)	S200-19
3103.6 (New)	S200-19
Chapter 33	
3301.2.1(New)	EB75-19
Appendix B	ADM43-19 Part I
Appendix O (NEW)	ADM44-19
Appendix O (NEW)	ADM45-19
INTERNATIONAL EXISTING BUILDING CODE	
Chapter 1	SEE ADM CODE CHANGE PROPOSALS
Chapter 2	
[A] CHANGE OF OCCUPANCY	ADM1-19 Part I, ADM2-19 Part I, ADM3-19 Part I
[A] REPAIR	ADM4-19
Appendix A (NEW)	ADM43-19 Part I
Chapter 7	
705.1	S1-19, S2-19, S8-19, S9-18
705.3	S5-19
705.3.1	S7-19
705.3.1.1	S6-19, S7-19
705.4	S7-19
705.5	S10-19
INTERNATIONAL ENERGY CONSERVATION CODE	
Chapter 1	
CHAPTER 1 -- CE	SEE ADM CODE CHANGE PROPOSALS
CHAPTER 1 -- RE	SEE ADM CODE CHANGE PROPOSALS
R101.2	
R101.3 (IRC N1101.2)	CE1-19 Part II, CE3-19 Part II, CE4-19 Part II, CE5-19 Part II, CE6-19 Part II, CE7-19 Part II
R101.4.1	CE1-19 Part II
R101.5	CE1-19 Part II
R102.1	CE8-19 Part II, CE9-19 Part II, CE10-19 Part II
R102.1.1 (IRC N1101.4)	CE11-19 Part II, CE12-19 Part II, CE42-19 Part II
R103.2 (IRC N1101.5)	CE13-19 Part II
R103.2.2 (IRC N1101.5.2.2) (New)	CE15-19 Part II
R105.4	CE16-19 Part II
R105.4.1 (New)	CE16-19 Part II
R105.4.2 (New)	CE16-19 Part II

R105.4.3 (New)	CE16-19 Part II
R107.1.2	CE17-19 Part II
Chapter 2 - [RE]	
R202 (IRC N1101.6) ACCESSIBLE	CE29-19 Part II
R202 (IRC N1101.6) ACCESSORY STRUCTURE	CE18-19 Part II
R202 (IRC N1101.6) ACCESS (TO) (New)	CE29-19 Part II
R202 (IRC N1101.6) AIR-IMPERMEABLE INSULATION	CE19-19 Part II
R202 (IRC N1101.6) AIR, OUTDOOR (New)	CE20-19 Part II
R202 (IRC N1101.6) BUILDING SITE	CE1-19 Part II
R202 (IRC N1101.6) CAVITY INSULATION (New)	CE60-19 Part II
R202 (IRC N1101.6) CIRCULATING HOT WATER SYSTEM	CE22-19 Part II
R202 (IRC N1101.6) COMPLIANCE REPORT (New)	CE23-19 Part II
R202 (IRC N1101.6) ELECTRIC VEHICLE SUPPLY EQUIPMENT (New)	CE217-19 Part II
R202 (IRC N1101.6) EV CAPABLE SPACE (New)	CE217-19 Part II
R202 (IRC N1101.6) EV READY SPACE (New)	CE217-19 Part II
R202 (IRC N1101.6) ON-SITE RENEWABLE ENERGY (New)	CE31-19 Part II
R202 (IRC N1101.6) READILY ACCESSIBLE	CE29-19 Part II
R202 (IRC N1101.6) READY ACCESS (TO) (New)	CE29-19 Part II
R202 (IRC N1101.6) RENEWABLE ENERGY RESOURCES (New)	CE31-19 Part II
R202 (IRC N1101.6) RESIDENTIAL BUILDING	CE28-19 Part II
R202 (IRC N1101.6) ROOF MEMBRANE PEEL AND REPLACEMENT (New)	CE255-19 Part II
R202 (IRC N1101.6) STANDARD REFERENCE DESIGN	CE32-19 Part II
R202 (IRC N1101.6) STRUCTURE (New)	CE1-19 Part II
R202 (IRC N1101.6) THERMAL DISTRIBUTION EFFICIENCY (New)	CE151-19 Part II
TOWNHOUSE UNIT (NEW)	ADM5-10 Part III
R202 (IRC N1101.6) U-FACTOR (THERMAL TRANSMITTANCE)	CE34-19 Part II
Chapter 3 - [RE]	
R303.1 (IRC N1101.10)	CE37-19 Part II
R303.1.2 (IRC N1101.10.2)	CE40-19 Part II

R303.3 (IRC N1101.12)	CE29-19 Part II
Chapter 4 - [RE]	
R401.1	CE1-19 Part II
R401.2 (IRC N1101.13) (New)	CE51-19 Part II
R401.2 (IRC N1101.13)	CE1-19 Part II, CE51-19 Part II, CE54-19 Part II
R401.2.1 (IRC 1101.13.1) (New)	CE1-19 Part II
R401.2.1 (IRC 1101.13.1)	CE1-19 Part II, CE54-19 Part II
R401.2.1.1 (IRC N1101.13.1.1) (New)	CE1-19 Part II, CE54-19 Part II
R401.2.1.2 (IRC N1101.13.1.2) (New)	CE54-19 Part II
R402.1.3 (IRC N1102.1.3)	CE60-19 Part II
R401.3 (IRC N1101.14)	CE1-19 Part II, CE42-19 Part II
R402.1 (IRC N1102.1)	CE42-19 Part II
R402.2 (IRC N1102.2)	CE42-19 Part II
R402.2.5 (IRC N1102.2.5)	CE62-19 Part II
R402.2.10 (IRC N1102.2.10) (New)	CE78-19 Part II
R402.2.10.1 (IRC N1102.2.10.1)	CE78-19 Part II
R402.3 (IRC N1102.3)	CE42-19 Part II
R402.4 (IRC N1102.4)	CE42-19 Part II
R402.5 (IRC N1102.5)	CE42-19 Part II, CE93-19 Part II
R403.1 (IRC N1103.1)	CE42-19 Part II
R403.1.2 (IRC N1103.1.2)	CE42-19 Part II, CE115-19 Part II, CE116-19 Part II
R403.3.1 (IRC N1103.3.1)	CE42-19 Part II, CE151-19 Part II
R403.3.2 (IRC N1103.3.2)	CE42-19 Part II
R403.3.3 (IRC N1103.3.3)	CE42-19 Part II
R403.3.4 (IRC N1103.3.4)	CE42-19 Part II
R403.3.5 (IRC N1103.3.5)	CE42-19 Part II
R403.4 (IRC N1103.4)	CE42-19 Part II
R403.4.1 (IRC N1103.4.1)	CE150-19 Part II
R402.4.4.1 (IRC N1102.4.4.1) (New)	CE103-19 Part II
R403.5.1 (IRC N1103.5.1)	CE29 -19 Part II
R403.5.1.1 (IRC N1103.5.1.1)	CE159-19 Part II
R403.5.2 (IRC N1103.5.2)	CE159-19 Part II
R403.10 (IRC N1103.10)	CE160-19 Part II
R403.10.1 (IRC N1103.10.1)	CE29 -19 Part II, CE160-19 Part II
R403.10.3 (IRC N1103.10.3)	CE160-19 Part II
R403.11 (IRC N1103.11)	CE42-19 Part II
R403.12 (IRC N1103.12)	CE160-19 Part II
R404.1 (IRC N1104.1)	CE42-19 Part II
R404.1.1 (IRC N1104.1.1)	CE42-19 Part II

R404.2 (IRC N1104.2) (New)	CE217-19 Part II
R404.2.1 (IRC N1104.2.1) (New)	CE217-19 Part II
R404.2.2 (IRC N1104.2.2) (New)	CE217-19 Part II
TABLE R404.2.2 (IRC N1104.2.2) (New)	CE217-19 Part II
R404.2.3 (IRC N1104.2.3) (New)	CE217-19 Part II
R405 (N1105)	CE42-19 Part II
R405.2 (IRC N1105.2)	CE42-19 Part II, CE51-19 Part II
TABLE R405.2 (IRC N1105.2) (New)	CE42-19 Part II
R405.3 (IRC N1105.3)	CE42-19 Part II
TABLE R405.5.2(1) [IRC N1105.2(1)]	CE248-19 Part II
R503.1.1 (IRC N1109.1.1)	CE253-19 Part II
R406 (IRC N1106)	CE42-19 Part II
R406.2 (IRC N1106.2)	CE42-19 Part II, CE51-19 Part II
TABLE R406.2 (IRC N1106.2) (New)	CE42-19 Part II
R406.3 (IRC N1106.3)	CE42-19 Part II
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R406.3.2 (IRC N1106.3.2)	CE42-19 Part II
TABLE R406.4 (IRC N1106.4)	CE42-19 Part II
Chapter 5 - [RE]	
R503.1.1 (IRC N1109.1.1)	CE255-19 Part II
Appendix - [RE]	
Appendix RB (New)	CE263-19 Part II
INTERNATIONAL FIRE CODE	
Chapter 1	SEE ADM CODE CHANGE PROPOSALS AND THE FOLLOWING
Chapter 2	
[A] CHANGE OF OCCUPANCY	ADM2-19 Part I, ADM3-19 Part I
[A] TOWNHOUSE	ADM5-19 Part I
TOWNHOUSE UNIT (NEW)	ADM5-19 Part I
Appendix A	ADM43-19 Part I
INTERNATIONAL FUEL GAS CODE	
Chapter 1	SEE ADM CODE CHANGE PROPOSALS

[BS]302.3.3	S184-19
Appendix A (NEW)	ADM43-19 Part I
INTERNATIONAL GREEN CONSTRUCTION CODE	
Chapter 1	SEE ADM CODE CHANGE PROPOSALS
INTERNATIONAL MECHANICAL CODE	
Chapter 1	SEE ADM CODE CHANGE PROPOSALS
Appendix A (NEW)	ADM43-19 Part I
INTERNATIONAL PLUMBING CODE	
Chapter 1	SEE ADM CODE CHANGE PROPOSALS
Appendix C	
[BS]101.2	S184-19
[BS]101.3	S184-19
Appendix A (NEW)	ADM43-19 Part I
INTERNATIONAL PROPERTY MAINTENANCE CODE	
Chapter 1	SEE ADM CODE CHANGE PROPOSALS
Appendix A (NEW)	ADM43-19 Part I
INTERNATIONAL PRIVATE SEWAGE DISPOSAL CODE	
Chapter 1	SEE ADM CODE CHANGE PROPOSALS
Appendix A (NEW)	ADM43-19 Part I
INTERNATIONAL RESIDENTIAL CODE	
Chapter 1	SEE ADM CODE CHANGE PROPOSALS
R102.4.2	CE17-19 Part III (Heard by RB)
Chapter 2	
[RB] BUILDING	ADM5-19 Part II
R202 [RB] ROOF RECOVER	RE9-19 Part II (Heard by RB)
[RB] TOWNHOUSE	ADM5-19 Part II
TOWNHOUSE UNIT (NEW)	ADM5-19 Part II
Chapter 3	
R302.2.1, R302.2.2, R302.2.3, R302.2.4, R302.2.6, R310.1	ADM5-19 Part II
R310.2.5	EB63 PART II
R310.5	EB101 PART II
R310.6	EB63 PART II, EB101 PART II
R310.9.1(NEW)	EB101 PART II
R324.3.1	S34-19 Part II
Chapter 6	

R602.6	S184-19 Part II
R602.9	S183-19 Part II
Chapter 9	
R902.3	S33-19 Part II
R905.16.4	S33-19 Part II, S34-19 Part II
R905.16.6	S33-19 Part II
Table R905.16.6	S33-19 Part II
R905.17.5	S33-19 Part II, S34-19 Part II
R905.17.7	S33-19 Part II
Chapter 11	Changes to Chapter 11 of the IRC are Heard by the RE Committee
Appendix	
Appendix AJ	
AJ102.4	EB63 PART II
AJ102.4.3	EB63 PART II
AJ102.4.3.1 (NEW)	EB63 PART II
AJ102.4.4	EB63 PART II
Appendix U (New)	CE263-19 Part III (Heard by RE)
Appendix U (New)	RE224-19 Part II (Heard by RE)
INTERNATIONAL SWIMMING POOL AND SPA CODE	
Chapter 1	SEE ADM CODE CHANGE PROPOSALS
INTERNATIONAL PERFORMANCE CODE	
Chapter 1	SEE ADM CODE CHANGE PROPOSALS
INTERNATIONAL WILDLAND URBAN INTERFACE CODE	
Chapter 1	SEE ADM CODE CHANGE PROPOSALS
Appendix A (NEW)	ADM43-19 Part I

2019 GROUP B COMMITTEE ACTION HEARING SCHEDULE

April 28 – May 8, 2019

Albuquerque Convention Center Albuquerque, New Mexico

The hearings will start at 1:00 pm on Sunday, April 28th. Prior to the hearings on Sunday morning, the Membership Councils and Major Jurisdictions Committee will be holding meetings. See [schedule](#).

Unless noted by “Start no earlier than X am/pm,” each Code Committee will begin immediately upon completion of the hearings for the prior Committee. This includes moving a Committee forward or back from the day indicated based on hearing progress. The actual start times for the various Committees are not stipulated because of uncertainties in hearing progress. The schedule anticipates that the hearings will finish on the date noted as “Finish” for each track. This may require going beyond the scheduled finish time.

	Sunday April 28	Monday April 29	Tuesday April 30	Wednesday May 1	Thursday May 2	Friday May 3
TRACK 1	Start 1 pm ADMIN IEBC End 7 pm	Start 8 am IEBC End 7 pm	Start 8 am IEBC IRC – B (Start no earlier than 1 pm) End 7 pm	Start 8 am IRC – B End 7 pm	Start 8 am IRC – B End 7 pm	Start 8 am IRC – B End 7 pm
TRACK 2	Start 1 pm IgCC IECC – R / IRC – E End 7 pm	Start 8 am IECC – R / IRC – E End 7 pm	Start 8 am IECC – R / IRC – E End 7 pm	Start 8 am IECC – R / IRC – E End 7 pm	Start 8 am IECC – R / IRC – E End 7 pm	Start 8 am IECC – R / IRC – E End 7 pm

	Saturday May 4	Sunday May 5	Monday May 6	Tuesday May 7	Wednesday May 8
TRACK 1	Start 8 am IRC – B IEBC – S / IBC – S (Start no earlier than 8 am) End 7 pm	Start 10 am IBC – S End 7 pm	Start 8 am IBC – S End 7 pm	Start 8 am IBC – S End 7 pm	Start 8 am IBC – S Finish 7 pm
TRACK 2	Start 8 am IECC – R / IRC – E IECC – C (Start no earlier than 8 am) End 7 pm	Start 10 am IECC – C End 7 pm	Start 8 am IECC – C End 7 pm	Start 8 am IECC – C End 7 pm	Start 8 am IECC – C Finish 7 pm

SEE NEXT PAGE FOR SCHEDULE NOTES AND CODE COMMITTEE DESIGNATIONS

Notes:

- Code change agenda to be posted March 4th.
- Hearing times may be modified at the discretion of the Chairman based on hearing progress.
- Morning and afternoon breaks will be announced. A lunch break is planned for each track. A dinner break is not planned. The hearings are scheduled to adjourn for dinner and resume the next day, unless otherwise necessary to complete the agenda.
- Because of uncertainties in hearing progress, the start time indicated as “start no earlier than xx” is conservatively estimated and is not intended to be a hearing progress target.
- Consult the hearing order in the posted code change agenda for:
 - Code changes to be heard by a Committee other than the Committee under which the code change is designated.
 - Code changes comprised of multiple parts where each part is heard by a different Committee.
 - Code changes to the definitions to determine the applicable Committee who will hear the change to the definition for the respective code.

Code Committees/Codes:

- ADMIN: Chapter 1 of all the I-Codes except the IECC, IgCC and IRC. Also includes the update of currently referenced standards in all of the 2018 Codes, except the IgCC.
- IBC-S: IBC Structural provisions. IBC Chapters 15 – 25.
- IEBC: IEBC Non-structural provisions.
- IEBC – S: IEBC Structural provisions to be heard by the IBS – S code committee.
- IECC – C: IECC Commercial energy provisions.
- IECC – R/IRC – E: IECC Residential energy provisions and IRC Energy provisions in Chapter 11.
- IgCC: Administration provisions (Chapter 1) of the IgCC. The technical provisions are based on the provisions of ASHRAE Standard 189.1 *Standard for the Design of High-Performance Green Buildings, Except Low-Rise Residential Buildings*.
- IRC – B: IRC Building provisions. Chapters 1 – 10.

**2019 PROPOSED CHANGES TO
THE INTERNATIONAL CODES**

<u>CODE</u>	<u>PAGE</u>
IADMIN.....	ADM1
IBC – Fire Safety	FS1
IBC – General	G1
IBC – Structural.....	S1
ICCPC	PC1
IEBC.....	EB1
IECC – Commercial	CE1
IECC – Residential	RE1
IgCC	GG1
IPC.....	P1
IRC – Building	RB1
CCC	CCC1

2019 GROUP B – PROPOSED CHANGES TO THE ADMINISTRATIVE PROVISIONS CODE

ADMINISTRATIVE PROVISIONS COMMITTEE

Anthony W. Catana, AIA, Chair
Director of Building Technology
Spiezle Architectural Group
Hamilton, NJ

J. Michael Davis, MCP, Vice Chair
Director of Code Services
Miami County, Kansas
Paola, KS

Corey Coleman, MCP
Carson City/Building Official
Charles Abbott and Associates
Carson City, NV

Robert J. Frances, PE
Director
Howard Co. (MD) Dept. of Insp., Lic., & Permits
Ellicott City, MD

Regina Hanshaw
Executive Secretary
Ohio Board of Building Standards
Reynoldsburg, OH

Ian Hardage
Assistant Fire Marshal
Santa Rosa Fire Department
Santa Rosa, CA

E. Ray Kothe
Rep: National Association of Home Builders
Owner
Kothe Contr & Const Management LLC
Baton Rouge, LA

Joseph A. Lavallo, AIA, MCP, NCARB
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Building #4, Suite 150
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Jeff Manzetti, AIA, NCARB, CDT
Project Architect
Mead & Hunt
Middleton, WI

Richard Meister, CBO
Manager of Plan Review
Memphis & Shelby County
Office of Construction Code Enforcement
Memphis, TN

Kelly Nicoletto
Senior Regulatory Engineer
UL LLC
Fort Worth, TX

Ed Peaser, CBO
Sr. Building Inspector
Town of Carefree
Scottsdale, AZ

Blake J. Steiner, CBO
Chief Building Official
Rapides Area Planning Commission
Alexandria, LA

Thomas R. Wood
Senior Plans Examiner
City of Carrollton
Carrollton, TX

Staff Secretariat
Keith Enstrom, PE
Staff Engineer
International Code Council
Central Regional Office
Country Club Hills, IL

TENTATIVE ORDER OF DISCUSSION 2019 PROPOSED CHANGES TO THE ADMINISTRATIVE PROVISIONS CODE

The following is the tentative order in which the proposed changes to the code will be discussed at the public hearings. Proposed changes which impact the same subject have been grouped to permit consideration in consecutive changes.

Proposed change numbers that are indented are those which are being heard out of numerical order. Indentation does not necessarily indicate that one change is related to another. Proposed changes may be grouped for purposes of discussion at the hearing at the discretion of the chair. Note that some ADM code change proposals may not be included on this list, as they are being heard by another committee.

ADM1-19 Part I	ADM38-19 Part I
ADM2-19 Part I	ADM39-19 Part I
ADM3-19 Part I	ADM40-19 Part I
ADM4-19	ADM41-19 Part I
ADM5-19 Part I	ADM42-19
ADM6-19	ADM43-19 Part I
ADM7-19	ADM44-19
ADM8-19	ADM45-19
ADM9-19 Part I	ADM47-19 IBC
ADM10-19 Part I	ADM47-19 IFC
ADM11-19	ADM47-19 IMC
ADM12-19	ADM47-19 IPC
ADM13-19	ADM47-19 IRC
ADM14-19	ADM47-19 IEBC
ADM15-19	ADM47-19 IFGC
ADM16-19 Part I	ADM47-19 IPMC
ADM17-19	ADM47-19 IPSDC
ADM18-19	ADM47-19 ISPSC
ADM19-19	ADM47-19 IWUIC
ADM20-19	ADM47-19 IECC-C
ADM21-19	ADM47-19 IECC-R
ADM22-19	
ADM23-19 Part I	
ADM24-19 Part I	
ADM25-19	
ADM26-19	
ADM27-19	
ADM28-19	
ADM46-19 Part I	
ADM29-19	
ADM30-19	
ADM31-19 Part I	
ADM32-19 Part I	
ADM33-19 Part I	
ADM34-19	
ADM35-19	
ADM36-19	
ADM37-19 Part I	

ADM1-19 Part I

PART I — IEBC®: [A] 202 (New)

PART II — IECC: 202 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE ADMINISTRATIVE CODE COMMITTEE. PART II WILL BE HEARD BY THE IECC-COMMERCIAL CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Existing Building Code

Revise as follows:

[A] CHANGE OF OCCUPANCY. A change in the use of a building or a portion of a building that results in any of the following:

1. A change of occupancy classification.
2. A change from one group to another group within an occupancy classification.
3. Any change in use within a group for which there is a change in application of the requirements of ~~this code~~ the International Building Code.

Proposal # 4071

ADM1-19 Part I

ADM1-19 Part II

IECC: 202 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Energy Conservation Code

Revise as follows:

CHANGE OF OCCUPANCY. A change in the use of a building or a portion of a building that results in any of the following:

1. A *change of occupancy* classification.
2. A change from one group to another group within an occupancy classification.
3. Any change in use within a group for which there is a change in the application of the requirements of ~~this code~~ the International Building Code.

Reason: The IBC establishes occupancies, thus the IBC and not “this code” should be referenced for a change in use. The IEBC and IECC do not include occupancy classifications. ADM 9-16 Part 1 was a BCAC revised to this definition for consistency between codes. A floor modification changed “specific occupancy classification” to “change in application of the requirements of this code”. A public comment changed this definition to a list. The question that has been raised is in the IEBC is this should reference IBC or IEBC/IECC.

This proposal is submitted by the ICC Building Code Action Committee (BCAC) and the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC).

BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

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The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is an editorial item.

Proposal # 5738

ADM1-19 Part II

ADM2-19 Part I

PART I — IBC®: [A] 202; IEBC®: [A] 202, 202 (New); IFC®: [A] 202; IRC®: [RB] 202

PART II — IECC: SECTION C202, 202

Proponent: Kevin Duerr-Clark, NYS Department of State, representing NYS Department of State (kevin.duerr-clark@dos.ny.gov); Gary Traver, representing NYS Department of State (gary.traver@dos.ny.gov)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE ADMINISTRATIVE CODE COMMITTEE. PART II WILL BE HEARD BY THE IECC-COMMERCIAL CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Building Code

Revise as follows:

[A] CHANGE OF OCCUPANCY. A change in the use of a building or a portion a building which results in one of the following:

1. A change of occupancy classification.
2. A change from one group to another group within an occupancy classification.
3. ~~Any change in use within a group for which there is a change in application of the requirements of this code.~~

2018 International Existing Building Code

[A] CHANGE OF OCCUPANCY. A change in the use of a building or a portion of a building that results in any of the following:

1. A change of occupancy classification.
2. A change from one group to another group within an occupancy classification.
3. ~~Any change in use within a group for which there is a change in application of the requirements of this code.~~

Add new definition as follows:

CHANGE OF USE. A change in the use of a building or a portion of a building, within the same group and classification that results in a change in application of the requirements of this code.

2018 International Fire Code

Revise as follows:

[A] CHANGE OF OCCUPANCY. A change in the use of a building or a portion of a building that results in any of the following:

1. A change of occupancy classification.
2. A change from one group to another group within an occupancy classification.
3. ~~Any change in use within a group for which there is a change in the application of the requirements of this code.~~

2018 International Residential Code

[RB] CHANGE OF OCCUPANCY. A change in the use of a building or portion of a building that involves a change in the application of the requirements of this code.

Proposal # 4320

ADM2-19 Part I

ADM2-19 Part II

IECC: SECTION C202, 202

Proponent: Kevin Duerr-Clark, NYS Department of State, representing NYS Department of State (kevin.duerr-clark@dos.ny.gov); Gary Traver, representing NYS Department of State (gary.traver@dos.ny.gov)

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Revise as follows:

CHANGE OF OCCUPANCY. A change in the use of a building or a portion of a building that results in any of the following:

1. A *change of occupancy* classification.
2. A change from one group to another group within an occupancy classification.
3. ~~Any change in use within a group for which there is a change in the application of the requirements of this code.~~

Reason: Sections 1001.2.1 and 1001.2.2 of the Existing Building Code stipulate a distinct set of requirements to be met when a Change of Use takes place, and an additional set of requirements for when a Change of Occupancy takes place. However, the combined definition for Change of Use and Change of Occupancy does not support that distinction.

The definition for a Change of Occupancy contains within it the definition for a Change of Use. This leads some code users to believe that both terms are interchangeable. The 2018 code takes a step to clarify this by separating the definition into 3 bullet points, but it does not go far enough.

Removing the third bullet from the definition of Change of Occupancy and adding a new definition for Change of Use, which is based on the language of the third bullet, would provide clarity and simplify enforcement.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is simply a clarification of existing code provisions and does not carry a cost impact.

Proposal # 5745

ADM2-19 Part II

ADM3-19 Part I

PART I — IEBC®: [A] 202; IBC®: [A] 202; IFC®: [A] 202; IRC®: [RB] 202

PART II — IECC: 202

Proponent: Allison Cook, Arlington County, VA, representing VBCOA; Kenney Payne, Moseley Architects, representing AIA Virginia (kpayne@moseleyarchitects.com); Ronald Clements Jr, representing Chesterfield County (clementsro@chesterfield.gov); Bob Orr, representing VBCOA (borr@culpepercounty.gov); Charles Vernon, representing VBCOA (cvernon@arlingtonva.us); David Collins, The American Institute of Architects (dcollins@preview-group.com); Michael Williams, representing Virginia Building and Code Officials Association (VBCOA) (mike.williams@harrisonburgva.gov); Christina Jackson, representing City of Norfolk / WICED of VA (christina.reynolds@norfolk.gov)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE ADMINISTRATIVE CODE COMMITTEE. PART II WILL BE HEARD BY THE IECC-COMMERCIAL CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Existing Building Code

Revise as follows:

[A] CHANGE OF OCCUPANCY. A change in the use of a building or a portion of a building that results in any of the following Either of the following shall be considered as a change of occupancy where the current IBC requires a greater degree of accessibility, structural strength, fire protection, means of egress, ventilation or sanitation than is existing in the current building or structure:

1. Any change in the occupancy classification of a building or structure.
 2. Any change in the purpose of, or a change in the level of activity within, a building or structure.
- ~~1. A change of occupancy classification.~~
 - ~~2. A change from one group to another group within an occupancy classification.~~
 - ~~3. Any change in use within a group for which there is a change in application of the requirements of this code.~~

2018 International Building Code

[A] CHANGE OF OCCUPANCY. A change in the use of a building or a portion a building which results in one of the following Either of the following shall be considered as a change of occupancy where this code requires a greater degree of accessibility, structural strength, fire protection, means of egress, ventilation or sanitation than is existing in the current building or structure:

1. Any change in the occupancy classification of a building or structure.
 2. Any change in the purpose of, or a change in the level of activity within, a building or structure.
- ~~1. A change of occupancy classification.~~
 - ~~2. A change from one group to another group within an occupancy classification.~~
 - ~~3. Any change in use within a group for which there is a change in application of the requirements of this code.~~

2018 International Fire Code

[A] CHANGE OF OCCUPANCY. A change in the use of a building or a portion of a building that results in any of the following Either of the following shall be considered as a change of occupancy where the International Building Code requires a greater degree of accessibility, structural strength, fire protection, means of egress, ventilation or sanitation than is existing in the current building or structure:

1. Any change in the occupancy classification of a building or structure.
 2. Any change in the purpose of, or a change in the level of activity within, a building or structure.
- ~~1. A change of occupancy classification.~~
 - ~~2. A change from one group to another group within an occupancy classification.~~
 - ~~3. Any change in use within a group for which there is a change in the application of the requirements of this code.~~

2018 International Residential Code

[RB] CHANGE OF OCCUPANCY. A change in the use of a building or portion of a building that involves a change in the application of the requirements of this code.

Proposal # 5215

ADM3-19 Part II

IECC: 202

Proponent: Allison Cook, Arlington County, VA, representing VBCOA; Kenney Payne, Moseley Architects, representing AIA Virginia (kpayne@moseleyarchitects.com); Ronald Clements Jr, representing Chesterfield County (clementsro@chesterfield.gov); Bob Orr, representing VBCOA (borr@culpepercounty.gov); Charles Vernon, representing VBCOA (cvernon@arlingtonva.us); David Collins, The American Institute of Architects (dcollins@preview-group.com); Michael Williams, representing Virginia Building and Code Officials Association (VBCOA) (mike.williams@harrisonburgva.gov); Christina Jackson, representing City of Norfolk / WICED of VA (christina.reynolds@norfolk.gov)

2018 International Energy Conservation Code

Revise as follows:

CHANGE OF OCCUPANCY. ~~A change in the use of a building or a portion of a building that results in any of the following~~ Either of the following shall be considered as a change of occupancy where the International Building Code requires a greater degree of accessibility, structural strength, fire protection, means of egress, ventilation or sanitation than is existing in the current building or structure:

1. Any change in the occupancy classification of a building or structure.
2. Any change in the purpose of, or a change in the level of activity within, a building or structure.

~~1. A change of occupancy classification.~~

~~2. A change from one group to another group within an occupancy classification.~~

~~3. Any change in use within a group for which there is a change in the application of the requirements of this code.~~

1.

Reason: The proposed change keeps the language add to the 2018 code regarding change of occupancy classification and change of occupancy within the same classification. By adding the "greater degree" it ensures that businesses are not made to "retro-fit" existing tenant spaces that do not present a risk to the welfare or life safety of the tenants. Any renovations would still need to meet the requirements for alterations of the Existing Building Code.

For example, if a nail salon is change to an office space (assuming the same occupant load), why should the office be required to provide additional electrical outlets (section 1007.4) or new lighting (section 1010.1). There was already a tenant in the space with those conditions. Any life safety issues (such as a need for increased exits or sprinklers) are caught by the "greater degree" language.

The purpose of the Existing Building code should be to allow existing buildings to be renovated and occupied while maintaining the level of safety. It should not be to retrofit the tenant space or building to meet today's code.

Cost Impact: The code change proposal will decrease the cost of construction

This should reduce the cost for business owners/tenants by only applying the change of occupancy requirements of the Existing Building Code if the International Building Code requires a greater degree of any one of the six elements listed.

Proposal # 5746

ADM3-19 Part II

ADM4-19

IBC®: [A] 202; IEBC®: [A] 202

Proponent: David Bonowitz, David Bonowitz, S.E., representing Self (dbonowitz@att.net)

2018 International Building Code

Revise as follows:

[A] REPAIR. The reconstruction, replacement or renewal of any part of an existing building for the purpose of ~~its maintenance or to correct damage~~. correcting damage or restoring the predamage condition.

2018 International Existing Building Code

[A] REPAIR. The reconstruction, replacement or renewal of any part of an *existing building* for the purpose of ~~its maintenance or to correct damage~~. correcting damage or restoring the predamage condition.

Reason: This proposal completes an edit from the last cycle to distinguish repair from maintenance. There is already consensus support for this proposal. The 2018 IEBC definition of ROOF REPAIR already has the wording shown here.

In the last cycle, Group A proposal EB26-15 was approved to clarify distinctions in the IEBC between maintenance and repair. Corresponding changes to the definitions of REPAIR and ROOF REPAIR in the IBC and IEBC would be made in Group B with proposal ADM27-16. Here is what happened:

ICC split the proposal, assigning Part I for REPAIR to the Admin Committee and Part II for ROOF REPAIR to the IBC-S Committee.

IBC-S approved its portion, so Part II was done. But because of a snafu in testimony, the Admin Committee became confused and Disapproved Part I. But that was ok, because ...

At the Public Comment Hearing, Part I was easily Approved as Submitted by a show of hands. All good, until ...

OGV voters supported Part I As Submitted, but only with 55% approval. Since the PCH show-of-hands votes could not be added to the OGV votes, the OGV tally did not reach 2/3, so the consensus on Part I could not be approved, leaving the two codes and the two definitions out of coordination. This proposal corrects that snafu.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The change is editorial, for coordination with changes already approved last cycle.

Staff Analysis: There is an errata in the first printing of the 2018 IBC regarding the definition of roof repair. The definition was revised in the run up to the 2018 code. It should read:

ROOF REPAIR. Reconstruction or renewal of any part of an existing roof for the purpose of correcting damage or restoring the predamage condition.

Proposal # 4632

ADM4-19

ADM5-19 Part I

PART I — IBC®: [A] 202, 202 (New); IFC®: [A], (New)

PART II — IRC®: [RB] 202, 202 (New), R302.2.1, R302.2.2, R302.2.3, R302.2.4, R302.2.6, R310.1

PART III — IECC: R202 (IRC N1101.6), TABLE R405.5.2(1) [IRC N1105.5.2(1)]

Proponent: Jeffrey Shapiro, P.E., representing Self (jeff.shapiro@intlcodeconsultants.com)

THIS IS A 3 PART CODE CHANGE. PART I WILL BE HEARD BY THE ADMINISTRATIVE CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-BUILDING CODE COMMITTEE. PART III WILL BE HEARD BY THE IECC-RESIDENTIAL CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Building Code

Revise as follows:

[A] TOWNHOUSE. ~~A single-family dwelling unit constructed in a group of building that contains three or more attached townhouse units in which each unit extends from the foundation to roof and with open space on at least two sides, constructed in a group, and used, intended, or designed to be built, used, rented, leased, let or hired out to be occupied, or that are occupied for living purposes.~~

Add new definition as follows:

TOWNHOUSE UNIT. A single-family dwelling unit in a townhouse that extends from foundation to roof and with a yard or public way on not less than two sides.

2018 International Fire Code

[A] TOWNHOUSE. ~~A single-family dwelling unit constructed in a group of building that contains three or more attached townhouse units in which each unit extends from the foundation to roof and with open space on not less than two sides, constructed in a group, and used, intended, or designed to be built, used, rented, leased, let or hired out to be occupied, or that are occupied for living purposes.~~

Add new definition as follows:

TOWNHOUSE UNIT. A single-family dwelling unit in a townhouse that extends from foundation to roof and with a yard or public way on not less than two sides.

Proposal # 5675

ADM5-19 Part I

ADM5-19 Part II

IRC@: [RB] 202, 202 (New), R302.2.1, R302.2.2, R302.2.3, R302.2.4, R302.2.6, R310.1

Proponent: Jeffrey Shapiro, P.E., International Code Consultants, representing Self (jeff.shapiro@intlcodeconsultants.com)

2018 International Residential Code

Revise as follows:

[RB] BUILDING. Any one- or two-family dwelling or townhouse, or portion thereof, including townhouses, used or intended to be used for human habitation, for living, sleeping, cooking or eating purposes, or any combination thereof, or any *accessory structure*. For the definition applicable in Chapter 11, see Section N1101.6.

[RB] TOWNHOUSE. A single-family dwelling unit constructed in a group of building that contains three or more attached townhouse units in which each unit extends from foundation to roof and with a yard or public way on not less than two sides, constructed in a group, and used, intended, or designed to be built, used, rented, leased, let or hired out to be occupied, or that are occupied for living purposes.

Add new definition as follows:

TOWNHOUSE UNIT. A single-family dwelling unit in a townhouse that extends from foundation to roof and that has a yard or public way on not less than two sides.

Revise as follows:

R302.2.1 Double walls. Each *townhouse unit* shall be separated from other *townhouse units* by two 1-hour fire-resistance-rated wall assemblies tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code.

R302.2.2 Common walls. Common walls separating ~~townhouses~~ *townhouse units* shall be assigned a fire-resistance rating in accordance with Item 1 or 2. The common wall shared by two ~~townhouses~~ *townhouse units* shall be constructed without plumbing or mechanical equipment, ducts or vents in the cavity of the common wall. The wall shall be rated for fire exposure from both sides and shall extend to and be tight against exterior walls and the underside of the roof sheathing. Electrical installations shall be in accordance with Chapters 34 through 43. Penetrations of the membrane of common walls for electrical outlet boxes shall be in accordance with Section R302.4.

1. Where a fire sprinkler system in accordance with Section P2904 is provided, the common wall shall be not less than a 1-hour fire-resistance-rated wall assembly tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code.
2. Where a fire sprinkler system in accordance with Section P2904 is not provided, the common wall shall be not less than a 2-hour fire-resistance-rated wall assembly tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code.

R302.2.3 Continuity. The fire-resistance-rated wall or assembly separating ~~townhouses~~ *townhouse units* shall be continuous from the foundation to the underside of the roof sheathing, deck or slab. The fire-resistance rating shall extend the full length of the wall or assembly, including wall extensions through and separating attached enclosed *accessory structures*.

R302.2.4 Parapets for townhouses. Parapets constructed in accordance with Section R302.2.5 shall be constructed for *townhouses* as an extension of exterior walls or common walls separating townhouse units in accordance with the following:

1. Where roof surfaces adjacent to the wall or walls are at the same elevation, the parapet shall extend not less than 30 inches (762 mm) above the roof surfaces.
2. Where roof surfaces adjacent to the wall or walls are at different elevations and the higher roof is not more than 30 inches (762 mm) above the lower roof, the parapet shall extend not less than 30 inches (762 mm) above the lower roof surface.
Exception: A parapet is not required in the preceding two cases where the roof covering complies with a minimum Class C rating as tested in accordance with ASTM E108 or UL 790 and the roof decking or sheathing is of noncombustible materials or fire-retardant-treated wood for a distance of 4 feet (1219 mm) on each side of the wall or walls, or one layer of 5/8-inch (15.9 mm) Type X gypsum board is installed directly beneath the roof decking or sheathing, supported by not less than nominal 2-inch (51 mm) ledgers attached to the sides of the roof framing members, for a distance of not less than 4 feet (1219 mm) on each side of the wall or walls and any openings or penetrations in the roof are not within 4 feet (1219 mm) of the common walls. Fire-retardant-treated wood shall meet the requirements of Sections R802.1.5 and R803.2.1.2.
3. A parapet is not required where roof surfaces adjacent to the wall or walls are at different elevations and the higher roof is more than 30 inches (762 mm) above the lower roof. The common wall construction from the lower roof to the underside of the higher roof deck shall have not less than a 1-hour fire-resistance rating. The wall shall be rated for exposure from both sides.

R302.2.6 Structural independence. Each ~~individual~~ *townhouse unit* shall be structurally independent.

Exceptions:

1. Foundations supporting *exterior walls* or common walls.
2. Structural roof and wall sheathing from each unit fastened to the common wall framing.
3. Nonstructural wall and roof coverings.
4. Flashing at termination of roof covering over common wall.
5. ~~Townhouses~~ Townhouse units separated by a common wall as provided in Section R302.2.2, Item 1 or 2.

R310.1 Emergency escape and rescue opening required. *Basements, habitable attics* and every sleeping room shall have not less than one operable emergency escape and rescue opening. Where *basements* contain one or more sleeping rooms, an emergency escape and rescue opening shall be required in each sleeping room. Emergency escape and rescue openings shall open directly into a public way, or to a *yard* or court that opens to a public way.

Exceptions:

1. Storm shelters and *basements* used only to house mechanical *equipment* not exceeding a total floor area of 200 square feet (18.58 m²).
2. Where the *dwelling unit* or *townhouse unit* is equipped with an automatic sprinkler system installed in accordance with Section P2904, sleeping rooms in basements shall not be required to have emergency escape and rescue openings provided that the basement has one of the following:
 - 2.1. One means of egress complying with Section R311 and one emergency escape and rescue opening.
 - 2.2. Two means of egress complying with Section R311.

Proposal # 5547

ADM5-19 Part II

ADM5-19 Part III

IECC: R202 (IRC N1101.6), TABLE R405.5.2(1) [IRC N1105.5.2(1)]

Proponent: Jeffrey Shapiro, P.E., International Code Consultants, representing Self (jeff.shapiro@intlcodeconsultants.com)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Add new definition as follows:

TOWNHOUSE UNIT. A single-family dwelling unit in a townhouse that extends from foundation to roof and with a yard or public way on not less than two sides.

Revise as follows:

TABLE R405.5.2(1) [IRC N1105.5.2(1)] SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

Portions of table not shown remain unchanged.

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
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- h. For residences with conditioned basements, R-2 and R-4 residences, and for ~~townhouses~~ townhouse units, the following formula shall be used to determine glazing area:

$$AF = A_s \times FA \times F$$

where:

AF	=	Total glazing area.
A_s	=	Standard reference design total glazing area.
FA	=	(Above-grade thermal boundary gross wall area)/(above-grade boundary wall area + 0.5 × below-grade boundary wall area).
F	=	(above-grade thermal boundary wall area)/(above-grade thermal boundary wall area + common wall area) or 0.56, whichever is greater.

and where:

Thermal boundary wall is any wall that separates conditioned space from unconditioned space or ambient conditions.

Above-grade thermal boundary wall is any thermal boundary wall component not in contact with soil.

Below-grade boundary wall is any thermal boundary wall in soil contact.

Common wall area is the area of walls shared with an adjoining dwelling unit.

L and CFA are in the same units.

Reason: The IRC currently contains the terms "townhouse" and "townhouse unit," but only "townhouse" is defined. Here are examples of a few of the locations where the term "townhouse unit" is currently used:

- Preamble "Effective Use of the International Residential Code," which states: *The International Residential Code (IRC) was created to serve as a complete, comprehensive code regulating the construction of single-family houses, two-family houses (duplexes) and buildings consisting of three or more townhouse units.*
- Section R302.2 states: **Townhouses.** Walls separating townhouse units shall be constructed in accordance with Section R302.2.1 or R302.2.2.
- Appendix K uses the term "townhouse units" throughout to describe individual dwelling units within a townhouse.

The term "townhouse" is currently used interchangeably as referencing either a single dwelling unit or as a structure with three or more such units, even though the current definition does not accommodate the latter. Literally, the current definition of "townhouse" is a "townhouse unit," yet previously approved code changes that introduced the term "townhouse unit" clearly demonstrate the confusion. I've also experienced this confusion when attempting to teach townhouse requirements to students in code classes.

This proposal will clarify the term "townhouse" as applying to structures that contain three or more dwelling units. This is consistent with how the IRC uses the term "dwelling" to reference a building with one or two dwelling units. Some of the text in the "dwelling" definition has been reproduced in the proposed "townhouse" definition, even though it's arguably poorly written. My objective was consistency, not fixing existing problems with the "dwelling" definition. It should be noted that, while the term "dwelling" currently captures buildings with up to two dwelling units, there is no term that currently defines a structure with more than two dwelling units. The updated definition of "townhouse" fills that hole.

To accommodate the need for a term that applies to individual dwelling units in a townhouse building, the proposal adds a new definition of "townhouse unit." The new definition is correlated with and uses the term "dwelling unit." For reference, the current IRC definitions of "dwelling" and "dwelling unit" are provided below, along with clean versions of the proposed "townhouse" and "townhouse unit" definitions for comparison:

- [RB] DWELLING. *Any building that contains one or two dwelling units used, intended, or designed to be built, used, rented, leased, let or hired out to be occupied, or that are occupied for living purposes.*
- [RB] DWELLING UNIT. *A single unit providing complete independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking and sanitation. For the definition applicable in Chapter 11, see Section N1101.6.*
- [RB] TOWNHOUSE. *A building that contains three or more attached townhouse units constructed in a group, and used, intended, or designed to be built, used, rented, leased, let or hired out to be occupied, or that are occupied for living purposes.*
- [RB] TOWNHOUSE UNIT. *A single-family dwelling unit in a townhouse that extends from foundation to roof and with a yard or public way on not less than two sides.*

In preparing this proposal, each of the 67 occurrences of the term "townhouse" was reviewed to determine whether the term was being used in a manner that applied to the entire structure or individual dwelling units within the structure, and this proposal recommends changes only to those sections where clarifications are needed to clearly convey the current intent of the code with respect to the updated definitions.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
No technical changes are intended by this proposal. The intent is simply to clarify terminology.

Proposal # 5717

ADM5-19 Part III

ADM6-19

IMC@: [A] 101.2; IPC@: 101.2; IEBC@: [A] 101.2; IFGC@: [A] 101.2

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgac@iccsafe.org)

2018 International Mechanical Code

Revise as follows:

[A] 101.2 Scope. This code shall regulate the design, installation, maintenance, *alteration* and inspection of mechanical systems that are permanently installed and utilized to provide control of environmental conditions and related processes within buildings. This code shall also regulate those mechanical systems, system components, *equipment* and appliances specifically addressed herein. The installation of fuel gas distribution piping and *equipment*, fuel gas-fired appliances and fuel gas-fired *appliance* venting systems shall be regulated by the International Fuel Gas Code .

Exception: Detached one- and two-family dwellings and ~~multiple single-family dwellings (townhouses)~~ not more than three stories ~~high above grade plane in height~~ with a separate means of egress, and their accessory structures not more than three stories above grade plane in height, shall comply with this code or the International Residential Code.

2018 International Plumbing Code

[A] 101.2 Scope. The provisions of this code shall apply to the erection, installation, alteration, repairs, relocation, replacement, addition to, use or maintenance of plumbing systems within this jurisdiction. This code shall regulate nonflammable medical gas, inhalation anesthetic, vacuum piping, nonmedical oxygen systems and sanitary and condensate vacuum collection systems. The installation of fuel gas distribution piping and equipment, fuel-gas-fired water heaters and water heater venting systems shall be regulated by the International Fuel Gas Code . Provisions in the appendices shall not apply unless specifically adopted.

Exception: Detached one- and two-family dwellings and ~~multiple single-family dwellings (townhouses)~~ not more than three stories ~~high above grade plane in height~~ with a separate means of egress, and their accessory structures not more than three stories above grade plane in height, shall comply with this code or the International Residential Code.

2018 International Existing Building Code

[A] 101.2 Scope. The provisions of the this code shall apply to the *repair, alteration, change of occupancy, addition* to and relocation of *existing buildings*.

Exception: Detached one- and two-family dwellings and ~~multiple single-family dwellings (townhouses)~~ not more than three stories above grade plane in height with a separate means of egress, and their accessory structures not more than three stories above grade plane in height, shall comply with this code or the International Residential Code.

2018 International Fuel Gas Code

[A] 101.2 Scope. This code shall apply to the installation of fuel-gas *piping* systems, fuel gas appliances, gaseous hydrogen systems and related accessories in accordance with Sections 101.2.1 through 101.2.5.

Exception: Detached one- and two-family dwellings and ~~multiple single-family dwellings (townhouses)~~ not more than three stories ~~high above grade plane in height~~ with a separate means of egress, and their accessory structures not more than three stories above grade plane in height, shall comply with this code or the International Residential Code.

Reason: The intent of this proposal is coordination in the exception. This language was revised in the IBC by ADM2-13, ADM32-16 and ADM33-16. IBC

[A] 101.2 Scope. The provisions of this code shall apply to the construction, *alteration*, relocation, enlargement, replacement, *repair*, equipment, use and occupancy, location, maintenance, removal and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures.

Exception: Detached one- and two-family *dwellings* and *townhouses* not more than three *stories above grade plane* in height with a separate *means of egress*, and their accessory structures not more than three *stories above grade plane* in height, shall comply with this code or the *International Residential Code*.

This same language is in IFC, IMC, IPC, IEBC and IFGC and was not consistently changed. As IFC Section 1001.1 is scoped to the IBC Egress Code Committee this will be addressed next cycle.

IFC (Group A – handle next cycle.)

1001.1 General. Buildings or portions thereof shall be provided with a *means of egress* system as required by this chapter. The provisions of this chapter shall control the design, construction and arrangement of *means of egress* components required to provide an *approved means of egress* from structures and portions thereof. Sections 1003 through 1030 shall apply to new construction. Section 1031 shall apply to existing buildings.

Exception: Detached one- and two-family dwellings ~~and multiple single-family dwellings (townhouses)~~ not more than three stories above grade plane in height with a separate means of egress and their accessory structures not more than three stories above grade plane in height, shall comply with this code or the *International Residential Code*.

The BCAC is working from the philosophy that ICC is a family of codes, so administrative requirements should be consistent across books. Most administrative and enforcement matters are the same for any code. Those matters unique for a specific code remain unchanged. This is one of a series of proposals being submitted relating to technical, editorial and organizational changes proposed for the Administrative chapters (Chapter 1) in all of the I-Codes.

While the Administrative Committee will consider each proposal independently, the proposals in this package are a correlated set of companion code change proposals.”

This proposal is submitted by the ICC Building Code Action Committee (BCAC) and the ICC Plumbing/Mechanical/Gas Code Action Committee (PMG CAC)

BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

The PMG CAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance the International Codes or portions thereof that were under the purview of the PMG CAC. In 2017-2018, the PMG CAC held one face-to-face meeting and 11 conference call meetings. Numerous interested parties attended the committee meetings and offered their input. Related documentation and reports are posted on the PMGCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/pmg-code-action-committee-pmgcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is an editorial change that provides consistency between I-codes.

Proposal # 4053

ADM6-19

ADM7-19

IEBC@: [A] 101.2

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

2018 International Existing Building Code

Revise as follows:

[A] 101.2 Scope. The provisions of the this code shall apply to the *repair, alteration, change of occupancy, addition* to and relocation of *existing buildings*.

Exception: ~~Detached~~ Subject to the approval of the code official, detached one- and two-family *dwellings* and multiple single-family *dwellings* (*townhouses*) not more than three *stories above grade plane* in height with a separate *means of egress*, and their accessory structures not more than three *stories above grade plane* in height, shall comply with this code or the International Residential Code.

Reason: This proposal edits a new exception that was just added in the last cycle (ADM 31-16). It preserves the intent of that proposal, but it explicitly gives discretion to the code official, thus ensuring consistency within a jurisdiction.

ADM 31-16 added the exception to Section 101.2. The intent was given in the Admin committee's reason statement: "Not mixing codes on the same building will make compliance easier." This is true. By the same token, not mixing codes within a jurisdiction with many similar projects will also make compliance easier and avoid a host of problems. Unfortunately, by giving full discretion to the permit applicant, the new exception creates exactly the problems it meant to solve.

Both the IEBC and the IRC contain provisions for existing dwellings and townhouses. For years, neither code has been completely clear about which code applies in a jurisdiction that adopts both. Rather, that decision has been left to the jurisdiction and its code official. The new exception added to the 2018 IEBC overturned that local practice and removed that local discretion. This proposal restores it.

This proposal will allow jurisdictions that have been using the IEBC for existing dwellings and townhouses to continue doing so. This benefits all stakeholders. First, it supports the local code official and policy-makers who have been using the IEBC without incident. Second, it ensures owners and developers that similar projects will be handled consistently, and consistent with past local precedents. Third, it helps FEMA grant applicants (jurisdictions), and FEMA assistance applicants (owners) comply with FEMA policy, which requires consistent use of the IEBC's upgrade triggers (discussed below). Fourth, it helps insurers and their customers understand and anticipate the costs and benefits of upgrade coverage. The new exception to IEBC Section 101.2 re-opened all those questions, but they can all be answered with this proposal, by allowing jurisdictions to maintain their own precedents and practices.

The proposal is consistent with other IEBC provisions that allow code official discretion. The added words are identical to those used in the exception to IEBC Section 301.3.

Is there a significant difference between the IEBC and the IRC's provisions for existing buildings? Yes, especially with regard to townhouses. The IEBC has 18 provisions that jurisdictions rely on to enhance earthquake, wind, and snow safety in existing townhouses, and ten for existing dwellings. All of these would be lost if a permit applicant is allowed to skip them by invoking the exception to Section 101.2. That said, this does not mean the IEBC treats dwellings just like commercial buildings; on the contrary, the IEBC exempts certain existing dwellings and townhouses from ten different triggers.

Whether one likes these IEBC provisions or not, one must acknowledge that any jurisdiction that has been applying them without incident should be allowed to continue that practice, and that it cannot help consistency to allow such different regulations to apply to similar projects. In many cases, the local code official will want to continue using the IEBC; this proposal allows that. In other cases, the local code official might recognize that the IRC approach is acceptable; this proposal allows that too. But the only way to ensure consistent policy is to have that decision rest with the code official.

Finally, even those who prefer the IRC approach must acknowledge that the new exception will lead to unclear application to individual projects as well. The exception allows ANY existing dwelling or townhouse – even one without conventional framing, or one that violates the conventional framing rules, or is highly deficient, or has irregularities that would make it ineligible for the IRC, or is located in a region that would make it ineligible for the IRC, or is highly vulnerable to wind or earthquake – to use the IRC and avoid addressing those conditions. IRC Section R102.7.1 would be the only applicable provision, and it sets a VERY low bar; it prohibits only projects that would *make* the existing building unsafe. If the existing building is already highly deficient, the IRC sets no limits on alterations, additions, or repairs. By giving discretion to the local code official who best knows the local building stock, the proposal resolves these issues as well.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal merely gives discretion to the jurisdiction and code official to maintain precedents and past practices.

Proposal # 5237

ADM8-19

IEBC@: 101.2.1 (New)

Proponent: Anthony Apfelbeck, representing City of Altamonte Springs (ACApfelbeck@altamonte.org)

2018 International Existing Building Code

Add new text as follows:

101.2.1 Application of fire code. The construction requirements for existing buildings in Chapter 11 of the *International Fire Code* shall be applied prior to the provisions of this code.

Reason: The ICC family of codes have a conflict between the IEBC and the IFC. Chapter 11 of the IFC establishes the minimum level for all existing buildings and these requirements shall apply prior to the IEBC requirements.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Clarifies the existing intent of the code. Provides no impact to cost over the existing provisions.

Proposal # 5543

ADM8-19

ADM9-19 Part I

PART I — IBC®: [A] 101.3; IFC®: [A] 101.3; IEBC®: [A] 101.3; IPC®: 101.3; IMC®: [A] 101.3; IPSDC®: [A] 101.6; IFGC®: [A] 101.4; ISPSC®: [A] 101.3; IPMC®: [A] 101.3; IZC®: [A] 101.2; IWUIC®: [A] 101.3; ICCPC®: [A] 101.4, [A] 101.4.1

PART II — IECC: C101.3

PART III — IECC: R101.3

PART IV — IRC®: R101.3

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgac@iccsafe.org); Michael O'Brian, FCAC, representing FCAC (fcac@iccsafe.org)

THIS IS A 4 PART CODE CHANGE. PART I WILL BE HEARD BY THE ADMINISTRATIVE CODE COMMITTEE. PART II WILL BE HEARD BY THE IECC-COMMERCIAL CODE COMMITTEE. PART III WILL BE HEARD BY THE IECC-RESIDENTIAL CODE COMMITTEE. PART IV WILL BE HEARD BY THE IRC-BUILDING CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Building Code

Revise as follows:

[A] 101.3 Intent. Purpose. The purpose of this code is to establish the minimum requirements to provide a reasonable level of safety, ~~public~~ health and general welfare through structural strength, ~~means of egress facilities~~, stability, sanitation, ~~adequate~~ light and ventilation, energy conservation, and safety to life and property from fire, explosion and other hazards, and to provide a reasonable level of safety to fire fighters and emergency responders during emergency operations.

2018 International Fire Code

[A] 101.3 Intent. Purpose. The purpose of this code is to establish the minimum requirements consistent with nationally recognized good practice for providing a reasonable level of life safety and property protection from the hazards of fire, explosion or dangerous conditions in new and existing buildings, structures and premises, and to provide a reasonable level of safety to fire fighters and emergency responders during emergency operations.

2018 International Existing Building Code

[A] 101.3 Intent. Purpose. The ~~intent purpose~~ of this code is to provide flexibility to permit the use of alternative approaches to achieve compliance with minimum requirements to ~~safeguard the public~~ provide a reasonable level of safety, health, safety and general welfare insofar as they are affected by the *repair, alteration, change of occupancy, addition and relocation of existing buildings.*

2018 International Plumbing Code

101.3 Intent. Purpose. The purpose of this code is to establish minimum ~~standards requirements~~ to provide a reasonable level of safety, health, property protection and ~~public general~~ welfare by regulating and controlling the design, construction, installation, quality of materials, location, operation and maintenance or use of plumbing equipment and systems.

2018 International Mechanical Code

[A] 101.3 Intent. Purpose. The purpose of this code is to establish minimum ~~standards requirements~~ to provide a reasonable level of safety, health, property protection and ~~public general~~ welfare by regulating and controlling the design, construction, installation, quality of materials, location, operation and maintenance or use of mechanical equipment or systems.

2018 International Private Sewage Disposal Code

[A] 101.6 Intent. Purpose. The purpose of this code is to establish minimum ~~standards requirements~~ to provide a reasonable level of safety health, property protection and ~~public general~~ welfare by regulating and controlling the design, construction, installation, quality of materials, location, operation and maintenance or use of *private sewage disposal systems.*

2018 International Fuel Gas Code

[A] 101.4 Intent. Purpose. The purpose of this code is to establish minimum ~~standards requirements~~ to provide a reasonable level of safety, health, property protection and ~~public general~~ welfare by regulating and controlling the design, construction, installation, quality of materials, location, operation and maintenance or use of fuel gas equipment or systems.

2018 International Swimming Pool and Spa Code

~~[A] 101.3 Intent. Purpose.~~ The purpose of this code is to establish minimum ~~standards-requirements~~ to provide a reasonable level of safety ~~and protection of health~~, health, property ~~protection~~ and ~~public-general~~ welfare by regulating and controlling the design, construction, installation, quality of materials, location and maintenance or use of pools and spas.

2018 International Property Maintenance Code

~~[A] 101.3 Intent. Purpose.~~ This code shall be construed to secure its expressed intent, which is to ensure public ~~The purpose of this code is to establish minimum requirements to provide a reasonable level of~~ health, safety and ~~general~~ welfare insofar as they are affected by the continued ~~occupancy~~ and maintenance of structures and ~~premises~~. Existing structures and ~~premises~~ that do not comply with these provisions shall be altered or repaired to provide a ~~reasonable~~ minimum level of health, safety and ~~safety-general welfare~~ as required herein.

2018 International Zoning Code

~~[A] 101.2 Intent. Purpose.~~ The purpose of this code is to ~~safeguard the health, property and public~~ ~~establish minimum requirements to provide a~~ ~~reasonable level of health, safety, property protection and~~ welfare by controlling the design, location, use or occupancy of all buildings and structures through the regulated and orderly development of land and land uses within this jurisdiction.

2018 International Wildland-Urban Interface Code

~~[A] 101.3 Objective. Purpose.~~ The ~~objective-purpose~~ of this code is to establish minimum regulations consistent with nationally recognized good practice for the safeguarding of life and for property protection. Regulations in this code are intended to mitigate the risk to life and structures from intrusion of fire from wildland fire exposures and fire exposures from adjacent structures and to mitigate structure fires from spreading to wildland fuels. The extent of this regulation is intended to be tiered commensurate with the relative level of hazard present. The unrestricted use of property in *wildland-urban interface areas* is a potential threat to life and property from fire and resulting erosion. Safeguards to prevent the occurrence of fires and to provide adequate fire protection facilities to control the spread of fire in *wildland-urban interface areas* shall be in accordance with this code.

This code shall supplement the jurisdiction's building and fire codes, if such codes have been adopted, to provide for special regulations to mitigate the fire- and life-safety hazards of the *wildland-urban interface areas*.

2018 International Code Council Performance Code

[A] 101.4 Intent. Purpose.

~~[A] 101.4.1 Building.~~ ~~To~~ ~~The purpose of this code is to~~ provide an acceptable level of health, safety, and ~~general~~ welfare and to limit damage to property from events that are expected to impact buildings and structures. Accordingly, Part II of this code intends buildings and structures to provide for the following:

1. An environment free of unreasonable risk of death and injury from fires.
2. A structure that will withstand loads associated with normal use and of the severity associated with the location in which the structure is constructed.
3. Means of egress and access for normal and emergency circumstances.
4. Limited spread of fire both within the building and to adjacent properties.
5. Ventilation and sanitation facilities to maintain the health of the occupants.
6. Natural light, heating, cooking and other amenities necessary for the well being of the occupants.
- 7 Efficient use of energy.
8. Safety to fire fighters and emergency responders during emergency operations.

Proposal # 4057

ADM9-19 Part I

ADM9-19 Part II

IECC: C101.3

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgcac@iccsafe.org); Michael O'Brian, FCAC, representing FCAC (fcac@iccsafe.org)

2018 International Energy Conservation Code

Revise as follows:

C101.3 Intent. Purpose. ~~This code shall regulate the design and construction.~~ The purpose of this code is to establish minimum requirements to provide a reasonable level of health, safety and general welfare by regulating the design, construction and operation of buildings for the effective use and conservation of energy over the useful life of each building. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective. ~~This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.~~

Proposal # 5725

ADM9-19 Part II

ADM9-19 Part III

IECC: R101.3

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgcac@iccsafe.org); Michael O'Brian, FCAC, representing FCAC (fcac@iccsafe.org)

2018 International Energy Conservation Code

Revise as follows:

R101.3 Intent. Purpose. ~~This code shall regulate the design and construction.~~ The purpose of this code is to establish minimum requirements to provide a reasonable level of health, safety and general welfare by regulating the design, construction and operation of buildings for the effective use and conservation of energy over the useful life of each building. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective. ~~This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.~~

Proposal # 5726

ADM9-19 Part III

ADM9-19 Part IV

IRC@: R101.3

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgcac@iccsafe.org); Michael O'Brian, FCAC, representing FCAC (fcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

R101.3 Intent, Purpose. The purpose of this code is to establish minimum requirements to ~~safeguard the public~~ provide a reasonable level of safety, health and general welfare through affordability, structural strength, means of egress ~~facilities~~, stability, sanitation, light and ventilation, energy conservation and safety to life and property from fire, explosion and other hazards ~~attributed to the built environment~~, and to provide a reasonable level of safety to fire fighters and emergency responders during emergency operations.

Reason: The purpose of this proposal is for consistency in language for the sections on "Intent" or "Purpose" in the family of codes. The title of the section should be revised to be consistent with the text, which is "purpose." The phrase "health, safety and general welfare" is used in several different configurations. A change from "public" to "general" would show that this is intended for everyone – by using "public" it could be read to not include employees.

IECC - The last line in the current Intent section is unique to the IECC, and redundant. It is proposed to deleting it for consistency.

The BCAC is working from the philosophy that ICC is a family of codes, so administrative requirements should be consistent across books. Most administrative and enforcement matters are the same for any code. Those matters unique for a specific code remain unchanged. This is one of a series of proposals being submitted relating to technical, editorial and organizational changes proposed for the Administrative chapters (Chapter 1) in all of the I-Codes.

While the Administrative Committee will consider each proposal independently, the proposals in this package are a correlated set of companion code change proposals."

This proposal is submitted by the ICC Building Code Action Committee (BCAC), the ICC Fire Code Action Committee (FCAC), the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC) and the ICC Plumbing/Mechanical/Gas Code Action Committee (PMG CAC).

BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

The FCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes with regard to fire safety and hazardous materials in new and existing buildings and facilities and the protection of life and property in wildland urban interface areas. In 2018 the Fire-CAC has held 3 open meetings. In addition, there were numerous conference calls, Regional Work Group and Task Group meetings for the current code development cycle, which included members of the committees as well as any interested parties, to discuss and debate the proposed changes. Related documentation and reports are posted on the FCAC website at: <https://www.iccsafe.org/codes-tech-support/cs/fire-code-action-committee-fcac/>

he SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>.

The PMG CAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance the International Codes or portions thereof that were under the purview of the PMG CAC. In 2017-2018, the PMG CAC held one face-to-face meeting and 11 conference call meetings. Numerous interested parties attended the committee meetings and offered their input. Related documentation and reports are posted on the PMGCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/pmg-code-action-committee-pmgcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is an editorial change that provides consistency between I-codes.

Proposal # 5795

ADM9-19 Part IV

ADM10-19 Part I

PART I — IBC®: [A] 101.3; IEBC®: [A] 101.3; ISPSC®: [A] 101.3; IPMC®: [A] 101.3; IZC®: [A] 101.2

PART II — IRC®: R101.3

PART III — IECC: C101.3

PART IV — IECC: R101.3

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgac@iccsafe.org)

THIS IS A 4 PART CODE CHANGE. PART I WILL BE HEARD BY THE ADMINISTRATIVE CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-BUILDING CODE COMMITTEE. PART III WILL BE HEARD BY THE IECC-COMMERCIAL CODE COMMITTEE. PART IV WILL BE HEARD BY THE IECC-RESIDENTIAL CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Building Code

Revise as follows:

[A] 101.3 Intent. The purpose of this code is to establish the minimum requirements to provide a reasonable level of safety, public health and general welfare through structural strength, *means of egress* facilities, stability, sanitation, adequate light and ventilation, energy conservation, and ~~safety to life for providing a reasonable level of life safety and property protection from the hazards of fire, explosion and other hazards or dangerous conditions~~, and to provide a reasonable level of safety to fire fighters and emergency responders during emergency operations.

2018 International Existing Building Code

[A] 101.3 Intent. The intent of this code is to provide flexibility to permit the use of alternative approaches to achieve compliance with minimum requirements to safeguard the public health, safety ~~and~~ property protection and welfare insofar as they are affected by the *repair, alteration, change of occupancy, addition* and relocation of *existing buildings*.

2018 International Swimming Pool and Spa Code

[A] 101.3 Intent. The purpose of this code is to establish minimum standards to provide a reasonable level of safety ~~and protection of health~~, property protection and public welfare by regulating and controlling the design, construction, installation, quality of materials, location and maintenance or use of pools and spas.

2018 International Property Maintenance Code

[A] 101.3 Intent. This code shall be construed to secure its expressed intent, which is to ensure public health, safety property protection and welfare insofar as they are affected by the continued *occupancy* and maintenance of structures and *premises*. Existing structures and *premises* that do not comply with these provisions shall be altered or repaired to provide a minimum level of health and safety as required herein.

2018 International Zoning Code

[A] 101.2 Intent. The purpose of this code is to safeguard the health, property protection and public welfare by controlling the design, location, use or occupancy of all buildings and structures through the regulated and orderly development of land and land uses within this jurisdiction.

Proposal # 4074

ADM10-19 Part I

ADM10-19 Part II

IRC@: R101.3

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

R101.3 Intent. The purpose of this code is to establish minimum requirements to safeguard the public safety, health and general welfare through affordability, structural strength, means of egress facilities, stability, sanitation, light and ventilation, energy conservation and ~~safety to life for~~ providing a reasonable level of life safety and property protection from fire and other hazards attributed ~~the hazards of fire, explosion or dangerous conditions attributed~~ to the built environment, and to provide safety to fire fighters and emergency responders during emergency operations.

Proposal # 5741

ADM10-19 Part II

ADM10-19 Part III

IECC: C101.3

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

2018 International Energy Conservation Code

Revise as follows:

C101.3 Intent. ~~This code shall regulate the design and construction.~~ The purpose of this code is to establish minimum requirements to provide a reasonable level of health, safety, property protection and general welfare by regulating the design, construction and operation of buildings for the effective use and conservation of energy over the useful life of each building. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

Proposal # 5742

ADM10-19 Part III

ADM10-19 Part IV

IECC: R101.3

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

2018 International Energy Conservation Code

Revise as follows:

R101.3 Intent. ~~This code shall regulate the design and construction~~ The purpose of this code is to establish minimum requirements to provide a reasonable level of health, safety, property protection and general welfare by regulating the design, construction and operation of buildings for the effective use and conservation of energy over the useful life of each building. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

Reason: The purpose of this proposal is for consistency in language for the sections on "Intent" or "Purpose" in the family of codes. The title of the section should be revised to be consistent with the text, which is "purpose."

The IFC was used as the guidance for the phrase to use. Several of the codes included the term "property protection", but not all. It is the intent of all the codes to provide "a reasonable level of life safety and property protection". Thus, this phrase is proposed to be used consistently across codes.

The BCAC is working from the philosophy that ICC is a family of codes, so administrative requirements should be consistent across books. Most administrative and enforcement matters are the same for any code. Those matters unique for a specific code remain unchanged. This is one of a series of proposals being submitted relating to technical, editorial and organizational changes proposed for the Administrative chapters (Chapter 1) in all of the I-Codes.

While the Administrative Committee will consider each proposal independently, the proposals in this package are a correlated set of companion code change proposals."

This proposal is submitted by the ICC Building Code Action Committee (BCAC), the ICC Fire Code Action Committee (FCAC), the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC) and the ICC Plumbing/Mechanical/Gas Code Action Committee (PMG CAC).

BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

The FCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes with regard to fire safety and hazardous materials in new and existing buildings and facilities and the protection of life and property in wildland urban interface areas. In 2018 the Fire-CAC has held 3 open meetings. In addition, there were numerous conference calls, Regional Work Group and Task Group meetings for the current code development cycle, which included members of the committees as well as any interested parties, to discuss and debate the proposed changes. Related documentation and reports are posted on the FCAC website at: <https://www.iccsafe.org/codes-tech-support/cs/fire-code-action-committee-fcac/>

The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>.

The PMGCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance the International Codes or portions thereof that were under the purview of the PMG CAC. In 2017-2018, the PMG CAC held one face-to-face meeting and 11 conference call meetings. Numerous interested parties attended the committee meetings and offered their input. Related documentation and reports are posted on the PMGCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/pmg-code-action-committee-pmgcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is an editorial change that provides consistency between I-codes.

Proposal # 5743

ADM10-19 Part IV

ADM11-19

IBC®: [A] 101.4.8

Proponent: Daniel E Nichols, MTA Metro-North Railroad, representing MTA Metro-North Railroad (dnichols@mnr.org)

2018 International Building Code

Revise as follows:

[A] 101.4.8 Performance-Based Design. Performance-based designs are determined to be acceptable to this Code when completed in accordance with the ICC Performance Code.

Reason: The ICC Performance Code is an established document that does not have a connection to the IBC. Without such a connection, the designer and the code official is faced with looking into one or two different options to achieve approval; an alternative method or material process from Section 104.11 or by undergoing a local Board of Appeals/Variance process. Using either path, both the designer and code official are left with much interpretation on what is actually needed for both compliance and approval on more complex projects.

The ICC Performance Code is a document that is encompassing to address the issues in the IBC from an approach of intent and goals. Using the ICC Performance Code as a reference from the IBC allows for the IBC to be the basis of all items that don't require a performance design.

The rail industry relies on the use of performance-based design due to the unique layout of passenger loading platforms in rail stations. The current process is seeking local approval (or acceptance) of NFPA 101 or NFPA 130 due to the specific performance-based criteria. This creates many issues as the path to compliance is usually an administrative issue of what code applies when the different codes conflict, as well as the determination of the acceptance and approval process of larger projects.

The ICC Performance Code provides a useful tool for many building projects and ensures the code official has the needed information to approve alternative designs.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This provides a design option for alternative approaches to code requirements.

Proposal # 2370

ADM11-19

ADM12-19

IMC@: [A] 102.3 (New), ACCA Chapter 15 (New)

Proponent: David Bixby, Air Conditioning Contractors of America (ACCA), representing Air Conditioning Contractors of America (bixster1953@yahoo.com)

2018 International Mechanical Code

Revise as follows:

[A] 102.3 Maintenance. Mechanical systems, both existing and new, and parts thereof shall be maintained in proper operating condition in accordance with the original design and in a safe and sanitary condition. Devices or safeguards that are required by this code shall be maintained in compliance with the edition of the code under which they were installed. The owner or the owner's authorized agent shall be responsible for maintenance of mechanical systems. To determine compliance with this provision, the code official shall have the authority to require a mechanical system to be reinspected.

The inspection for maintenance of HVAC systems not within the scope of ACCA 4 QM shall be performed in accordance with ASHRAE/ACCA/ANSI Standard 180.

The inspection for maintenance of HVAC systems in one and two family dwellings and multi family dwellings of three stories or fewer above grade shall be performed in accordance with ACCA 4 QM.

Add new standard(s) as follows:

ACCA

Air Conditioning Contractors of America
2800 Shirlington Road, Suite 300
Arlington VA 22206

ANSI/ACCA 4 QM – 2013: Maintenance of Residential HVAC Systems

Reason: The proposal is to (1) clarify that the current requirement showing Standard 180 specifically covers inspection for maintenance of commercial HVAC systems, and (2) add a reference to ACCA 4 QM which covers inspection for maintenance of residential HVAC systems for one- and two-family dwellings of three stories or less. ACCA 4 QM is a consensus-based ANSI standard. A proposal to add ACCA 4 QM to Chapter 15, Referenced Standards, has also been submitted.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
No cost impacts since this is a clarification of maintenance requirements.

Proposal # 1877

ADM12-19

ADM13-19

IBC®: [A] 102.6.2; IEBC®: [A] 101.4.2

Proponent: Jeffrey Shapiro, P.E., representing Self (jeff.shapiro@intlcodeconsultants.com)

2018 International Building Code

Revise as follows:

[A] 102.6.2 **Buildings previously occupied.** The legal occupancy of any building existing on the date of adoption of this code shall be permitted to continue without change, except as otherwise specifically provided in this code ~~;~~ and all of the following:

1. Existing buildings shall comply with applicable provisions in the *International Fire Code*, including the construction requirements for existing buildings in IFC Chapter 11.
2. Existing buildings shall comply with the ~~or~~ *International Property Maintenance Code*.
3. Existing buildings shall make changes ~~;~~ ~~or as is~~ deemed necessary by the *building official* for the general safety and welfare of the occupants and the public.

2018 International Existing Building Code

[A] 101.4.2 **Buildings previously occupied.** The legal occupancy of any building existing on the date of adoption of this code shall be permitted to continue without change, except as ~~is~~ otherwise specifically covered provided in this code ~~;~~ and all of the following:

1. Existing buildings shall comply with applicable provisions in the *International Fire Code*, including the construction requirements for existing buildings in IFC Chapter 11.
2. Existing buildings shall comply with ~~or~~ the *International Property Maintenance Code*.
3. Existing buildings shall make changes ~~;~~ ~~or as is~~ deemed necessary by the ~~code~~ *building official* for the general safety and welfare of the occupants and the public.

Reason: The proposed revisions are intended to emphasize and clarify requirements that are applicable to all existing buildings by using a list structure and emphasizing that the requirements are all applicable, versus use of the current "or" that separates the list. Reference to IFC Chapter 11 is also specifically highlighted because it includes construction requirements that are applicable to some existing buildings, which might otherwise be overlooked.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The change is intended as a clarification of existing provisions.

Proposal # 5662

ADM13-19

ADM14-19

IPMC@: [A] 102.3 (New)

Proponent: Benchmark Harris, representing Self (bharris@huckabee-inc.com)

2018 International Property Maintenance Code

Add new text as follows:

[A] 102.3 Application of other codes. Where structural engineering analysis is used to determine if an unsafe structural condition exists, the nominal strengths, nominal loads, load effects, required strengths and limit states shall be in accordance with the regulation or code under which the structure was constructed.

Exceptions:

1. If the regulation or code under which the structure was constructed is not known, it shall be permitted to apply any regulation or code that the code official determines to be representative of the requirements under which the structure was constructed.
2. If applying currently adopted code provisions indicates that there is not an unsafe structural condition, it shall be permitted to apply currently adopted code provisions.

Repairs, additions or alterations to a structure, or changes of occupancy, shall be done in accordance with the procedures and provisions of the International Building Code, International Existing Building Code, International Energy Conservation Code, International Fire Code, International Fuel Gas Code, International Mechanical Code, International Residential Code, International Plumbing Code and NFPA 70. Nothing in this code shall be construed to cancel, modify or set aside any provision of the International Zoning Code.

Reason: 2018 IPMC Sections 304.1.1, 305.1.1 and 306.1.1 indicate that unsafe conditions occur if structural engineering analysis determines that certain conditions exist, using the terms “nominal strengths”, “nominal loads”, “load effects”, “required strengths” in those provisions. These terms are not defined in Chapter 2 “Definitions” of the 2018 IPMC.

2018 IPMC Section 201.3 states, “Where terms are not defined in this code and are defined in the International Building Code, International Existing Building Code, International Fire Code, International Fuel Gas Code, International Mechanical Code, International Plumbing Code, International Residential Code, International Zoning Code or NFPA 70, such terms shall have the meanings ascribed to them as stated in those codes.”

These terms are not defined in Chapter 2 “Definitions” of the 2018 IEBC, 2018 IFC, 2018 IFGC, 2018 IPC, 2018 IRC, or the 2018 IZC. However, 2018 IBC Chapter 2 has the following relevant definitions:

LIMIT STATE. A condition beyond which a structure or member becomes unfit for service and is judged to no longer useful for its intended function (serviceability limit state) or to be unsafe (strength limit state).

LOADS: Forces or other actions that result from the weight of building materials, occupants and their possessions, environmental effects, differential movement and restrained dimensional changes. Permanent loads are those loads in which variations over time are rare or of small magnitude, such as dead loads. All other loads are variable loads (see “Nominal Loads”).

LOAD EFFECTS: Forces and deformations produced in structural members by applied loads.

NOMINAL LOADS: The magnitudes of the loads specified in Chapter 16 (dead, live, soil, wind, snow, rain, flood and earthquake).

STRENGTH (for Chapter 21).

Required strength. Strength of a member or cross section required to resist factored loads.

STRENGTH (for Chapter 16).

Required strength. Strength of a member, cross section or connection required to resist factored loads or related internal moments and forces in such combinations as stipulated by those provisions.

The following term is defined in Chapter 2 of the 2018 IMC but it is not considered relevant to this structural application:

STRENGTH, ULTIMATE. The highest stress level that the component will tolerate without rupture.

The definitions in the 2018 IBC make the structural provisions in the 2018 IBC the applicable standard when determining if a structure is unsafe. This is not how the IPMC is actually applied in jurisdictions throughout the country, though, because many building officials agree that existing buildings

should not be considered dangerous when the requirements for new buildings simply increase with time, which does occur. This would create a large economic burden on Owners that are otherwise maintaining their facilities according to the original design.

For example, TMS 402 recently approved completely removing the Empirical Design Appendix which had provisions for unreinforced masonry design. The next edition of TMS 402 will therefore no longer allow Empirical Design. The Empirical Design method was a simplified method that primarily limited span to thickness ratios without as formal a structural analysis as is required for the Allowable Stress Design or Strength Design methods. The Empirical Design provisions were permitted and have been used in the design of a great many buildings across the entire country for generations, even though it became recognized over time that the methodology did not necessarily provide as high a level of structural reliability that is required for masonry designed using the Allowable Stress Design or Strength Design methods. If not modified, the IPMC provisions would make "unsafe" any Empirically designed structure where this is the case.

Many Building Officials and even ICC Staff have indicated that they believe the intent of the IPMC was to apply the structural requirements which originally applied to the design when the structure was constructed. This is rational and how many Building Officials actually interpret the current language. The justification for this interpretation seems to be 2018 IPMC Section 102.2 Maintenance; however, that provision does not explicitly waive the structural engineering requirements in Sections 304.1.1, 305.1.1 and 306.1.1 which Chapter 2 indicates are associated with the 2018 IBC Definitions, making the definitions of these terms the definitions in the 2018 IBC.

This proposed change would correct this unintended problem by clearly stating that the applicable code is the original code.

It is quite often unknown what the original code or structural provisions were when a building was constructed. It is also quite often unknown when the building was constructed. This proposed change therefore allows a Building Official to use their judgment in making the determination of which

structural code provisions are sufficiently representative of what they understand to be the applicable provisions when the structure was constructed.

The proposed exception allows use of the current IBC when the code provisions allow construction that was not previously permitted. This is appropriate and rational considering that building codes sometimes recognize greater strengths of materials and/or required loads are reduced. For example, the allowable flexural strengths of unreinforced masonry in some of the original versions of TMS 402 are much lower than the allowable flexural strengths of unreinforced masonry in the more recent versions. This increase in recognized strength was based on test data that accumulated with time and an extensive structural reliability index study. It should be permitted for an Owner to use the current building code to justify existing conditions as not being "unsafe" if that's possible.

This proposed language is most appropriate in Section 102.3 rather than another Section in the IPMC because:

1. There are 3 separate sections in which numerous conditions deemed "unsafe" are listed, with many of these conditions using the structural engineering terms in question: 304.11, 305.11 and 306.11. It would be cumbersome to add all of the proposed language to each one of these 3 sections. Furthermore, this issue is related to provisions in Chapter 2 "Definitions" and involves the applicability of other codes.
2. It would not be appropriate to simply add the proposed language to 301 because Section 301 covers general requirements for property maintenance whereas the issue is related to provisions in Chapter 2 "Definitions" and involves the applicability of other codes.
3. Section 102.7 Reference Standards is not a suitable location either, because that provision is related to specific standards that are referenced whereas actual names of the original building codes are not explicitly named (or "referenced") in the IPMC, considering that they vary from project to project.
4. Section 102.3 is titled "Application of other codes" and is the most suitable location for the clarification of which regulation or code should be applied in the structural engineering analysis to determine if an unsafe condition exists.

If this proposed change is approved, it is suggested that ICC Staff add Commentary language to Sections 304.1.1, 305.1.1 and 306.1.1 that calls attention to the new language in Section 102.3.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal is related to existing buildings, not new construction.

Proposal # 2265

ADM14-19

ADM15-19

IFC@: [A] 102.7 (New)

Proponent: Jeffrey Harper, representing JENSEN HUGHES (jharper@jensenhughes.com)

2018 International Fire Code

Add new text as follows:

[A] 102.7 Application of the International Existing Building Code. Where existing buildings and structures cannot meet the prescriptive provisions of this code with regards to the current degree of public safety, health and welfare in existing buildings, and where approved by the fire code official, the performance compliance method provided in the International Existing Building Code (IEBC) shall be used.

Reason: Chapter 11 of the IFC provides no alternate to compliance for existing buildings in the same manner that NFPA 101A provides for existing buildings regulated by NFPA 101.

The IEBC only applies to buildings undergoing repair, alteration, change of occupancy, addition and relocation of existing buildings. However, Chapter 13 of IEBC allows the performance compliance method to be used for existing occupancies. Per 1301.2: "The provisions of Sections 1301.2 through 1301.5 shall apply to existing occupancies that will continue to be, or are proposed to be in Groups A, B, E, F, I-2, M, R and S." Therefore, no change is needed to allow the use of this Chapter to existing buildings.

By adding an applicability section to the administrative provisions of the fire code, the user is given a code path to use the evaluation methods prescribed in Chapter 13 of the IEBC for existing buildings wherein no work may be planned.

For example: An existing office building's highest story is 55 feet above the lowest level of fire department access and has been cited for not having any standpipes. Per IFC Section 1103.6, standpipes are required. The building is fully sprinkler protected per NFPA 13 and provided with a fire alarm system throughout. All shafts are 2-hour rated and corridors are 1-hour rated. Egress capacity, travel distances and common paths all exceed that required by the IBC for new construction and elevators have been recently replaced with fully compliant Stage 2 recall capability. The fire code would require standpipes regardless of these other systems. The Performance Compliance Method permits an accepted method of evaluating all components of a building and providing a score to account for deficiencies.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This code provision will not increase cost and has a high likelihood of reducing cost by providing flexibility that does not currently exist in the code.

Proposal # 5492

ADM15-19

ADM16-19 Part I

PART I — IBC®: SECTION 103, [A] 103.1, [A] 103.2, [A] 103.3; IFC®: SECTION 103, [A] 103.1, [A] 103.2, [A] 103.3, [A] 103.4, [A] 103.4.1; IPC®: SECTION 103, 103.1, 103.2, 103.3, 103.4, 103.4.1; IMC®: SECTION 103, [A] 103.1, [A] 103.2, [A] 103.3, [A] 103.4, [A] 103.4.1; IFGC®: SECTION 103 (IFGC), [A] 103.1, [A] 103.2, [A] 103.3, [A] 103.4, [A] 103.4.1; IEBC®: SECTION 103, [A] 103.1, [A] 103.2, [A] 103.3; ISPC®: SECTION 103, [A] 103.1, [A] 103.2, [A] 103.3, [A] 103.4, [A] 103.4.1; IPMC®: SECTION 103, [A] 103.1, [A] 103.2, [A] 103.3, [A] 103.4, [A] 103.4.1; IPSDC®: SECTION 103, [A] 103.1, [A] 103.2, [A] 103.3, [A] 103.4, [A] 103.4.1; IWUIC®: SECTION 103, [A] 103.1, [A] 103.2, [A] 103.3

PART II — IRC®: SECTION R103, R103.1, R103.2, R103.3

PART III — IGCC®: 103 (New), 103.1 (New), 103.2 (New), 103.3 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Michael O'Brian, representing FCAC (fcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgac@iccsafe.org)

THIS IS A 3 PART CODE CHANGE. PART I WILL BE HEARD BY THE ADMINISTRATIVE CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-BUILDING CODE COMMITTEE. PART III WILL BE HEARD BY THE IGCC CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Building Code

Revise as follows:

SECTION 103 **DEPARTMENT OF BUILDING SAFETY CODE COMPLIANCE AGENCY**

Add new text as follows:

[A] 103.1 Creation of agency. The [INSERT NAME OF DEPARTMENT] is hereby created and the official in charge thereof shall be known as the building official. The function of the agency shall be the implementation, administration and enforcement of the provisions of this code.

Revise as follows:

[A] 103.2 Appointment. The *building official* shall be appointed by the chief appointing authority of the jurisdiction.

[A] 103.3 Deputies. In accordance with the prescribed procedures of this jurisdiction and with the concurrence of the appointing authority, the building official shall have the authority to appoint a deputy building official, the other related technical officers, inspectors, plan examiners and other employees. Such employees shall have powers as delegated by the building official. ~~For the maintenance of existing properties, see the International Property Maintenance Code.~~

2018 International Fire Code

SECTION 103 **DEPARTMENT OF FIRE PREVENTION CODE COMPLIANCE AGENCY**

[A] 103.1 General. Creation of agency. ~~The department of fire prevention is established within the jurisdiction under the direction of the fire code official.~~ [INSERT NAME OF DEPARTMENT] is hereby created and the official in charge thereof shall be known as the fire code official. The function of the ~~department~~ agency shall be the implementation, administration and enforcement of the provisions of this code.

[A] 103.2 Appointment. ~~The fire code official shall be appointed by the chief appointing authority of the jurisdiction, and the fire code official shall not be removed from office except for cause and after full opportunity to be heard on specific and relevant charges by and before the appointing authority.~~

[A] 103.3 Deputies. In accordance with the prescribed procedures of this jurisdiction and with the concurrence of the appointing authority, the fire code official shall have the authority to appoint a deputy fire code official, other related technical officers, inspectors and other employees. Such employees shall have powers as delegated by the fire code official.

[A] ~~103.4~~ 104.7 Liability. The *fire code official*, member of the board of appeals, officer or employee charged with the enforcement of this code, while acting for the jurisdiction, in good faith and without malice in the discharge of the duties required by this code or other pertinent law or ordinance, shall not thereby be rendered civilly or criminally liable personally, and is hereby relieved from all personal liability for any damage accruing to persons or property as a result of an act or by reason of an act or omission in the discharge of official duties.

[A] ~~103.4.1~~ 104.7.1 Legal defense. Any suit or criminal complaint instituted against any officer or employee because of an act performed by that officer or employee in the lawful discharge of duties and under the provisions of this code shall be defended by the legal representatives of the jurisdiction until the final termination of the proceedings. The *fire code official* or any subordinate shall not be liable for costs in an action, suit or proceeding that is instituted in pursuance of the provisions of this code; and any officer of the department of fire prevention, acting in good faith and

without malice, shall be free from liability for acts performed under any of its provisions or by reason of any act or omission in the performance of official duties in connection therewith.

2018 International Plumbing Code

SECTION 103 DEPARTMENT OF PLUMBING INSPECTION CODE COMPLIANCE AGENCY

Add new text as follows:

103.1 Creation of agency. The [INSERT NAME OF DEPARTMENT] is hereby created and the official in charge thereof shall be known as the code official. The function of the agency shall be the implementation, administration and enforcement of the provisions of this code.

Revise as follows:

103.2 Appointment. The code official shall be appointed by the chief appointing authority of the jurisdiction.

103.3 Deputies. In accordance with the prescribed procedures of this jurisdiction and with the concurrence of the appointing authority, the code official shall have the authority to appoint a deputy code official, other related technical officers, inspectors and other employees. Such employees shall have powers as delegated by the code official.

~~103.4~~ **104.8 Liability.** The code official, member of the board of appeals or employee charged with the enforcement of this code, while acting for the jurisdiction in good faith and without malice in the discharge of the duties required by this code or other pertinent law or ordinance, shall not thereby be rendered civilly or criminally liable personally, and is hereby relieved from all personal liability for any damage accruing to persons or property as a result of any act or by reason of an act or omission in the discharge of official duties.

~~103.4.1~~ **104.8.1 Legal defense.** Any suit or criminal complaint instituted against any officer or employee because of an act performed by that officer or employee in the lawful discharge of duties and under the provisions of this code shall be defended by the legal representative of the jurisdiction until the final termination of the proceedings. The code official or any subordinate shall not be liable for costs in any action, suit or proceeding that is instituted in pursuance of the provisions of this code.

2018 International Mechanical Code

SECTION 103 DEPARTMENT OF MECHANICAL INSPECTION CODE COMPLIANCE AGENCY

Add new text as follows:

[A] 103.1 Creation of agency. The [INSERT NAME OF DEPARTMENT] is hereby created and the official in charge thereof shall be known as the code official. The function of the agency shall be the implementation, administration and enforcement of the provisions of this code.

Revise as follows:

[A] 103.2 Appointment. The code official shall be appointed by the chief appointing authority of the jurisdiction.

[A] 103.3 Deputies. In accordance with the prescribed procedures of this jurisdiction and with the concurrence of the appointing authority, the code official shall have the authority to appoint a deputy code official, other related technical officers, inspectors and other employees. Such employees shall have powers as delegated by the code official.

[A] ~~103.4~~ 104.8 Liability. The code official, member of the board of appeals or employee charged with the enforcement of this code, while acting for the jurisdiction in good faith and without malice in the discharge of the duties required by this code or other pertinent law or ordinance, shall not thereby be rendered civilly or criminally liable personally, and is hereby relieved from personal liability for any damage accruing to persons or property as a result of an act or by reason of an act or omission in the discharge of official duties.

[A] ~~103.4.1~~ 104.8.1 Legal defense. Any suit or criminal complaint instituted against any officer or employee because of an act performed by that officer or employee in the lawful discharge of duties and under the provisions of this code shall be defended by the legal representatives of the jurisdiction until the final termination of the proceedings. The code official or any subordinate shall not be liable for costs in an action, suit or proceeding that is instituted in pursuance of the provisions of this code.

2018 International Fuel Gas Code

SECTION 103 (IFGC) DEPARTMENT OF INSPECTION CODE COMPLIANCE AGENCY

Add new text as follows:

[A] 103.1 Creation of agency. The [INSERT NAME OF DEPARTMENT] is hereby created and the official in charge thereof shall be known as the code official. The function of the agency shall be the implementation, administration and enforcement of the provisions of this code.

Revise as follows:

[A] 103.2 Appointment. The code official shall be appointed by the chief appointing authority of the jurisdiction.

[A] 103.3 Deputies. In accordance with the prescribed procedures of this jurisdiction and with the concurrence of the appointing authority, the code official shall have the authority to appoint a deputy code official, other related technical officers, inspectors and other employees. Such employees shall have powers as delegated by the code official.

[A] ~~103.4~~ 104.8 Liability. The code official, member of the board of appeals or employee charged with the enforcement of this code, while acting for the jurisdiction in good faith and without malice in the discharge of the duties required by this code or other pertinent law or ordinance, shall not thereby be rendered civilly or criminally liable personally, and is hereby relieved from all personal liability for any damage accruing to persons or property as a result of an act or by reason of an act or omission in the discharge of official duties.

[A] ~~103.4.1~~ 104.8.1 Legal defense. Any suit or criminal complaint instituted against any officer or employee because of an act performed by that officer or employee in the lawful discharge of duties and under the provisions of this code shall be defended by the legal representatives of the jurisdiction until the final termination of the proceedings. The code official or any subordinate shall not be liable for costs in an action, suit or proceeding that is instituted in pursuance of the provisions of this code.

2018 International Existing Building Code

SECTION 103 ~~DEPARTMENT OF BUILDING SAFETY CODE COMPLIANCE AGENCY~~

Add new text as follows:

[A] 103.1 Creation of agency. The [INSERT NAME OF DEPARTMENT] is hereby created and the official in charge thereof shall be known as the code official. The function of the agency shall be the implementation, administration and enforcement of the provisions of this code.

Revise as follows:

[A] 103.2 Appointment. The *code official* shall be appointed by the chief appointing authority of the jurisdiction.

[A] 103.3 Deputies. In accordance with the prescribed procedures of this jurisdiction and with the concurrence of the appointing authority, the code official shall have the authority to appoint a deputy code official, ~~the other~~ related technical officers, inspectors, ~~plan examiners~~, and other employees. Such employees shall have powers as delegated by the code official.

2018 International Swimming Pool and Spa Code

SECTION 103 ~~DEPARTMENT OF BUILDING SAFETY CODE COMPLIANCE AGENCY~~

Add new text as follows:

[A] 103.1 Creation of agency. The [INSERT NAME OF DEPARTMENT] is hereby created and the official in charge thereof shall be known as the code official. The function of the agency shall be the implementation, administration and enforcement of the provisions of this code.

Revise as follows:

[A] 103.2 Appointment. The code official shall be appointed by the chief appointing authority of the jurisdiction.

[A] 103.3 Deputies. In accordance with the prescribed procedures of ~~the this~~ jurisdiction and with the concurrence of the appointing authority, the code official shall have the authority to appoint a deputy code official, ~~the other~~ related technical officers, inspectors, ~~plans examiners~~ and other employees. Such employees shall have powers as delegated by the code official.

[A] ~~103.4~~ 104.8 Liability. The code official, member of the board of appeals or employee charged with the enforcement of this code, while acting for the jurisdiction in good faith and without malice in the discharge of the duties required by this code or other pertinent law or ordinance, shall not thereby be rendered civilly or criminally liable personally and is hereby relieved from personal liability for any damage accruing to persons or property as a result of any act or by reason of an act or omission in the discharge of official duties.

[A] ~~103.4.1~~ 104.8.1 Legal defenses. Any suit or criminal complaint instituted against an officer or employee because of an act performed by that officer or employee in the lawful discharge of duties and under the provisions of this code shall be defended by legal representatives of the jurisdiction until the final termination of the proceedings. The code official or any subordinate shall not be liable for cost in any action, suit or proceeding that is instituted in pursuance of the provisions of this code.

2018 International Property Maintenance Code

SECTION 103

~~DEPARTMENT OF PROPERTY MAINTENANCE INSPECTION~~ CODE COMPLIANCE AGENCY

Add new text as follows:

[A] 103.1 Creation of agency. The [INSERT NAME OF DEPARTMENT] is hereby created and the official in charge thereof shall be known as the code official. The function of the agency shall be the implementation, administration and enforcement of the provisions of this code.

Revise as follows:

[A] 103.2 Appointment. The *code official* shall be appointed by the chief appointing authority of the jurisdiction.

[A] 103.3 Deputies. In accordance with the prescribed procedures of this jurisdiction and with the concurrence of the appointing authority, the code official shall have the authority to appoint a deputy ~~(s)~~ code official, other related technical officers, inspectors and other employees. Such employees shall have powers as delegated by the code official.

[A] ~~103.4~~ 104.7 Liability. The *code official*, member of the board of appeals or employee charged with the enforcement of this code, while acting for the jurisdiction, in good faith and without malice in the discharge of the duties required by this code or other pertinent law or ordinance, shall not thereby be rendered civilly or criminally liable personally, and is hereby relieved from all personal liability for any damage accruing to persons or property as a result of an act or by reason of an act or omission in the discharge of official duties.

[A] ~~103.4.1~~ 104.7.1 Legal defense. Any suit or criminal complaint instituted against any officer or employee because of an act performed by that officer or employee in the lawful discharge of duties and under the provisions of this code shall be defended by the legal representative of the jurisdiction until the final termination of the proceedings. The code official or any subordinate shall not be liable for costs in an action, suit or proceeding that is instituted in pursuance of the provisions of this code.

2018 International Private Sewage Disposal Code

SECTION 103

~~DEPARTMENT OF PRIVATE SEWAGE DISPOSAL INSPECTION~~ CODE COMPLIANCE AGENCY

Add new text as follows:

[A] 103.1 Creation of agency. The [INSERT NAME OF DEPARTMENT] is hereby created and the official in charge thereof shall be known as the code official. The function of the agency shall be the implementation, administration and enforcement of the provisions of this code.

Revise as follows:

[A] 103.2 Appointment. The code official shall be appointed by the chief appointing authority of the jurisdiction.

[A] 103.3 Deputies. In accordance with the prescribed procedures of ~~the this~~ jurisdiction and with the concurrence of the appointing authority, the code official shall have the authority to appoint a deputy code official, other related technical officers, inspectors and other employees. Such employees shall have powers as delegated by the code official.

[A] ~~103.4~~ 104.7 Liability. The code official, member of the board of appeals or employee charged with the enforcement of this code, while acting for the jurisdiction in good faith and without malice in the discharge of the duties required by this code or other pertinent law or ordinance, shall not thereby be rendered civilly or criminally liable personally, and is hereby relieved from all personal liability for any damage accruing to persons or property as a result of any act or by reason of an act or omission in the discharge of official duties.

[A] ~~103.4.1~~ 104.7.1 Legal defense. Any suit or criminal complaint instituted against any officer or employee because of an act performed by that officer or employee in the lawful discharge of duties and under the provisions of this code shall be defended by the legal representatives of the jurisdiction until the final termination of the proceedings. The code official or any subordinate shall not be liable for costs in any action, suit or proceeding that is instituted in pursuance of the provisions of this code.

2018 International Wildland-Urban Interface Code

SECTION 103

~~ENFORCEMENT~~ CODE COMPLIANCE AGENCY

Add new text as follows:

[A] 103.1 Creation of agency. The [INSERT NAME OF DEPARTMENT] is hereby created and the official in charge thereof shall be known as the code official. The function of the agency shall be the implementation, administration and enforcement of the provisions of this code.

Revise as follows:

[A] 103.2 Appointment. The code official shall be appointed by the chief appointing authority of the jurisdiction.

[A] 103.3 Deputies. In accordance with the prescribed procedures of this jurisdiction and with the concurrence of the appointing authority, the code official shall have the authority to appoint a deputy ~~(s) code official, other related technical officers, inspectors and other employees.~~ Such employees shall have powers as delegated by the code official.

Proposal # 4064

ADM16-19 Part I

ADM16-19 Part II

IRC@: SECTION R103, R103.1, R103.2, R103.3

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Michael O'Brian, representing FCAC (fcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

SECTION R103 ~~DEPARTMENT OF BUILDING SAFETY CODE COMPLIANCE AGENCY~~

Add new text as follows:

R103.1 Creation of agency. The [INSERT NAME OF DEPARTMENT] is hereby created and the official in charge thereof shall be known as the building official. The function of the agency shall be the implementation, administration and enforcement of the provisions of this code.

Revise as follows:

R103.2 Appointment. The building official shall be appointed by the chief appointing authority of the jurisdiction.

R103.3 Deputies. In accordance with the prescribed procedures of this jurisdiction and with the concurrence of the appointing authority, the building official shall have the authority to appoint a deputy building official, ~~the other~~ related technical officers, inspectors, ~~plan examiners~~ and other employees. Such employees shall have powers as delegated by the building official.

Proposal # 5731

ADM16-19 Part II

ADM16-19 Part III

IGCC@: 103 (New), 103.1 (New), 103.2 (New), 103.3 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Michael O'Brian, representing FCAC (fcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

2018 International Green Construction Code

Add new text as follows:

103 CODE COMPLIANCE AGENCY

103.1 Creation of agency The **[INSERT NAME OF DEPARTMENT]** is hereby created and the official in charge thereof shall be known as the authority having jurisdiction (AHJ). The function of the agency shall be the implementation, administration and enforcement of the provisions of this code.

103.2 Appointment The authority having jurisdiction (AHJ) shall be appointed by the chief appointing authority of the jurisdiction.

103.3 Deputies In accordance with the prescribed procedures of this jurisdiction and with the concurrence of the appointing authority, the authority having jurisdiction (AHJ) shall have the authority to appoint a deputy authority having jurisdiction (AHJ), other related technical officers, inspectors and other employees as shall be necessary. Such employees shall have powers as delegated by the authority having jurisdiction (AHJ).

Reason: There are many different names for the title of this section, but all include provisions for the creation of the code compliance agency. The department's responsibilities are more than just 'enforcement' of the code. The fill in the blank for the name allows for the agency to develop a name appropriate to their jurisdiction and responsibilities.

In some of the codes there will be a move from this section to *General Authority and responsibilities* section so that requirements for liability and legal defense will be in a consistent location.

The BCAC is working from the philosophy that ICC is a family of codes, so administrative requirements should be consistent across books. Most administrative and enforcement matters are the same for any code. Those matters unique for a specific code remain unchanged. This is one of a series of proposals being submitted relating to technical, editorial and organizational changes proposed for the Administrative chapters (Chapter 1) in all of the I-Codes.

While the Administrative Committee will consider each proposal independently, the proposals in this package are a correlated set of companion code change proposals."

The following is the template utilized to create this code change proposal. There may be some differences depending on the unique applications of each code – such as "building/fire/code official".

SECTION 103

CODE COMPLIANCE AGENCY

103.1 Creation of agency. The **[INSERT NAME OF DEPARTMENT]** is hereby created and the official in charge thereof shall be known as the *code official*. The function of the agency shall be the implementation, administration and enforcement of the provisions of this code.

103.2 Appointment. The *code official* shall be appointed by the chief appointing authority of the jurisdiction.

103.3 Deputies. In accordance with the prescribed procedures of this jurisdiction and with the concurrence of the appointing authority, the *code official* shall have the authority to appoint a deputy *code official*, other related technical officers, inspectors and other employees. Such employees shall have powers as delegated by the *code official*.

This proposal is submitted by the ICC Building Code Action Committee (BCAC), the ICC Fire Code Action Committee (FCAC), the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC) and the ICC Plumbing/Mechanical/Gas Code Action Committee (PMG CAC).

BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

The FCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes with regard to fire safety and hazardous materials in new and existing buildings and facilities and the protection of life and property in wildland urban interface areas. In 2018 the Fire-CAC has held 3 open meetings. In addition, there were numerous conference calls, Regional Work Group and Task Group meetings for the current code development cycle, which included members of the committees as well as any interested parties, to discuss and debate the proposed changes. Related documentation and reports are posted on the FCAC website at: <https://www.iccsafe.org/codes-tech-support/cs/fire-code-action-committee-fcac/>

The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>.

The PMG CAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance the International Codes or portions thereof that were under the purview of the PMG CAC. In 2017-2018, the PMG CAC held one face-to-face meeting and 11 conference call meetings. Numerous interested parties attended the committee meetings and offered their input. Related documentation and reports are posted on the PMGCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/pmg-code-action-committee-pmgcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is an editorial change with no change to construction requirements.

Proposal # 5732

ADM16-19 Part III

ADM17-19

IFC@: [A] 103.3 (New), 103.3, 103.3.1, NFPA Chapter 80 (New)

Proponent: Richard Boisvert, Brighton Area Fire Authority, representing Michigan Fire Inspector's Society (rboisvert@brightonareafire.com)

2018 International Fire Code

Revise as follows:

[A] ~~103.3~~ **103.2.1 Deputies.** In accordance with the prescribed procedures of this jurisdiction and with the concurrence of the appointing authority, the *fire code official* shall have the authority to appoint a deputy *fire code official*, other related technical officers, inspectors and other employees.

Add new text as follows:

103.3 Fire code official qualifications. The fire code official shall possess appropriate qualifications, requisite skills, and knowledge. The fire code official shall continually work on professional development to maintain his/her skills, knowledge, and qualifications. The fire code official shall maintain a professional level of performance and education pertaining to the minimum job performance requirements (JPR's) established by NFPA 1037: Standard on Fire Marshal Professional Qualifications.

103.3.1 Deputy qualifications. The deputy fire code official, other related technical officers, inspectors, and other employees shall possess appropriate qualifications, requisite skills, and knowledge. The deputy fire code official(s) shall continually work towards professional development in an effort to maintain their skills, knowledge and, qualifications. The deputy fire code official(s) shall maintain a professional level of performance and education pertaining to the job performance requirements (JPR's) established by NFPA 1031: Standard for Professional Qualifications for Fire Inspector and Plans Examiner.

Add new standard(s) as follows:

NFPA

National Fire Protection Association
1 Batterymarch Park
Quincy MA 02169-7471

1031-2014: Standard for Professional Qualifications for Fire Inspector and Plan Examiner

NFPA

National Fire Protection Association
1 Batterymarch Park
Quincy MA 02169-7471

1037-2016: Standard on Fire Marshal Professional Qualifications

Reason: Currently, the International Fire Code does not address education and qualification requirements for an individual to appointed as a fire code official or deputies. The fire code official and associated deputies must be fire service individuals that meet an established professional level of qualification and education relevant to the position held. These positions are not only administrative or political but those that require an advanced technical, specialized knowledge along with an understanding of fire service operations and those duties applicable to fire code enforcement and interpretation. The individual(s) operating in these capacities should possess relevant and applicable qualifications and education that meet a recognized national standard that verifies their ability to demonstrate various job performance requirements and knowledge related to their position. This is essential to successful interpretation and application of the code for not only enforcement and application, but also to limit potential liability to the agency based on actions or responsibility. Without having a minimum requirement established, the position is open to the appointment of individuals who lack appropriate education, knowledge, and qualifications to hold the position. The need for minimum requirements for code officials; specifically plan reviewers and inspectors are currently being addressed in the development process of NFPA Standards, specifically NFPA 72: The National Fire Alarm Code.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal provides for a lack of required education and qualification guidelines for a fire code official and associated deputies utilizing recognized standards.

Proposal # 1145

ADM17-19

ADM18-19

IEBC@: [A] 104.2.1, [A] 109.3.3; IBC@: [A] 104.2.1, [A] 110.3.3

Proponent: Gregory Wilson, representing Federal Emergency Management Agency (gregory.wilson2@fema.dhs.gov); Rebecca Quinn, RCQuinn Consulting, on behalf of Federal Emergency Management Agency, representing Federal Emergency Management Agency (rcquinn@earthlink.net)

2018 International Existing Building Code

Revise as follows:

[A] 104.2.1 Determination of substantially improved or substantially damaged existing buildings and structures in flood hazard areas. For applications for reconstruction, rehabilitation, repair, *alteration*, *addition* or other improvement of *existing buildings* or structures located in *flood hazard areas*, the building official shall determine where the proposed work constitutes *substantial improvement* or repair of *substantial damage*. Where the building official determines that the proposed work constitutes *substantial improvement* or repair of *substantial damage*, and where required by this code, the building official shall require the building to meet the requirements of Section 1612 of the *International Building Code* or Section R322 of the *International Residential Code*, as applicable.

[A] 109.3.3 Lowest floor elevation. For *additions* and *substantial improvements* to *existing buildings* in *flood hazard areas*, on placement of the lowest floor, including basement, and prior to further vertical construction, the elevation documentation required in the *International Building Code* or *International Residential Code*, as applicable, shall be submitted to the *code official*.

2018 International Building Code

[A] 104.2.1 Determination of substantially improved or substantially damaged existing buildings and structures in flood hazard areas. For applications for reconstruction, rehabilitation, *repair*, *alteration*, *addition* or other improvement of existing buildings or structures located in *flood hazard areas*, the *building official* shall determine if the proposed work constitutes *substantial improvement* or *repair* of *substantial damage*. Where the *building official* determines that the proposed work constitutes *substantial improvement* or *repair* of *substantial damage*, and where required by this code, the *building official* shall require the building to meet the requirements of Section ~~1612~~: 1612 or Section R322 of the *International Residential Code*, as applicable.

[A] 110.3.3 Lowest floor elevation. In *flood hazard areas*, upon placement of the lowest floor, including the *basement*, and prior to further vertical construction, the elevation certification required in Section 1612.4 or *International Residential Code*, as applicable, shall be submitted to the *building official*.

Reason: This proposal could be considered editorial because it makes these two sections consistent with other sections in the IEBC that reference both the IBC and IRC, "as applicable."

It is appropriate to reference the IRC in these sections because existing dwellings are subject to the IEBC. When existing dwellings are required to be brought into compliance with the flood resistant construction requirements (substantial improvement or substantial damage), the IEBC refers to IRC Section R322 for those requirements (see sections 404.3, 405.2.5, 502.3, 503.2, 507.3, 701.3, 1103.3, 1201.4, 1301.3.3 and 1402.6).

Cost Impact: The code change proposal will not increase or decrease the cost of construction

No additional cost. The proposal references existing requirements; it makes this section consistent with phrasing used throughout to refer to compliance based on whether the IBC or IRC is applicable.

Proposal # 4505

ADM18-19

ADM19-19

IBC®: [A] 104.11 (New)

Proponent: Manny Muniz, Self, representing Self (Mannymuniz.mm@gmail.com)

2018 International Building Code

Delete and substitute as follows:

~~[A] 104.11 Alternative materials, design and methods of construction and equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety. Where the alternative material, design or method of construction is not approved, the building official shall respond in writing, stating the reasons why the alternative was not approved.~~

[A] 104.11 Alternative materials, design and methods of construction and equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design meets all of the following:

1. The alternative material, design or method of construction is satisfactory and complies with the intent of the provisions of this code.
2. The material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code as it pertains to the following:
 - 2.1. quality
 - 2.2. strength
 - 2.3. effectiveness
 - 2.4. fire resistance
 - 2.5. durability
 - 2.6. safety

Where the alternative material, design or method of construction is not approved, the building official shall respond in writing, stating the reasons why the alternative was not approved.

Reason: This section can be written more clearly as to the various criteria that must be met in order to be approved as an alternate material, design or method of construction. This will make it easier for the building official to make the necessary evaluation and decision. Should the alternate not be approved, it will also make it easier for the building official to cite the reasons for disapproval. There are no changes to the various requirements that the building official must consider.

Bibliography: No bibliography.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
There are no changes to the existing requirements.

Proposal # 1959

ADM19-19

ADM20-19

IBC®: [A] 104.11 (New)

Proponent: Manny Muniz, representing Self (Mannymuniz.mm@gmail.com)

2018 International Building Code

Revise as follows:

[A] 104.11 Alternative materials, design and methods of construction and equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been *approved*. An alternative material, design or method of construction shall be *approved* where the *building official* finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code in quality, strength, effectiveness, *fire resistance*, durability and safety. Approval of an alternate material, design or method of construction shall be issued in writing demonstrating evaluation of all the criteria stated in this section. Where the alternative material, design or method of construction is not *approved*, the *building official* shall respond in writing, stating the reasons why the alternative was not *approved*.

Reason: Just as written documentation is required for not approving an alternate, written documentation should also be required when the alternate is approved to show that the building official has determined that the alternate meets all of the criteria of 104.11.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This has no impact on the cost of construction.

Proposal # 1973

ADM20-19

ADM21-19

IBC®: [A] 104.11

Proponent: Manny Muniz, representing Self (Mannymuniz.mm@gmail.com)

2018 International Building Code

Revise as follows:

[A] 104.11 Alternative materials, design and methods of construction and equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been *approved*. An alternative material, design or method of construction shall be *approved* where the *building official* finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code in quality, strength, effectiveness, *fire resistance*, durability and safety. Such approval shall be limited to a specific project. Where the alternative material, design or method of construction is not *approved*, the *building official* shall respond in writing, stating the reasons why the alternative was not *approved*.

Reason: Alternates should be limited to a specific project in order to encourage the use of ICC-ES Acceptance Criteria or a formal code change so an alternate is not used in perpetuity, thus avoiding closer scrutiny. This will not prevent the building official from approving an alternate for future projects but provides a method for limiting them.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The code change does not prevent the building official from approving an alternate for any number of projects.

Proposal # 1980

ADM21-19

ADM22-19

IBC®: [A] 104.11.2

Proponent: Manny Muniz, representing Self (Mannymuniz.mm@gmail.com)

2018 International Building Code

[A] 104.11.2 Tests. Whenever there is insufficient evidence of compliance with the provisions of this code, or evidence that a material or method does not conform to the requirements of this code, or in order to substantiate claims for alternative materials or methods, the *building official* shall have the authority to require tests as evidence of compliance to be made without expense to the jurisdiction. Test methods shall be as specified in this code or by other recognized test standards. Test samples shall be randomly selected by an approved agency. In the absence of recognized and accepted test methods, the *building official* shall approve the testing procedures. Tests shall be performed by an *approved agency*. Reports of such tests shall be retained by the *building official* for the period required for retention of public records.

Reason: When the building official requires a test as evidence of compliance, it is important that the test samples be randomly selected by an approved agency so the agency knows what they are testing. This is similar to what test agencies do when testing a product that is to be listed. Unless otherwise instructed, test agencies will perform developmental tests on test samples submitted to them. Such developmental tests are not suitable for listing purposes nor are they suitable for tests required by this section.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The cost of construction will not be affected by the verification of legitimate test samples.

Proposal # 1987

ADM22-19

ADM23-19 Part I

PART I — IBC®: [A] 104.11, [A] 104.11.1, 104.11.1.1 (New), [A] 104.11.2, 107.3.1.1 (New), 202 (New)

PART II — IBC®: [BS] 202

Proponent: Michael Savage, representing Compliance Code Action Committee (CCAC) (ccac@iccsafe.org)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE ADMINISTRATIVE CODE COMMITTEE. PART II WILL BE HEARD BY THE IBC-STRUCTURAL CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEES.

2018 International Building Code

[A] 104.11 Alternative materials, design and methods of construction and equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been *approved*. An alternative material, design or method of construction shall be *approved* where the *building official* finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code in quality, strength, effectiveness, *fire resistance*, durability and safety. Where the alternative material, design or method of construction is not *approved*, the *building official* shall respond in writing, stating the reasons why the alternative was not *approved*.

[A] 104.11.1 Research reports. Supporting data, where necessary to assist in the approval of materials or assemblies not specifically provided for in this code, shall consist of valid research reports from *approved* sources.

Add new text as follows:

104.11.1.1 Approved sources. Agencies conducting product certification or product evaluation shall be accredited by an *accreditation body*. For the research report to be accepted for product approval, the scope of accreditation shall include the acceptance criteria referenced in the research report.

[A] 104.11.2 Tests. Whenever there is insufficient evidence of compliance with the provisions of this code, or evidence that a material or method does not conform to the requirements of this code, or in order to substantiate claims for alternative materials or methods, the *building official* shall have the authority to require tests as evidence of compliance to be made without expense to the jurisdiction. Test methods shall be as specified in this code or by other recognized test standards. In the absence of recognized and accepted test methods, the *building official* shall approve the testing procedures. Tests shall be performed by an *approved agency*. Reports of such tests shall be retained by the *building official* for the period required for retention of public records.

107.3.1.1 Third-party certification. Products and materials required by the code to be in compliance with referenced standards shall be *certified* by a *third-party certification agency* as complying with the referenced standards. Products and materials shall bear the identification of the manufacturer and any markings required by the applicable referenced standards.

Add new definition as follows:

THIRD-PARTY CERTIFICATION AGENCY. An *approved* agency operating a product or material certification system that incorporates initial product testing, assessment and surveillance of a manufacturer's quality control system.

Proposal # 4999

ADM23-19 Part I

ADM23-19 Part II

IBC®: [BS] 202

Proponent: Michael Savage, representing Compliance Code Action Committee (CCAC) (ccac@iccsafe.org)

2018 International Building Code

Revise as follows:

[BS] ACCREDITATION BODY. An *approved*, third-party organization that is independent of the grading product certification and inspection agencies ~~, and the lumber mills,~~ and that initially accredits and subsequently monitors agencies conducting building product certification or evaluation schemes, on a continuing basis, including the competency and performance of a grading or inspection agency related to carrying out specific tasks.

Reason: The standard practice in building products conformity assessment involves accreditation of the agencies by an accreditation body such as ISO. Third party testing, manufacturing inspections and product certification or product evaluation provide a higher level of quality assurance on these activities for the building official. Approved sources that issue research reports must be accredited to the specific acceptance criteria referenced in the research report. This ensures that the approved sources have the requisite technical expertise and experience to conduct such activities on behalf of the building official. Harmonized language is proposed for inclusion in a new Section 107.3.1.1 regarding third-party certification, and in Chapter 2 with a definition for third-party certification agency. The language in the new Section 107.3.1.1 is identical to language in the International Plumbing Code Section 303.4. The added definition is the same as that in the International Residential Code, International Plumbing Code and International Mechanical Code. The revised definition for Accreditation Body is necessary as it applies to product certification and inspection activities for building products and materials in general, and not lumber mills specifically. These additions will improve the consistency and intent of the I-codes.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal provides clarification and consistency.

Proposal # 5803

ADM23-19 Part II

ADM24-19 Part I

PART I — IBC®: [A] 105.2 (New)

PART II — IRC®: R105.2 (New)

Proponent: Marc Levitan, representing the ICC 500 Development Committee; Pataya Scott, representing Federal Emergency Management Agency (pataya.scott@fema.dhs.gov); Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE ADMINISTRATIVE CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-BUILDING CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Building Code

Revise as follows:

[A] 105.2 Work exempt from permit. Exemptions from *permit* requirements of this code shall not be deemed to grant authorization for any work to be done in any manner in violation of the provisions of this code or any other laws or ordinances of this jurisdiction. *Permits* shall not be required for the following:

Building:

1. ~~One-story~~ Other than storm shelters, one-story detached accessory structures used as tool and storage sheds, playhouses and similar uses, provided that the floor area is not greater than 120 square feet (11 m²).
2. Fences not over 7 feet (2134 mm) high.
3. Oil derricks.
4. Retaining walls that are not over 4 feet (1219 mm) in height measured from the bottom of the footing to the top of the wall, unless supporting a surcharge or impounding Class I, II or IIIA liquids.
5. Water tanks supported directly on grade if the capacity is not greater than 5,000 gallons (18 925 L) and the ratio of height to diameter or width is not greater than 2:1.
6. Sidewalks and driveways not more than 30 inches (762 mm) above adjacent grade, and not over any basement or *story* below and are not part of an *accessible route*.
7. Painting, papering, tiling, carpeting, cabinets, counter tops and similar finish work.
8. Temporary motion picture, television and theater stage sets and scenery.
9. Prefabricated *swimming pools* accessory to a Group R-3 occupancy that are less than 24 inches (610 mm) deep, are not greater than 5,000 gallons (18 925 L) and are installed entirely above ground.
10. Shade cloth structures constructed for nursery or agricultural purposes, not including service systems.
11. Swings and other playground equipment accessory to detached one- and two-family *dwelling*s.
12. Window awnings in Group R-3 and U occupancies, supported by an exterior wall that do not project more than 54 inches (1372 mm) from the *exterior wall* and do not require additional support.
13. Nonfixed and movable fixtures, cases, racks, counters and partitions not over 5 feet 9 inches (1753 mm) in height.

Electrical:

1. **Repairs and maintenance:** Minor repair work, including the replacement of lamps or the connection of *approved* portable electrical equipment to *approved* permanently installed receptacles.
2. **Radio and television transmitting stations:** The provisions of this code shall not apply to electrical equipment used for radio and television transmissions, but do apply to equipment and wiring for a power supply and the installations of towers and antennas.
3. **Temporary testing systems:** A *permit* shall not be required for the installation of any temporary system required for the testing or servicing of electrical equipment or apparatus.

Gas:

1. Portable heating appliance.
2. Replacement of any minor part that does not alter approval of equipment or make such equipment unsafe.

Mechanical:

1. Portable heating appliance.
2. Portable ventilation equipment.
3. Portable cooling unit.
4. Steam, hot or chilled water piping within any heating or cooling equipment regulated by this code.
5. Replacement of any part that does not alter its approval or make it unsafe.
6. Portable evaporative cooler.
7. Self-contained refrigeration system containing 10 pounds (4.54 kg) or less of refrigerant and actuated by motors of 1 horsepower (0.75 kW) or less.

Plumbing:

1. The stopping of leaks in drains, water, soil, waste or vent pipe, provided, however, that if any concealed trap, drain pipe, water, soil, waste or vent pipe becomes defective and it becomes necessary to remove and replace the same with new material, such work shall be considered as new work and a *permit* shall be obtained and inspection made as provided in this code.
2. The clearing of stoppages or the repairing of leaks in pipes, valves or fixtures and the removal and reinstallation of water closets, provided that such repairs do not involve or require the replacement or rearrangement of valves, pipes or fixtures.

Proposal # 4188

ADM24-19 Part I

ADM24-19 Part II

IRC@: R105.2 (New)

Proponent: Marc Levitan, representing the ICC 500 Development Committee; Pataya Scott, representing Federal Emergency Management Agency (pataya.scott@fema.dhs.gov); Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

R105.2 Work exempt from permit. Exemption from *permit* requirements of this code shall not be deemed to grant authorization for any work to be done in any manner in violation of the provisions of this code or any other laws or ordinances of this *jurisdiction*. *Permits* shall not be required for the following:

Building:

1. ~~One- Other than storm shelters, one-story~~ detached *accessory structures*, provided that the floor area does not exceed 200 square feet (18.58 m²).
2. Fences not over 7 feet (2134 mm) high.
3. Retaining walls that are not over 4 feet (1219 mm) in height measured from the bottom of the footing to the top of the wall, unless supporting a surcharge.
4. Water tanks supported directly upon *grade* if the capacity does not exceed 5,000 gallons (18 927 L) and the ratio of height to diameter or width does not exceed 2 to 1.
5. Sidewalks and driveways.
6. Painting, papering, tiling, carpeting, cabinets, counter tops and similar finish work.
7. Prefabricated swimming pools that are less than 24 inches (610 mm) deep.
8. Swings and other playground equipment.
9. Window awnings supported by an exterior wall that do not project more than 54 inches (1372 mm) from the exterior wall and do not require additional support.
10. Decks not exceeding 200 square feet (18.58 m²) in area, that are not more than 30 inches (762 mm) above *grade* at any point, are not attached to a dwelling and do not serve the exit door required by Section R311.4.

Electrical:

1. *Listed* cord-and-plug connected temporary decorative lighting.
2. Reinstallation of attachment plug receptacles but not the outlets therefor.
3. Replacement of branch circuit overcurrent devices of the required capacity in the same location.
4. Electrical wiring, devices, *appliances*, apparatus or *equipment* operating at less than 25 volts and not capable of supplying more than 50 watts of energy.
5. Minor repair work, including the replacement of lamps or the connection of *approved* portable electrical *equipment* to *approved* permanently installed receptacles.

Gas:

1. Portable heating, cooking or clothes drying *appliances*.
2. Replacement of any minor part that does not alter approval of *equipment* or make such *equipment* unsafe.
3. Portable-fuel-cell *appliances* that are not connected to a fixed piping system and are not interconnected to a power grid.

Mechanical:

1. Portable heating *appliances*.
2. Portable ventilation *appliances*.
3. Portable cooling units.
4. Steam, hot- or chilled-water piping within any heating or cooling *equipment* regulated by this code.
5. Replacement of any minor part that does not alter approval of *equipment* or make such *equipment* unsafe.
6. Portable evaporative coolers.
7. Self-contained refrigeration systems containing 10 pounds (4.54 kg) or less of refrigerant or that are actuated by motors of 1 horsepower (746 W) or less.
8. Portable-fuel-cell *appliances* that are not connected to a fixed piping system and are not interconnected to a power grid.

Plumbing:

1. The stopping of leaks in drains, water, soil, waste or vent pipe; provided, however, that if any concealed trap, drainpipe, water, soil, waste or vent pipe becomes defective and it becomes necessary to remove and replace the same with new material, such work shall be considered as new work and a *permit* shall be obtained and inspection made as provided in this code.
2. The clearing of stoppages or the repairing of leaks in pipes, valves or fixtures, and the removal and reinstallation of water closets, provided such repairs do not involve or require the replacement or rearrangement of valves, pipes or fixtures.

Reason: The list of 'Work exempted from permit' in the IBC includes detached accessory structures not greater than 120 square feet; the IRC exempts the same detached accessory structures, but sets the area threshold at 200 square feet. Some detached storm shelters – especially prefabricated units – may be smaller than 120 (or 200) square feet, and classified as accessory structures in accordance with administrative provisions described above. It should also be noted that storm shelters may serve as multi-function buildings such as garden sheds (residential) and light storage (residential and commercial). However, unlike other accessory structures where function is incidental, the storm shelter's primary function is to provide life safety protection from extreme wind events. As such, storm shelter construction and installation should always require a building permit to provide quality assurance for the life safety protection of all potential storm shelter occupants.

Non-permitted storm shelter installation is unfortunately common for residential prefabricated models which are frequently installed after the residential building has been occupied. Some Midwestern jurisdictions only permit storm shelters when they are installed under FEMA-sponsored rebate programs, but all storm shelters should provide consumers with the same level of life safety protection and associated security. Unpermitted prefabricated shelters are most vulnerable to inadequate anchorage because in most cases proper installation is not verified through an independent field inspection. For above ground storm shelters, the existing slab must meet manufacturer's minimum requirements to resist uplift and overturning during an extreme wind event. Accordingly, ICC 500 Section 106.3.1 requires special inspection to verify 1) the capacity of anchors that are post-installed in hardened concrete and 2) the adequacy of the existing slab to meet specifications provided by the manufacturer. For in-ground storm shelters, inadequate anchorage can result in shelters being dislodged when groundwater rises around them.

This proposal is submitted by the ICC Building Code Action Committee (BCAC) and the ICC 500 Storm Shelter Standard Development committee.

BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

The ICC 500 Standards Development committee is responsible for the development of the ICC/NSSA Standard for the Design and Construction of Storm Shelters. The committee is currently working on the development of the 2020 edition. In 2017 the ICC 500 committee held 7 open conference calls. In addition, there were numerous Working Group meetings and conference calls, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/standards-development/is-stm>.

Cost Impact: The code change proposal will increase the cost of construction

Increases the cost for installing storm shelters by the cost of the permit fee, but only in jurisdictions that currently allow installation without permits.

Proposal # 5744

ADM24-19 Part II

ADM25-19

IFC®: [A] 105.7.14 (New), 105.6.22 (New)

Proponent: Kevin Scott, representing KH Scott & Associates LLC (khscoassoc@gmail.com); Jeffrey Hugo, representing National Fire Sprinkler Association (hugo@nfsa.org)

2018 International Fire Code

Revise as follows:

[A] 105.7.14 High-piled combustible storage. A construction permit is required for the installation of or modification to a structure ~~exceeding with more than~~ 500 square feet (46 m²), including aisles, ~~for~~ of high-piled combustible storage. Maintenance performed in accordance with this code is not considered to be a modification and does not require a construction permit.

105.6.22 High-piled storage. An operational permit is required to use a building or portion thereof with more than 500 square feet (46 m²), including aisles, *of high-piled combustible storage.*

Reason: Code change F311-16 revised these two permits attempting to clarify that the 500 square feet referenced in each permit is the size of the high-piled storage area, not the size of the building. This code change adds further clarification as this is an item that is often misinterpreted. Section 105.7.14 is revised to clarify that it is not the structure that must exceed 500 square feet, but rather the high-piled combustible storage area. So, it will now state that it is a structure with high-piled combustible occupying an area greater than 500 square feet.

The revision in Section 105.6.22 is editorial to merely correct the terminology and reference the defined term of “high-piled combustible storage.”

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Clarification of code requirement, does not change application.

Proposal # 2021

ADM25-19

ADM26-19

IFC@: 105.7.26

Proponent: Bob Morgan, Fort Worth Fire Department, representing Fort Worth Fire Department

2018 International Fire Code

Add new text as follows:

105.7.26 Electrically locked egress doors. A construction permit is required for the installation or modification of electrically locked egress doors, as specified in Chapter 10. A separate construction permit is required for the installation or modification of a fire alarm system that may be connected to the electrically locked egress doors. Maintenance performed in accordance with this code is not considered a modification and does not require a permit.

Reason: The installation of electrically locked egress doors primarily in the form of mag locks has become quite prevalent in commercial occupancies. These systems are easily installed, potentially resulting in locked exits without the option to exit at that of the individual and potentially not interlocked with the fire alarm system. The requirement to interlock with the fire alarm system leads to a need for these systems to be permitted and inspected via the fire code official. Additionally, identification of illegal installations during Fire Inspections will be more easily coordinated when permits are required via the fire code official.

Cost Impact: The code change proposal will increase the cost of construction

If the construction complies with the code to begin with as it should, then the only increase in the cost of construction would be the potential cost of the permit in question.

Proposal # 919

ADM26-19

ADM27-19

IMC®: SECTION 107 (New), [A] 106.5, 107.2 (New), [A] 106.5.2, 107.3 (New), [A] 106.5.1, 107.5 (New), [A] 106.5.3, 107.6 (New); IPC®: SECTION 107 (New), 106.6, 107.2 (New), 106.6.2, 107.3 (New), 106.6.1, 107.5 (New), 106.6.3, 107.6 (New); IPMC®: SECTION 104 (New), [A] 103.5, 104.2 (New); IFGC®: SECTION 107 (New), [A] 106.6, 107.2 (New), [A] 106.6.2, 107.3 (New), [A] 106.6.1, 107.5 (New), [A] 106.6.3, 107.6 (New); ISPSC®: SECTION 106 (New), [A] 105.6, [A] 105.6.2, 106.2 (New), 106.3 (New), [A] 105.6.1, 106.5 (New), [A] 105.6.3, 106.6 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgac@iccsafe.org)

2018 International Mechanical Code

Add new text as follows:

SECTION 107 FEES

Revise as follows:

~~[A] **106.5.1 107.1 Fees- Payment of fees.** A permit shall not be issued valid until the fees prescribed in Section 106.5.2 by law have been paid, nor shall an An amendment to a permit shall not be released until the additional fee, if any, due to an increase of the mechanical system, has been paid.~~

Add new text as follows:

107.2 Schedule of permit fees. Where work requires a permit, a fee for each permit shall be paid as required, in accordance with the schedule as established by the applicable governing authority.

Delete without substitution:

~~[A] **106.5.2 Fee schedule.** The fees for mechanical work shall be as indicated in the following schedule.
[JURISDICTION TO INSERT~~

~~APPROPRIATE SCHEDULE]~~

Add new text as follows:

107.3 Permit valuations. The applicant for a permit shall provide an estimated permit value at time of application. Permit valuations shall include total value of work, including materials and labor, for which the permit is being issued, such as mechanical equipment and permanent systems. If, in the opinion of the code official, the valuation is underestimated on the application, the permit shall be denied, unless the applicant can show detailed estimates to meet the approval of the code official. Final building permit valuation shall be set by the code official.

Revise as follows:

~~[A] **106.5.1 107.4 Work commencing before permit issuance.** Any person who commences any work on a mechanical system before obtaining the necessary permits shall be subject to 100 percent of the usual permit fee a fee established by the code official that shall be in addition to the required permit fees.~~

Add new text as follows:

107.5 Related fees. The payment of the fee for the construction, alteration, removal or demolition for work done in connection to or concurrently with the work authorized by a permit shall not relieve the applicant or holder of the permit from the payment of other fees that are prescribed by law.

Delete without substitution:

~~[A] **106.5.3 Fee refunds.** The code official shall authorize the refunding of fees as follows:~~

- ~~1- The full amount of any fee paid hereunder that was erroneously paid or collected.~~
- ~~2- Not more than [SPECIFY PERCENTAGE] percent of the permit fee paid where work has not been done under a permit issued in accordance with this code.~~
- ~~3- Not more than [SPECIFY PERCENTAGE] percent of the plan review fee paid where an application for a permit for which a plan review fee has been paid is withdrawn or canceled before any plan review effort has been expended.~~

The code official shall not authorize the refunding of any fee paid, except upon written application filed by the original permittee not later than 180 days after the date of fee payment.

Add new text as follows:

107.6 Refunds. The code official is authorized to establish a refund policy.

2018 International Plumbing Code

SECTION 107 FEES

Revise as follows:

~~106.6 107.1 Fees. Payment of fees.~~ A permit shall not be issued valid until the fees prescribed in Section 106.6.2 by law have been paid, and an amendment to a permit shall not be released until the additional fee, if any, due to an increase of the plumbing systems, has been paid.

Add new text as follows:

107.2 Schedule of permit fees. Where work requires a permit, a fee for each permit shall be paid as required, in accordance with the schedule as established by the applicable governing authority.

Delete without substitution:

~~106.6.2 Fee schedule.~~ The fees for all plumbing work shall be as indicated in the following schedule:
[JURISDICTION TO INSERT APPROPRIATE SCHEDULE]

Revise as follows:

~~106.6.1 107.4 Work commencing before permit issuance.~~ Any person who commences any work on a plumbing mechanical system before obtaining the necessary permits shall be subject to 100 percent of the usual permit fee established by the code official that shall be in addition to the required permit fees.

Add new text as follows:

107.5 Related fees. The payment of the fee for the construction, alteration, removal or demolition for work done in connection to or concurrently with the work authorized by a permit shall not relieve the applicant or holder of the permit from the payment of other fees that are prescribed by law.

Delete without substitution:

~~106.6.3 Fee refunds.~~ The code official shall authorize the refunding of fees as follows:

- ~~1- The full amount of any fee paid hereunder that was erroneously paid or collected.~~
- ~~2- Not more than [SPECIFY PERCENTAGE] percent of the permit fee paid where work has been done under a permit issued in accordance with this code.~~
- ~~3- Not more than [SPECIFY PERCENTAGE] percent of the plan review fee paid where an application for a permit for which a plan review fee has been paid is withdrawn or canceled before any plan review effort has been expended.~~

The code official shall not authorize the refunding of any fee paid except upon written application filed by the original permittee not later than 180 days after the date of fee payment.

Add new text as follows:

107.6 Refunds. The code official is authorized to establish a refund policy.

2018 International Property Maintenance Code

SECTION 104 FEES

Revise as follows:

[A] ~~103.5 104.1 Fees.~~ The fees for activities and services performed by the department in carrying out its responsibilities under this code shall be as indicated in the following schedule. [JURISDICTION TO INSERT APPROPRIATE SCHEDULE.] established by the applicable governing authority.

Add new text as follows:

104.2 Refunds. The code official is authorized to establish a refund policy.

2018 International Fuel Gas Code

SECTION 107 FEES

Revise as follows:

[A] ~~106.6~~ 107.1 Fees- Payment of fees. A permit shall not be issued valid until the fees prescribed in Section ~~106.6.2~~ by law have been paid, ~~nor shall an An~~ amendment to a permit shall not be released until the additional fee, if any, ~~due to an increase of the installation,~~ has been paid.

Add new text as follows:

107.2 Schedule of permit fees. Where work requires a permit, a fee for each permit shall be paid as required, in accordance with the schedule as established by the applicable governing authority.

Delete without substitution:

[A] ~~106.6.2 Fee schedule.~~ The fees for work shall be as indicated in the following schedule:
[JURISDICTION TO INSERT APPROPRIATE SCHEDULE]

Add new text as follows:

107.3 Permit valuations. The applicant for a permit shall provide an estimated permit value at time of application. Permit valuations shall include total value of work, including materials and labor, for which the permit is being issued, such as plumbing equipment and permanent systems. If, in the opinion of the code official, the valuation is underestimated on the application, the permit shall be denied, unless the applicant can show detailed estimates to meet the approval of the code official. Final building permit valuation shall be set by the code official.

Revise as follows:

[A] ~~106.6.1~~ 107.4 Work commencing before permit issuance. Any person who commences any work on ~~an installation a~~ a mechanical system before obtaining the necessary permits shall be subject to ~~100 percent of the usual permit fee~~ a fee established by the code official that shall be in addition to the required permit fees.

Add new text as follows:

107.5 Related fees. The payment of the fee for the construction, alteration, removal or demolition for work done in connection to or concurrently with the work authorized by a permit shall not relieve the applicant or holder of the permit from the payment of other fees that are prescribed by law.

Delete without substitution:

[A] ~~106.6.3 Fee refunds.~~ The code official shall authorize the refunding of fees as follows:

- ~~1- The full amount of any fee paid hereunder that was erroneously paid or collected.~~
- ~~2- Not more than [SPECIFY PERCENTAGE] percent of the permit fee paid where work has not been done under a permit issued in accordance with this code.~~
- ~~3- Not more than [SPECIFY PERCENTAGE] percent of the plan review fee paid where an application for a permit for which a plan review fee has been paid is withdrawn or canceled before any plan review effort has been expended.~~

~~The code official shall not authorize the refunding of any fee paid, except upon written application filed by the original permittee not later than 180 days after the date of fee payment.~~

Add new text as follows:

107.6 Refunds. The code official is authorized to establish a refund policy.

2018 International Swimming Pool and Spa Code

SECTION 106 FEES

Revise as follows:

[A] ~~105.6~~ 106.1 Fees- Payment of fees. A permit shall not be valid until the fees prescribed by law have been paid. An amendment to a permit shall not be released until the additional fee, if any, has been paid.

Delete without substitution:

~~[A] 105.6.2 Fee schedule.~~ The fees for work shall be as indicated in the following schedule:
~~[JURISDICTION TO INSERT APPROPRIATE SCHEDULE]~~

Add new text as follows:

106.2 Schedule of permit fees. Where work requires a permit, a fee for each permit shall be paid as required, in accordance with the schedule as established by the applicable governing authority.

106.3 Permit valuations. The applicant for a permit shall provide an estimated permit value at time of application. Permit valuations shall include total value of work, including materials and labor, for which the permit is being issued, such as mechanical equipment and permanent systems. If, in the opinion of the code official, the valuation is underestimated on the application, the permit shall be denied, unless the applicant can show detailed estimates to meet the approval of the code official. Final building permit valuation shall be set by the code official.

Revise as follows:

~~[A] 105.6.1 106.4 Work commencing before permit issuance.~~ Any person who commences any work on a mechanical system before obtaining the necessary permits shall be subject to a fee ~~as indicated in the adopted fee schedule and would~~ established by the code official that shall be in addition to the required permit fees.

Add new text as follows:

106.5 Related fees. The payment of the fee for the construction, alteration, removal or demolition for work done in connection to or concurrently with the work authorized by a permit shall not relieve the applicant or holder of the permit from the payment of other fees that are prescribed by law.

Delete without substitution:

~~[A] 105.6.3 Fee refunds.~~ The code official shall authorize the refunding of fees as follows:

- ~~1- The full amount of any fee paid hereunder that was erroneously paid or collected.~~
- ~~2- Not more than [SPECIFY PERCENTAGE] percent of the permit fee paid when no work has been done under a permit issued in accordance with this code.~~
- ~~3- Not more than [SPECIFY PERCENTAGE] percent of the plan review fee paid when an application for a permit for which a plan review fee has been paid is withdrawn or canceled before any plan review effort has been expended.~~

~~The code official shall not authorize the refunding of any fee paid except upon written application filed by the original permittee not later than 180 days after the date of fee payment.~~

Add new text as follows:

106.6 Refunds. The code official is authorized to establish a refund policy.

Reason: There are two different proposals to address consistency in the Fees section – the end result would be coordination between all codes. The IPC, IMC, IPSDC, IFGC and ISPSC include sections on Fees in the permit section. Each requires the insertion of a table for fees and sets a policy for refunds. If the jurisdiction is on a code for 3 to 6 years, this would prohibit them from adjusting their fees. What the policy is for refunds should also be determined by the department. The current text does not address permit valuations or related fees.

The BCAC is working from the philosophy that ICC is a family of codes, so administrative requirements should be consistent across books. Most administrative and enforcement matters are the same for any code. Those matters unique for a specific code remain unchanged. This is one of a series of proposals being submitted relating to technical, editorial and organizational changes proposed for the Administrative chapters (Chapter 1) in all of the I-Codes.

While the Administrative Committee will consider each proposal independently, the proposals in this package are a correlated set of companion code change proposals.”

The following is the template utilized to create this code change proposal. There may be some differences depending on the unique applications of each code – such as “building/fire/code official”.

IMC

SECTION 107FEES

~~[A] 107.1 Payment of Fees.~~ A permit shall not be valid until the fees prescribed by law have been paid: An amendment to a permit shall not be released until the additional fee, if any, has been paid.

~~[A] 107.2 Schedule of permit fees.~~ Where work requires a *permit*, a fee for each *permit* shall be paid as required, in accordance with the schedule as established by the applicable governing authority.

[A] 107.3 Permit valuations. The applicant for a *permit* shall provide an estimated *permit* value at time of application. *Permit* valuations shall include total value of work, including materials and labor, for which the *permit* is being issued, such as mechanical equipment and permanent systems. If, in the opinion of the *code official*, the valuation is underestimated on the application, the *permit* shall be denied, unless the applicant can show detailed estimates to meet the approval of the *code official*. Final building *permit* valuation shall be set by the *code official*.

[A] 107.4 Work commencing before permit issuance. Any person who commences any work on a mechanical system before obtaining the necessary permits shall be subject to a fee established by the *code official* that shall be in addition to the required permit fees.

[A] 107.5 Related fees. The payment of the fee for the construction, *alteration*, removal or demolition for work done in connection to or concurrently with the work authorized by a *permit* shall not relieve the applicant or holder of the *permit* from the payment of other fees that are prescribed by law.

[A] 107.6 Refunds. The *code official* is authorized to establish a refund policy.

This proposal is submitted by the ICC Plumbing/Mechanical/Gas Code Action Committee (PMG CAC). The PMG CAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance the International Codes or portions thereof that were under the purview of the PMG CAC. In 2017-2018, the PMG CAC held one face-to-face meeting and 11 conference call meetings. Numerous interested parties attended the committee meetings and offered their input. Related documentation and reports are posted on the PMGCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/pmg-code-action-committee-pmgcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is an editorial change that provides consistency between I-codes.

Proposal # 4055

ADM27-19

ADM28-19

IBC®: SECTION 107; IFC®: SECTION 106, [A] 105.4, [A] 105.4.1, [A] 105.4.1.1, [A] 105.4.2, [A] 105.4.2.1, [A] 105.4.3, [A] 105.4.4, [A] 105.4.4.1, [A] 105.4.5, [A] 105.4.6; IPC®: SECTION 107, 106.3.1, 106.5.6; IMC®: SECTION 107, [A] 106.3.1, [A] 106.4.6; IFGC®: SECTION 107, [A] 106.3.1, [A] 106.5.6; ISPSC®: SECTION 106, [A] 105.3, [A] 105.5.6; IPSDC®: SECTION 107, [A] 106.2.1, [A] 106.3.6; IWUIC®: SECTION 108

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Michael O'Brian, representing FCAC (fcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgac@iccsafe.org)

2018 International Building Code

Revise as follows:

SECTION 107 SUBMITTAL-CONSTRUCTION DOCUMENTS

2018 International Fire Code

SECTION 106 CONSTRUCTION DOCUMENTS

Delete without substitution:

~~[A] 105.4 Construction documents. Construction documents shall be in accordance with Sections 105.4.1 through 105.4.6.~~

Revise as follows:

[A] ~~105.4.1~~ **106.1 Submittals.** *Construction documents* and supporting data shall be submitted in two or more sets with each application for a permit and in such form and detail as required by the *fire code official*. The *construction documents* shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

Exception: The *fire code official* is authorized to waive the submission of *construction documents* and supporting data not required to be prepared by a registered design professional if it is found that the nature of the work applied for is such that review of *construction documents* is not necessary to obtain compliance with this code.

[A] ~~105.4.1.1~~ **106.2 Examination of documents.** The *fire code official* shall examine or cause to be examined the accompanying *construction documents* and shall ascertain by such examinations whether the work indicated and described is in accordance with the requirements of this code.

[A] ~~105.4.2~~ **106.2.1 Information on construction documents.** *Construction documents* shall be drawn to scale on suitable material. Electronic media documents are allowed to be submitted where *approved* by the *fire code official*. *Construction documents* shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that it will conform to the provisions of this code and relevant laws, ordinances, rules and regulations as determined by the *fire code official*.

[A] ~~105.4.2.1~~ **106.2.2 Fire protection system shop drawings.** Shop drawings for the fire protection system(s) shall be submitted to indicate compliance with this code and the *construction documents*, and shall be *approved* prior to the start of installation. Shop drawings shall contain all information as required by the referenced installation standards in Chapter 9.

[A] ~~105.4.3~~ **106.2.3 Applicant responsibility.** It shall be the responsibility of the applicant to ensure that the *construction documents* include all of the fire protection requirements and the shop drawings are complete and in compliance with the applicable codes and standards.

[A] ~~105.4.4~~ **106.2.4 Approved documents.** *Construction documents approved* by the *fire code official* are approved with the intent that such *construction documents* comply in all respects with this code. Review and approval by the *fire code official* shall not relieve the applicant of the responsibility of compliance with this code.

[A] ~~105.4.4.1~~ **106.2.4.1 Phased approval.** The *fire code official* is authorized to issue a permit for the construction of part of a structure, system or operation before the *construction documents* for the whole structure, system or operation have been submitted, provided that adequate information and detailed statements have been filed complying with pertinent requirements of this code. The holder of such permit for parts of a structure, system or operation shall proceed at the holder's own risk with the building operation and without assurance that a permit for the entire structure, system or operation will be granted.

[A] ~~105.4.5~~ **106.3 Amended construction documents.** Work shall be installed in accordance with the *approved construction documents*, and any changes made during construction that are not in compliance with the *approved construction documents* shall be resubmitted for approval as an amended set of *construction documents*.

[A] ~~105.4.6~~ **106.4 Retention of construction documents.** One set of *construction documents* shall be retained by the *fire code official* for a period

of not less than 180 days from date of completion of the permitted work, or as required by state or local laws. One set of *approved construction documents* shall be returned to the applicant, and said set shall be kept on the site of the building or work at all times during which the work authorized thereby is in progress.

2018 International Plumbing Code

SECTION 107 CONSTRUCTION DOCUMENTS

~~106.3.1~~ **107.1 Construction documents.** Construction documents, engineering calculations, diagrams and other such data shall be submitted in two or more sets with each application for a permit. The code official shall require construction documents, computations and specifications to be prepared and designed by a registered design professional where required by state law. Construction documents shall be drawn to scale and shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that the work conforms to the provisions of this code. Construction documents for buildings more than two stories in height shall indicate where penetrations will be made for pipes, fittings and components and shall indicate the materials and methods for maintaining required structural safety, fire-resistance rating and fireblocking.

Exception: The code official shall have the authority to waive the submission of construction documents, calculations or other data if the nature of the work applied for is such that reviewing of construction documents is not necessary to determine compliance with this code.

~~106.5.6~~ **107.2 Retention of construction documents.** One set of *approved construction documents* shall be retained by the code official for a period of not less than 180 days from date of completion of the permitted work, or as required by state or local laws. One set of *approved construction documents* shall be returned to the applicant, and said set shall be kept on the site of the building or work at all times during which the work authorized thereby is in progress.

2018 International Mechanical Code

SECTION 107 CONSTRUCTION DOCUMENTS

[A] ~~106.3.1~~ **107.1 Construction documents.** *Construction documents*, engineering calculations, diagrams and other data shall be submitted in two or more sets with each application for a permit. The code official shall require *construction documents*, computations and specifications to be prepared and designed by a *registered design professional* where required by state law. Where special conditions exist, the code official is authorized to require additional *construction documents* to be prepared by a *registered design professional*. *Construction documents* shall be drawn to scale and shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that the work conforms to the provisions of this code. *Construction documents* for buildings more than two stories in height shall indicate where penetrations will be made for mechanical systems, and the materials and methods for maintaining required structural safety, fire-resistance rating and fireblocking.

Exception: The code official shall have the authority to waive the submission of *construction documents*, calculations or other data if the nature of the work applied for is such that reviewing of *construction documents* is not necessary to determine compliance with this code.

[A] ~~106.4.6~~ **107.2 Retention of construction documents.** One set of *approved construction documents* shall be retained by the code official for a period of not less than 180 days from date of completion of the permitted work, or as required by state or local laws. One set of *approved construction documents* shall be returned to the applicant, and said set shall be kept on the site of the building or job at all times during which the work authorized thereby is in progress.

2018 International Fuel Gas Code

SECTION 107 CONSTRUCTION DOCUMENTS

[A] ~~106.3.1~~ **107.1 Construction documents.** *Construction documents*, engineering calculations, diagrams and other data shall be submitted in two or more sets with each application for a permit. The code official shall require *construction documents*, computations and specifications to be prepared and designed by a registered design professional where required by state law. *Construction documents* shall be drawn to scale and shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that the work conforms to the provisions of this code. *Construction documents* for buildings more than two stories in height shall indicate where penetrations will be made for installations and shall indicate the materials and methods for maintaining required structural safety, fire-resistance rating and fireblocking.

Exception: The code official shall have the authority to waive the submission of *construction documents*, calculations or other data if the nature of the work applied for is such that reviewing of *construction documents* is not necessary to determine compliance with this code.

[A] ~~106.5.6~~ **107.2 Retention of construction documents.** One set of *approved construction documents* shall be retained by the code official for a period of not less than 180 days from date of completion of the permitted work, or as required by state or local laws. One set of *approved construction documents* shall be returned to the applicant, and said set shall be kept on the site of the building or work at all times during which the

work authorized thereby is in progress.

2018 International Swimming Pool and Spa Code

SECTION 106 **CONSTRUCTION DOCUMENTS**

[A] ~~105.3~~ **106.1 Construction documents.** Construction documents, engineering calculations, diagrams and other such data shall be submitted in two or more sets with each application for a permit. The code official shall require construction documents, computations and specifications to be prepared and designed by a registered design professional where required by state law. Construction documents shall be drawn to scale and shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that the work conforms to the provisions of this code.

[A] ~~105.5.6~~ **106.2 Retention of construction documents.** One set of *approved* construction documents shall be retained by the code official for a period of not less than 180 days from date of completion of the permitted work, or as required by state or local laws. One set of *approved* construction documents shall be returned to the applicant, and said set shall be kept on the site of the building or work at all times during which the work authorized thereby is in progress.

2018 International Private Sewage Disposal Code

SECTION 107 **CONSTRUCTION DOCUMENTS**

[A] ~~106.2.1~~ **107.1 Construction documents.** An application for a permit shall be accompanied by not less than two copies of construction documents drawn to scale, with sufficient clarity and detail dimensions showing the nature and character of the work to be performed. Specifications shall include pumps and controls, dose volume, elevation differences (vertical lift), pipe friction loss, pump performance curve, pump model and pump manufacturer. The code official is permitted to waive the requirements for filing construction documents where the work involved is of a minor nature. Where the quality of the materials is essential for conformity to this code, specific information shall be given to establish such quality, and this code shall not be cited, or the term "legal" or its equivalent used as a substitute for specific information.

[A] ~~106.3.6~~ **107.2 Retention of construction documents.** One set of approved construction documents shall be retained by the code official for a period of not less than 180 days from date of completion of the permitted work, or as required by state or local laws. One set of approved construction documents shall be returned to the applicant, and said set shall be kept on the site of the building or work at all times during which the work authorized thereby is in progress.

2018 International Wildland-Urban Interface Code

SECTION 108 **PLANS AND SPECIFICATIONS CONSTRUCTION DOCUMENTS**

Reason: The intent of this proposal is to move requirements for construction documents into its own section so that requirements can be consistently found in the codes.

The BCAC is working from the philosophy that ICC is a family of codes, so administrative requirements should be consistent across books. Most administrative and enforcement matters are the same for any code. Those matters unique for a specific code remain unchanged. This is one of a series of proposals being submitted relating to technical, editorial and organizational changes proposed for the Administrative chapters (Chapter 1) in all of the I-Codes.

While the Administrative Committee will consider each proposal independently, the proposals in this package are a correlated set of companion code change proposals."

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is an editorial change only.

Proposal # 4076

ADM28-19

ADM29-19

IBC®: [A] 107.2.4; IEBC®: [A] 106.2.4

Proponent: John Woestman, representing Extruded Polystyrene Foam Association (jwoestman@kellenccompany.com)

2018 International Building Code

Revise as follows:

[A] 107.2.4 Exterior wall envelope. *Construction documents* for all buildings shall describe the *exterior wall envelope* in sufficient detail to determine compliance with this code. The *construction documents* shall provide details of the *exterior wall envelope* as required, including flashing, intersections with dissimilar materials, corners, end details, control joints, intersections at roof, eaves or parapets, means of drainage, water-resistive ~~membrane barrier~~ and details around openings.

The *construction documents* shall include manufacturer's installation instructions that provide supporting documentation that the proposed penetration and opening details described in the *construction documents* maintain the weather resistance of the *exterior wall envelope*. The supporting documentation shall fully describe the *exterior wall system* that was tested, where applicable, as well as the test procedure used.

2018 International Existing Building Code

[A] 106.2.4 Exterior wall envelope. Construction documents for work affecting the exterior wall envelope shall describe the exterior wall envelope in sufficient detail to determine compliance with this code. The construction documents shall provide details of the exterior wall envelope as required, including windows, doors, flashing, intersections with dissimilar materials, corners, end details, control joints, intersections at roof, eaves or parapets, means of drainage, water-resistive ~~membrane barrier~~, and details around openings.

The construction documents shall include manufacturer's installation instructions that provide supporting documentation that the proposed penetration and opening details described in the construction documents maintain the wind and weather resistance of the exterior wall envelope. The supporting documentation shall fully describe the exterior wall system that was tested, where applicable, as well as the test procedure used.

Reason: Corrects inappropriate reference of water-resistive **membrane** and uses a term defined in the IBC and IRC (water-resistive barrier) and which is not exclusive of any type of WRB which may be a membrane, panel, etc.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This is a correction that uses a defined term to provide clarification of the requirements. No cost implications anticipated.

Proposal # 5238

ADM29-19

ADM30-19

IBC®: [A] 107.2.5; IEBC®: [A] 106.2.5

Proponent: Rebecca Baker, Jefferson County CO, representing the Colorado Chapter ICC (bbaker@co.jefferson.co.us)

2018 International Building Code

Revise as follows:

[A] 107.2.5 **Exterior balconies and elevated walking surfaces.** Where balconies or other elevated walking surfaces ~~are exposed to water from direct or blowing rain, snow, or irrigation~~ have *weather-exposed surfaces*, and the structural framing is protected by an impervious moisture barrier, the *construction documents* shall include details for all elements of the impervious moisture barrier system. The *construction documents* shall include manufacturer's installation instructions.

2018 International Existing Building Code

[A] 106.2.5 **Exterior balconies and elevated walking surfaces.** Where the scope of work involves balconies or other elevated walking surfaces ~~exposed to water from direct or blowing rain, snow or irrigation~~ have *weather-exposed surfaces*, and the structural framing is protected by an impervious moisture barrier, the construction documents shall include details for all elements of the impervious moisture barrier system. The construction documents shall include manufacturer's installation instructions.

Reason: The term irrigation was added to the 2018 and goes beyond the previous editions of the code. To verify compliance, landscape irrigation plans would need to become part of the construction documents. The proposed language uses a defined term which will increase consistency and satisfy the intent.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal will improve consistency in the application of the code.

Proposal # 4458

ADM30-19

ADM31-19 Part I

PART I — IPC®: SECTION 108, 107.5, 107.5.1; IMC®: SECTION 108, [A] 107.4, [A] 107.4.1; IFGC®: SECTION 108, [A] 107.4, [A] 107.4.1; ISPSC®: SECTION 107, [A] 106.17, [A] 106.17.1; IPSDC®: SECTION 108, [A] 107.7, [A] 107.7.1

PART II — IECC: SECTION C106 (New), C105.7, C105.7.1

PART III — IECC: SECTION R106, R105.7, R105.7.1

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

THIS IS A 3 PART CODE CHANGE. PART I WILL BE HEARD BY THE ADMINISTRATIVE CODE COMMITTEE. PART II WILL BE HEARD BY THE IECC-COMMERCIAL CODE COMMITTEE. PART III WILL BE HEARD BY THE IECC-RESIDENTIAL CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Plumbing Code

Add new text as follows:

SECTION 108 NOTICE OF APPROVAL

Revise as follows:

~~107.5.1~~ **108.1 Approval.** After the prescribed tests and inspections indicate that the work complies in all respects with this code, a notice of approval shall be issued by the code official.

~~107.5.1~~ **108.2 Revocation.** The code official is authorized to, in writing, suspend or revoke a notice of approval issued under the provisions of this code wherever the notice is issued in error, or on the basis of incorrect information supplied, or where it is determined that the building or structure, premise or portion thereof is in violation of any ordinance or regulation or any of the provisions of this code.

2018 International Mechanical Code

Add new text as follows:

SECTION 108 NOTICE OF APPROVAL

Revise as follows:

[A] ~~107.4~~ **108.1 Approval.** After the prescribed tests and inspections indicate that the work complies in all respects with this code, a notice of approval shall be issued by the code official.

[A] ~~107.4.1~~ **108.2 Revocation.** The code official is authorized to, in writing, suspend or revoke a notice of approval issued under the provisions of this code wherever the notice is issued in error, on the basis of incorrect information supplied, or where it is determined that the building or structure, premise or portion thereof is in violation of any ordinance or regulation or any of the provisions of this code.

2018 International Fuel Gas Code

Add new text as follows:

SECTION 108 NOTICE OF APPROVAL

Revise as follows:

[A] ~~107.4~~ **108.1 Approval.** After the prescribed tests and inspections indicate that the work complies in all respects with this code, a notice of approval shall be issued by the code official.

[A] ~~107.4.1~~ **108.2 Revocation.** The code official is authorized to, in writing, suspend or revoke a notice of approval issued under the provisions of this code wherever the notice is issued in error, or on the basis of incorrect information supplied or where it is determined that the building or structure, premise, or portion thereof is in violation of any ordinance or regulation or any of the provisions of this code.

2018 International Swimming Pool and Spa Code

Add new text as follows:

SECTION 107
NOTICE OF APPROVAL

Revise as follows:

[A] ~~106.17.1~~ **107.1 Approval.** After the prescribed tests and inspections indicate that the work complies in all respects with this code, a notice of approval shall be issued by the code official.

[A] ~~106.17.1~~ **107.2 Revocation.** The code official is authorized to, in writing, suspend or revoke a notice of approval issued under the provisions of this code wherever the notice is issued in error, or on the basis of the incorrect information supplied, or where it is determined that the building or structure, premise, system or portion thereof is in violation of any ordinance or regulation or any of the provisions of this code.

2018 International Private Sewage Disposal Code

Add new text as follows:

SECTION 108
NOTICE OF APPROVAL

Revise as follows:

[A] ~~107.7~~ **108.1 Approval.** After the prescribed inspections indicate that the work complies in all respects with this code, a notice of approval shall be issued by the code official.

[A] ~~107.7.1~~ **108.2 Revocation.** The code official is authorized to, in writing, suspend or revoke a notice of approval issued under the provisions of this code wherever the notice is issued in error, on the basis of incorrect information supplied, or where it is determined that the building or structure, premise or portion thereof is in violation of any ordinance or regulation or any of the provisions of this code.

Proposal # 4073

ADM31-19 Part I

ADM31-19 Part II

IECC: SECTION C106 (New), C105.7, C105.7.1

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

2018 International Energy Conservation Code

Add new text as follows:

SECTION C106 NOTICE OF APPROVAL

Revise as follows:

~~C105.7~~ **C106.1 Approval.** After the prescribed tests and inspections indicate that the work complies in all respects with this code, a notice of approval shall be issued by the *code official*.

~~C105.7.1~~ **C106.2 Revocation.** The *code official* is authorized to suspend or revoke, in writing, a notice of approval issued under the provisions of this code wherever the certificate is issued in error, or on the basis of incorrect information supplied, or where it is determined that the *building* or structure, premise, or portion thereof is in violation of any ordinance or regulation or any of the provisions of this code.

Proposal # 5739

ADM31-19 Part II

ADM31-19 Part III

IECC: SECTION R106, R105.7, R105.7.1

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

2018 International Energy Conservation Code

Add new text as follows:

SECTION R106 NOTICE OF APPROVAL

Revise as follows:

~~R105.7.1~~ R106.1 Approval. After the prescribed tests and inspections indicate that the work complies in all respects with this code, a notice of approval shall be issued by the *code official*.

~~R105.7.1~~ R106.2 Revocation. The *code official* is authorized to, in writing, suspend or revoke a notice of approval issued under the provisions of this code wherever the certificate is issued in error, or on the basis of incorrect information supplied, or where it is determined that the *building* or structure, premise, or portion thereof is in violation of any ordinance or regulation or any of the provisions of this code.

Reason: Several of the codes have requirements for a Notice of Approval. This should be in its own section similar to Certificate of Occupancy in the IBC, IRC and IEBC, so it can be readily located.

The BCAC is working from the philosophy that ICC is a family of codes, so administrative requirements should be consistent across books. Most administrative and enforcement matters are the same for any code. Those matters unique for a specific code remain unchanged. This is one of a series of proposals being submitted relating to technical, editorial and organizational changes proposed for the Administrative chapters (Chapter 1) in all of the I-Codes.

While the Administrative Committee will consider each proposal independently, the proposals in this package are a correlated set of companion code change proposals.”

This proposal is submitted by the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC) and the ICC Plumbing/Mechanical/Gas Code Action Committee (PMG CAC).

The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>.

The PMGCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance the International Codes or portions thereof that were under the purview of the PMGCAC. In 2017-2018, the PMGCAC held one face-to-face meeting and 11 conference call meetings. Numerous interested parties attended the committee meetings and offered their input. Related documentation and reports are posted on the PMGCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/pmg-code-action-committee-pmgcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is an editorial change.

Proposal # 5740

ADM31-19 Part III

ADM32-19 Part I

PART I — IBC®: SECTION 108, [A] 108.1, [A] 108.2, [A] 108.3, [A] 108.4; IPC®: SECTION 110, 110.1, 110.2, 110.3, 110.4; IMC®: SECTION 110, [A] 110.1, [A] 110.2, [A] 110.3, [A] 110.4; IFGC®: SECTION 110 (IFGC), [A] 110.1, [A] 110.2, [A] 110.3, [A] 110.4; IEBC®: SECTION 107, [A] 107.1, [A] 107.2, [A] 107.3, [A] 107.4; IPSC®: SECTION 110, [A] 110.1, [A] 110.2, [A] 110.3, [A] 110.4; IWUIC®: SECTION 112, [A] 112.1, [A] 112.2, 112.3, [A] 112.3; ISPC®: SECTION 106, 106.1, 106.2, 106.3, 106.4

PART II — IRC®: SECTION R107, R107.1, R107.2, R107.3, R107.4

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Michael O'Brian, FCAC, representing FCAC (fcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgac@iccsafe.org)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE ADMINISTRATIVE CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-BUILDING CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEES.

2018 International Building Code

Revise as follows:

SECTION 108 TEMPORARY USES, EQUIPMENT AND STRUCTURES ~~AND USES~~

[A] 108.1 **General.** The *building official* is authorized to issue a permit for temporary ~~structures and temporary uses,~~ structures, uses, equipment or systems. Such *permits* shall be limited as to time of service, but shall not be permitted for more than 180 days. The *building official* is authorized to grant extensions for demonstrated cause.

[A] 108.2 **Conformance.** Temporary ~~structures uses and uses shall~~ structures shall comply with the requirements in Section 3103.

[A] 108.3 **Temporary power.** The *building official* is authorized to give permission to temporarily supply ~~and use power in part of an electric installation before such installation~~ utilities, sources of energy, fuel, power, water systems or sewer systems before an installation has been fully completed and the final certificate of completion approval has been issued. The part covered by the temporary ~~certificate approval~~ shall comply with the requirements specified for temporary lighting, heat or power in ~~NFPA 70: this code.~~

[A] 108.4 **Termination of approval.** The *building official* is authorized to terminate such permit for a temporary ~~structure uses equipment, or use system~~ and to order the ~~temporary structure or use same~~ to be discontinued.

2018 International Plumbing Code

SECTION 110 TEMPORARY USES, EQUIPMENT, AND SYSTEMS ~~AND USES~~

110.1 **General.** The code official is authorized to issue a permit for temporary uses, equipment, systems and uses, ~~or systems.~~ Such permits shall be limited as to time of service, but shall not be permitted for more than 180 days. The code official is authorized to grant extensions for demonstrated cause.

110.2 **Conformance.** Temporary uses, equipment, and systems ~~and uses~~ shall conform to the structural strength, fire safety, means of egress, accessibility, light, ventilation and sanitary requirements of this code as necessary to ensure the ~~public~~ health, safety and general welfare.

110.3 **Temporary utilities.** The code official is authorized to give permission to temporarily supply utilities, sources of energy, fuel, power, water systems or sewer systems before an installation has been fully completed and the final ~~certificate of completion approval~~ has been issued. The part covered by the temporary ~~certificate approval~~ shall comply with the requirements specified for temporary lighting, heat or power in ~~the~~ this code.

110.4 **Termination of approval.** The code official is authorized to terminate such permit for temporary uses equipment, systems or uses ~~system~~ and to order the ~~temporary equipment, systems or uses same~~ to be discontinued.

2018 International Mechanical Code

SECTION 110 TEMPORARY USES, EQUIPMENT, AND SYSTEMS ~~AND USES~~

[A] 110.1 **General.** The code official is authorized to issue a permit for temporary uses, equipment, systems and uses, ~~or systems.~~ Such permits shall be limited as to time of service, but shall not be permitted for more than 180 days. The code official is authorized to grant extensions for demonstrated cause.

[A] 110.2 **Conformance.** Temporary uses, equipment, and systems ~~and uses~~ shall conform to the structural strength, fire safety, means of egress,

accessibility, light, ventilation and sanitary requirements of this code as necessary to ensure the public health, safety and general welfare.

[A] 110.3 Temporary utilities. The code official is authorized to give permission to temporarily supply utilities, sources of energy, fuel, power, water systems or sewer systems before an installation has been fully completed and the final ~~certificate of completion approval~~ has been issued. The part covered by the temporary ~~certificate approval~~ shall comply with the requirements specified for temporary lighting, heat or power in ~~the~~ this code.

[A] 110.4 Termination of approval. The code official is authorized to terminate such permit for temporary uses, equipment, systems or uses system and to order the ~~temporary equipment, systems or uses same~~ to be discontinued.

2018 International Fuel Gas Code

SECTION 110 (IFGC) TEMPORARY USES, EQUIPMENT, AND SYSTEMS ~~AND USES~~

[A] 110.1 General. The code official is authorized to issue a permit for temporary uses, equipment, systems and uses or systems. Such permits shall be limited as to time of service, but shall not be permitted for more than 180 days. The code official is authorized to grant extensions for demonstrated cause.

[A] 110.2 Conformance. Temporary uses, equipment, and systems and uses shall conform to the structural strength, fire safety, means of egress, accessibility, light, ventilation and sanitary requirements of this code as necessary to ensure the public health, safety and general welfare.

[A] 110.3 Temporary utilities. The code official is authorized to give permission to temporarily supply utilities, sources of energy, fuel, power, water systems or sewer systems before an installation has been fully completed and the final ~~certificate of completion approval~~ has been issued. The part covered by the temporary ~~certificate approval~~ shall comply with the requirements specified for temporary lighting, heat or power in ~~the~~ this code.

[A] 110.4 Termination of approval. The code official is authorized to terminate such permit for ~~a temporary structure uses equipment, or use system~~ and to order the ~~temporary structure or use same~~ to be discontinued.

2018 International Existing Building Code

SECTION 107 TEMPORARY STRUCTURES AND USES ~~USES, EQUIPMENT, AND SYSTEMS~~

[A] 107.1 General. The code official is authorized to issue a permit for temporary uses, equipment, or systems. Such permits shall be limited as to time of service, but shall not be permitted for more than 180 days. The code official is authorized to grant extensions for demonstrated cause.

[A] 107.2 Conformance. Temporary uses, equipment, and systems shall conform to the structural strength, fire safety, means of egress, accessibility, light, ventilation and sanitary requirements of this code as necessary to ensure the public health, safety and general welfare.

[A] 107.3 Temporary power. The code official is authorized to give permission to temporarily supply ~~and use power in part of an electric installation before such installation~~ utilities, sources of energy, fuel, power, water systems or sewer systems before an installation has been fully completed and the final ~~certificate of completion approval~~ has been issued. The part covered by the temporary ~~certificate approval~~ shall comply with the requirements specified for temporary lighting, heat or power in ~~NFPA 70; this code~~.

[A] 107.4 Termination of approval. The code official is authorized to terminate such permit for ~~a temporary use uses equipment, or system~~ and to order the ~~temporary use same~~ to be discontinued.

2018 International Private Sewage Disposal Code

SECTION 110 TEMPORARY USES, EQUIPMENT, AND SYSTEMS ~~AND USES~~

[A] 110.1 General. The code official is authorized to issue a permit for temporary uses, equipment, systems and uses or systems. Such permits shall be limited as to time of service, but shall not be permitted for more than 180 days. The code official is authorized to grant extensions for demonstrated cause.

[A] 110.2 Conformance. Temporary uses, equipment, and systems and uses shall conform to the structural strength, fire safety, means of egress, accessibility, light, ventilation and sanitary requirements of this code as necessary to ensure the public health, safety and general welfare.

[A] 110.3 Temporary utilities. The code official is authorized to give permission to temporarily supply utilities, sources of energy, fuel, power, water systems or sewer systems before an installation has been fully completed and the final ~~certificate of completion approval~~ has been issued. The part covered by the temporary ~~certificate approval~~ shall comply with the requirements specified for temporary lighting, heat or power in ~~the~~ this code.

[A] 110.4 Termination of approval. The code official is authorized to terminate such permit for ~~a temporary structure uses equipment, or use system~~ and to order the ~~temporary structure or use same~~ to be discontinued.

2018 International Wildland-Urban Interface Code

SECTION 112

TEMPORARY STRUCTURES AND USES, EQUIPMENT, AND SYSTEMS

[A] 112.1 General. The code official is authorized to issue a permit for temporary ~~structures and temporary uses~~ uses, equipment, or systems. Such permits shall be limited as to time of service, but shall not be permitted for more than 180 days. The code official is authorized to grant extensions for demonstrated cause.

[A] 112.2 Conformance. Temporary ~~structures and uses~~ equipment, and systems shall conform to the structural strength, fire safety, means of egress, accessibility, light, ventilation and sanitary requirements of this code as necessary to ensure the ~~public~~ health, safety and general welfare.

112.3 Temporary utilities. The code official is authorized to give permission to temporarily supply utilities, sources of energy, fuel, power, water systems or sewer systems before an installation has been fully completed and the final approval has been issued. The part covered by the temporary approval shall comply with the requirements specified for temporary lighting, heat or power in this code.

[A] ~~112.3~~ 112.4 Termination of approval. The code official is authorized to terminate such permit for a temporary ~~structure~~ uses equipment, or use system and to order the ~~temporary structure or use~~ same to be discontinued.

2018 International Swimming Pool and Spa Code

SECTION 106

TEMPORARY USES, EQUIPMENT, AND SYSTEMS

106.1 General. The code official is authorized to issue a permit for temporary uses, equipment, or systems. Such permits shall be limited as to time of service, but shall not be permitted for more than 180 days. The code official is authorized to grant extensions for demonstrated cause.

106.2 Conformance. Temporary uses, equipment, and systems shall conform to the structural strength, fire safety, means of egress, accessibility, light, ventilation and sanitary requirements of this code as necessary to ensure the health, safety and general welfare.

106.3 Temporary utilities. The code official is authorized to give permission to temporarily supply utilities, sources of energy, fuel, power, water systems or sewer systems before an installation has been fully completed and the final approval has been issued. The part covered by the temporary approval shall comply with the requirements specified for temporary lighting, heat or power in this code.

106.4 Termination of approval. The code official is authorized to terminate such permit for temporary uses equipment, or system and to order the same to be discontinued.

Proposal # 4058

ADM32-19 Part I

ADM32-19 Part II

IRC@: SECTION R107, R107.1, R107.2, R107.3, R107.4

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Michael O'Brian, FCAC, representing FCAC (fcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

SECTION R107 TEMPORARY STRUCTURES-USES, EQUIPMENT AND USES STRUCTURES

R107.1 General. The *building official* is authorized to issue a permit for temporary ~~structures and temporary uses~~ uses, equipment, or systems. Such *permits* shall be limited as to time of service, but shall not be permitted for more than 180 days. The *building official* is authorized to grant extensions for demonstrated cause.

R107.2 Conformance. Temporary ~~structures and uses shall~~ uses, structures, equipment or systems shall conform to the structural strength, fire safety, means of egress, accessibility, light, ventilation and sanitary requirements of this code as necessary to ensure ~~the public~~ the health, safety and general welfare.

R107.3 Temporary power. The building official is authorized to give permission to temporarily supply ~~and use power in part of an electric installation before such installation~~ utilities, sources of energy, fuel, power, water systems or sewer systems before an installation has been fully completed and the final ~~certificate of completion approval~~ approval has been issued. The part covered by the temporary ~~certificate approval~~ approval shall comply with the requirements specified for temporary lighting, heat or power in ~~NFPA 70: this code~~.

R107.4 Termination of approval. The building official is authorized to terminate such permit for ~~a temporary structure uses equipment, or use system~~ and to order the ~~temporary structure or use~~ same to be discontinued.

Reason:

The purpose of this proposal is coordination between codes for the section on temporary structures. The word use is moved to the front. The allowances for temporary connection under inspection and testing address more than just utilities, so the language in this section should match.

The phrase "certificate of completion" is not defined, so "approved" would be a better choice.

The BCAC is working from the philosophy that ICC is a family of codes, so administrative requirements should be consistent across books. Most administrative and enforcement matters are the same for any code. Those matters unique for a specific code remain unchanged. This is one of a series of proposals being submitted relating to technical, editorial and organizational changes proposed for the Administrative chapters (Chapter 1) in all of the I-Codes.

While the Administrative Committee will consider each proposal independently, the proposals in this package are a correlated set of companion code change proposals."

The following is the template utilized to create this code change proposal. There may be some differences depending on the unique applications of each code – such as "building/fire/code official".

IBC

SECTION 108

TEMPORARY USES, EQUIPMENT, AND SYSTEMS

[A] 108.1 General. The building official is authorized to issue a permit for temporary uses, equipment, or systems. Such permits shall be limited as to time of service, but shall not be permitted for more than 180 days. The building official is authorized to grant extensions for demonstrated cause.

[A] 108.2 Conformance. Temporary uses, equipment, and systems shall conform to the structural strength, fire safety, means of egress, accessibility, light, ventilation and sanitary requirements of this code as necessary to ensure the health, safety and general welfare.

[A] 108.3 Temporary utilities. The building official is authorized to give permission to temporarily supply utilities, sources of energy, fuel, power, water systems or sewer systems before an installation has been fully completed and the final approval has been issued. The part covered by the temporary approval shall comply with the requirements specified for temporary lighting, heat or power in this code.

[A] 108.4 Termination of approval. The building official is authorized to terminate such permit for temporary uses equipment, or system and to order

the same to be discontinued.

This proposal is submitted by the ICC Building Code Action Committee (BCAC), the ICC Fire Code Action Committee (FCAC), the ICC Sustainable and the ICC Plumbing/Mechanical/Gas Code Action Committee (PMG CAC).

BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/building-code-actioncommittee-bcac/>.

The FCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes with regard to fire safety and hazardous materials in new and existing buildings and facilities and the protection of life and property in wildland urban interface areas. In 2018 the Fire-CAC has held 3 open meetings. In addition, there were numerous conference calls, Regional Work Group and Task Group meetings for the current code development cycle, which included members of the committees as well as any interested parties, to discuss and debate the proposed changes. Related documentation and reports are posted on the FCAC website at: <https://www.iccsafe.org/codes-tech-support/cs/fire-code-action-committee-fcac/>

The PMG CAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance the International Codes or portions thereof that were under the purview of the PMG CAC. In 2017-2018, the PMG CAC held one face-to-face meeting and 11 conference call meetings. Numerous interested parties attended the committee meetings and offered their input. Related documentation and reports are posted on the PMGCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/pmg-code-action-committee-pmgcac/>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is an editorial change that provides consistency between I-codes.

Proposal # 5796

ADM32-19 Part II

ADM33-19 Part I

PART I — IBC®: SECTION 109, [A] 109.1, [A] 109.2, [A] 109.3, [A] 109.4, [A] 109.5, [A] 109.6; IFC®: SECTION 106, [A] 106.1, [A] 106.2, 106.3 (New), [A] 106.3, [A] 106.4, [A] 106.5; IEBC®: SECTION 108, [A] 108.1, [A] 108.2, [A] 108.3, [A] 108.4, [A] 108.5, [A] 108.6; IWUIC®: SECTION 109, [A] 109.1, [A] 109.2, 109.3, [A] 109.3, [A] 109.4, [A] 109.5; IZC®: SECTION 111, [A] 111.1, 111.2

PART II — IECC: SECTION C104, C104.1, C104.2, C104.3, C104.4, C104.5

PART III — IECC: SECTION R104, R104.1, R104.2, R104.3, R104.4, R104.5

PART IV — IGCC®: 107 (New), 107.1 (New), 107.2 (New), 107.3 (New), 107.4 (New), 107.5 (New), 107.6 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Michael O'Brian, representing FCAC (fcac@iccsafe.org)

THIS IS A 4 PART CODE CHANGE. PART I WILL BE HEARD BY THE ADMINISTRATIVE CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-BUILDING CODE COMMITTEE. PART III WILL BE HEARD BY THE IECC-COMMERCIAL CODE COMMITTEE. PART IV WILL BE HEARD BY THE IGCC CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Building Code

Revise as follows:

SECTION 109 FEES

[A] 109.1 Payment of fees. A *permit* shall not be valid until the fees prescribed by law have been paid, nor shall an amendment to a *permit* be released until the additional fee, if any, has been paid.

[A] 109.2 Schedule of permit fees. ~~On buildings, structures, electrical, gas, mechanical, and plumbing systems or alterations requiring~~ Where a *permit* is required, a fee for each *permit* shall be paid as required, in accordance with the schedule as established by the applicable governing authority.

[A] 109.3 ~~Building permit~~ Permit valuations. The applicant for a *permit* shall provide an estimated *permit* value at time of application. *Permit* valuations shall include total value of work, including materials and labor, for which the *permit* is being issued, such as electrical, gas, mechanical, plumbing equipment and permanent systems. If, in the opinion of the *building official*, the valuation is underestimated on the application, the *permit* shall be denied, unless the applicant can show detailed estimates to meet the approval of the *building official*. Final building *permit* valuation shall be set by the *building official*.

[A] 109.4 Work commencing before permit issuance. Any person who commences any ~~work on a building, structure, electrical, gas, mechanical or plumbing system before work before~~ obtaining the necessary *permits* shall be subject to a fee established by the *building official* that shall be in addition to the required *permit* fees.

[A] 109.5 Related fees. The payment of the fee for the construction, *alteration*, removal or demolition for work done in connection to or concurrently with the work authorized by a building *permit* shall not relieve the applicant or holder of the *permit* from the payment of other fees that are prescribed by law.

[A] 109.6 Refunds. The *building official* is authorized to establish a refund policy.

2018 International Fire Code

SECTION 106 FEES

[A] 106.1 Fees. A permit shall not be issued until the fees have been paid, nor shall an amendment to a permit be released until the additional fee, if any, has been paid.

[A] 106.2 Schedule of permit fees. ~~A~~ Where a *permit* is required, a fee for each permit shall be paid as required, in accordance with the schedule as established by the applicable governing authority.

Add new text as follows:

106.3 Permit valuations. The applicant for a *permit* shall provide an estimated *permit* value at time of application. *Permit* valuations shall include total value of work, including materials and labor, for which the *permit* is being issued, such as electrical, gas, mechanical, plumbing equipment and permanent systems. If, in the opinion of the *building official*, the valuation is underestimated on the application, the *permit* shall be denied, unless the applicant can show detailed estimates to meet the approval of the *building official*. Final building *permit* valuation shall be set by the *building official*.

Revise as follows:

[A] ~~106.3~~ **106.4 Work commencing before permit issuance.** A person who commences any work, activity or operation regulated by this code before obtaining the necessary permits shall be subject to ~~an additional a~~ fee established by the applicable governing authority, which shall be in addition to the required permit fees.

[A] ~~106.4~~ **106.5 Related fees.** The payment of the fee for the construction, *alteration*, removal or demolition of work done in connection to or concurrently with the work or activity authorized by a permit shall not relieve the applicant or holder of the permit from the payment of other fees that are prescribed by law.

[A] ~~106.5~~ **106.6 Refunds.** The applicable governing authority is authorized to establish a refund policy.

2018 International Existing Building Code

SECTION 108 FEES

[A] **108.1 Payment of fees.** A permit shall not be valid until the fees prescribed by law have been paid. ~~Not paid nor~~ shall an amendment to a permit be released until the additional fee, if any, has been paid.

[A] **108.2 Schedule of permit fees.** ~~On buildings, electrical, gas, mechanical, and plumbing systems or alterations requiring~~ Where a permit is required, a fee for each permit shall be paid as required in accordance with the schedule as established by the applicable governing authority.

[A] ~~108.3 Building permit~~ **Permit valuations.** The applicant for a permit shall provide an estimated permit value at time of application. Permit valuations shall include total value of work including materials and labor for which the permit is being issued, such as electrical, gas, mechanical, plumbing equipment, and permanent systems. If, in the opinion of the *code official*, the valuation is underestimated on the application, the permit shall be denied unless the applicant can show detailed estimates to meet the approval of the *code official*. Final building permit valuation shall be set by the *code official*.

[A] **108.4 Work commencing before permit issuance.** Any person who commences any work before obtaining the necessary permits shall be subject to ~~an additional a~~ fee established by the *code official* that shall be in addition to the required permit fees.

[A] **108.5 Related fees.** The payment of the fee for the construction, *alteration*, removal, or demolition of work done in connection to or concurrently with the work authorized by ~~a building a~~ permit shall not relieve the applicant or holder of the permit from the payment of other fees that are prescribed by law.

[A] **108.6 Refunds.** The *code official* is authorized to establish a refund policy.

2018 International Wildland-Urban Interface Code

SECTION 109 FEES

[A] ~~109.1 Fees-~~ **Payment of fees.** A permit shall not be issued until the fees prescribed ~~in Section 109.2 by law~~ have been paid, nor shall an amendment to a permit be released until the additional fee, if any, has been paid

[A] **109.2 Schedule of permit fees.** ~~A~~ Where a permit is required, a fee for each permit shall be paid as required, in accordance with the schedule as established by the applicable governing authority.

109.3 Permit valuations. The applicant for a permit shall provide an estimated permit value at time of application. Permit valuations shall include total value of work, including materials and labor, for which the permit is being issued. If, in the opinion of the applicable governing authority, the valuation is underestimated on the application, the permit shall be denied, unless the applicant can show detailed estimates to meet the approval of the applicable governing authority. Final building permit valuation shall be set by the applicable governing authority.

[A] ~~109.3~~ **109.4 Work commencing before permit issuance.** Any person who commences any work before obtaining the necessary permits shall be subject to ~~an additional a~~ fee established by the applicable governing authority, which shall be in addition to the required permit fees.

[A] ~~109.4~~ **109.5 Related fees.** The payment of the fee for the construction, *alteration*, removal or demolition of work done in connection to or concurrently with the work or activity authorized by a permit shall not relieve the applicant or holder of the permit from the payment of other fees that are prescribed by law.

[A] ~~109.5~~ **109.6 Refunds.** The applicable governing authority is authorized to establish a refund policy.

2018 International Zoning Code

SECTION 111 FEES

[A] 111.1 Fees. A fee for services shall be charged. Fees shall be set by the jurisdiction and schedules shall be available at the office of the code official.

111.2 Refunds. The code official is authorized to establish a refund policy.

Proposal # 4056

ADM33-19 Part I

ADM33-19 Part II

IECC: SECTION C104, C104.1, C104.2, C104.3, C104.4, C104.5

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Michael O'Brian, representing FCAC (fcac@iccsafe.org)

2018 International Energy Conservation Code

Revise as follows:

SECTION C104 FEES

C104.1 Fees- Payment of fees. A permit shall not be ~~issued valid~~ until the fees prescribed in ~~Section C104.2 by law~~ have been paid, nor shall an amendment to a permit be released until the additional fee, if any, has been paid.

C104.2 Schedule of permit fees. ~~A Where a permit is required, a~~ fee for each permit shall be paid as required, in accordance with the schedule as established by the applicable governing authority.

C104.3 Permit valuations. The applicant for a permit shall provide an estimated permit value at time of application. Permit valuations shall include total value of work, including materials and labor, for which the permit is being issued. If, in the opinion of the code official, the valuation is underestimated on the application, the permit shall be denied, unless the applicant can show detailed estimates to meet the approval of the code official. Final building permit valuation shall be set by the code official.

~~C104.3 C104.4~~ **Work commencing before permit issuance.** Any person who commences any work before obtaining the necessary permits shall be subject to ~~an additional a~~ fee established by the *code official* that shall be in addition to the required permit fees.

~~C104.4 C104.5~~ **Related fees.** The payment of the fee for the construction, *alteration*, removal or demolition of work done in connection to or concurrently with the work or activity authorized by a permit shall not relieve the applicant or holder of the permit from the payment of other fees that are prescribed by law.

~~C104.5 C104.6~~ **Refunds.** The *code official* is authorized to establish a refund policy.

Proposal # 5722

ADM33-19 Part II

ADM33-19 Part III

IECC: SECTION R104, R104.1, R104.2, R104.3, R104.4, R104.5

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Michael O'Brian, representing FCAC (fcac@iccsafe.org)

2018 International Energy Conservation Code

Revise as follows:

SECTION R104 FEES

R104.1 Fees- Payment of fees. A permit shall not be issued until the fees prescribed in ~~Section R104.2 by law~~ have been paid, ~~nor paid~~. Nor shall an amendment to a permit be released until the additional fee, if any, has been paid.

R104.2 Schedule of permit fees. ~~A Where a permit is required, a~~ fee for each permit shall be paid as required, in accordance with the schedule as established by the applicable governing authority.

R104.3 Permit valuations. The applicant for a permit shall provide an estimated permit value at time of application. Permit valuations shall include total value of work, including materials and labor, for which the permit is being issued. If, in the opinion of the code official, the valuation is underestimated on the application, the permit shall be denied, unless the applicant can show detailed estimates to meet the approval of the code official. Final building permit valuation shall be set by the code official.

R104.3 R104.4 Work commencing before permit issuance. Any person who commences any work before obtaining the necessary permits shall be subject to ~~an additional a~~ fee established by the *code official* that shall be in addition to the required permit fees.

R104.4 R104.5 Related fees. The payment of the fee for the construction, *alteration*, removal or demolition of work done in connection to or concurrently with the work or activity authorized by a permit shall not relieve the applicant or holder of the permit from the payment of other fees that are prescribed by law.

R104.5 R104.6 Refunds. The *code official* is authorized to establish a refund policy.

Proposal # 5723

ADM33-19 Part III

ADM33-19 Part IV

IGCC@: 107 (New), 107.1 (New), 107.2 (New), 107.3 (New), 107.4 (New), 107.5 (New), 107.6 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Michael O'Brian, representing FCAC (fcac@iccsafe.org)

2018 International Green Construction Code

Add new text as follows:

107 FEES

107.1 Payment of fees A permit shall not be valid until the fees prescribed by law have been paid, nor shall an amendment to a permit be released until the additional fee, if any, has been paid.

107.2 Schedule of permit fees Where a permit is required, a fee for each permit shall be paid as required, in accordance with the schedule as established by the applicable governing authority.

107.3 Permit valuations The applicant for a permit shall provide an estimated permit value at time of application. Permit valuations shall include total value of work, including materials and labor, for which the permit is being issued, such as electrical, gas, mechanical, plumbing equipment and permanent systems. If, in the opinion of the building official, the valuation is underestimated on the application, the permit shall be denied, unless the applicant can show detailed estimates to meet the approval of the building official. Final building permit valuation shall be set by the building official.

107.4 Work commencing before permit issuance Any person who commences any work before obtaining the necessary permits shall be subject to a fee established by the building official that shall be in addition to the required permit fees.

107.5 Related fees The payment of the fee for the construction, alteration, removal or demolition for work done in connection to or concurrently with the work authorized by a permit shall not relieve the applicant or holder of the permit from the payment of other fees that are prescribed by law.

107.6 Refunds The building official is authorized to establish a refund policy.

Reason: There are two different proposals to address consistency in the Fees section – the end result would be coordination between all codes. The intent is consistency in language for 'Fees' within the codes – IBC, IFC, IEBC, IWUIC, IZC, Energy – Commercial and Residential.

- Payment of fees – consistent title, always two sentences
- Schedule of permit fees – IBC currently also includes “structures”, while IFC and IEBC also includes “alterations”. IWUIC and Energy do not include anything. Eliminate the laundry list and make all codes consistent.
- Permit valuation: added valuation to IWUIC and Energy; permits can be for other than just buildings
- Work commencing before permit issuance – remove redundant language
- Refunds – no change
- The IZC currently has a section on fees that is very limited. It was not clear what should be added other than a section on refunds.

The BCAC is working from the philosophy that ICC is a family of codes, so administrative requirements should be consistent across books. Most administrative and enforcement matters are the same for any code. Those matters unique for a specific code remain unchanged. This is one of a series of proposals being submitted relating to technical, editorial and organizational changes proposed for the Administrative chapters (Chapter 1) in all of the I-Codes.

While the Administrative Committee will consider each proposal independently, the proposals in this package are a correlated set of companion code change proposals.”

The following is the template utilized to create this code change proposal. There may be some differences depending on the unique applications of each code – such as “building/fire/code official”.

IBC

SECTION 109FEES

[A] 109.1 Payment of fees. *A permit shall not be valid until the fees prescribed by law have been paid. Nor shall an amendment to a permit be released until the additional fee, if any, has been paid.*

[A] 109.2 Schedule of permit fees. *Where a permit is required, a fee for each permit shall be paid as required, in accordance with the schedule as established by the applicable governing authority.*

[A] 109.3 Permit valuations. The applicant for a *permit* shall provide an estimated *permit* value at time of application. *Permit* valuations shall include total value of work, including materials and labor, for which the *permit* is being issued, such as electrical, gas, mechanical, plumbing equipment and permanent systems. If, in the opinion of the *building official*, the valuation is underestimated on the application, the *permit* shall be denied, unless the applicant can show detailed estimates to meet the approval of the *building official*. Final building *permit* valuation shall be set by the *building official*.

[A] 109.4 Work commencing before permit issuance. Any person who commences any work before obtaining the necessary *permits* shall be subject to a fee established by the *building official* that shall be in addition to the required *permit* fees.

[A] 109.5 Related fees. The payment of the fee for the construction, *alteration*, removal or demolition for work done in connection to or concurrently with the work authorized by a *permit* shall not relieve the applicant or holder of the *permit* from the payment of other fees that are prescribed by law.

[A] 109.6 Refunds. The *building official* is authorized to establish a refund policy.

This proposal is submitted by the ICC Building Code Action Committee (BCAC), the ICC Fire Code Action Committee (FCAC), the ICC Sustainable and Energy and High Performance Code Action Committee (SEHPCAC).

BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

The FCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes with regard to fire safety and hazardous materials in new and existing buildings and facilities and the protection of life and property in wildland urban interface areas. In 2018 the Fire-CAC has held 3 open meetings. In addition, there were numerous conference calls, Regional Work Group and Task Group meetings for the current code development cycle, which included members of the committees as well as any interested parties, to discuss and debate the proposed changes. Related documentation and reports are posted on the FCAC website at: <https://www.iccsafe.org/codes-tech-support/cs/fire-code-action-committee-fcac/>

The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is an editorial change that provides consistency between I-codes.

Proposal # 5724

ADM33-19 Part IV

ADM34-19

IEBC@: 109.3.10 (New)

Proponent: Gregory Wilson, representing Federal Emergency Management Agency (gregory.wilson2@fema.dhs.gov); Rebecca Quinn, RCQuinn Consulting, on behalf of Federal Emergency Management Agency, representing Federal Emergency Management Agency (rcquinn@earthlink.net)

2018 International Existing Building Code

Add new text as follows:

109.3.10 Flood hazard documentation. Where a building is located in a flood hazard area, documentation of the elevation of the lowest floor as required in the *International Building Code* or the *International Residential Code*, as applicable, shall be submitted to the building official prior to the final inspection.

Reason: Submission of elevation documentation prior to the final inspection is required in both the IBC (Section 110.3.11.1) and IRC (Section R109.1.6.1). When a determination is made that work constitutes substantial improvement or that damage is substantial damage, buildings must be brought into compliance with the flood resistant construction requirements of IBC Section 1612 or IRC Section R322, as applicable. As with new construction, communities must require as-built elevation documentation, usually submitted on FEMA Elevation Certificates. Elevation Certificates with surveyed as-built elevations are required when property owners get flood insurance from the National Flood Insurance Program.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The requirement is administrative, to submit documentation which is already required by communities that participate in the NFIP.

Proposal # 4450

ADM34-19

ADM35-19

IBC®: 110.3.5 (New)

Proponent: Stephen DiGiovanni, representing ICC Ad Hoc Committee on Tall Wood Buildings (TWB) (TWB@iccsafe.org)

2018 International Building Code

Add new text as follows:

110.3.5 Type IV-A, IV-B, and IV-C connection protection inspection. In buildings of Type IV-A, IV-B, and IV-C Construction, where connection fire resistance ratings are provided by wood cover calculated to meet the requirements of Section 2304.10.1, inspection of the wood cover shall be made after the cover is installed, but before any other coverings or finishes are installed.

Reason: The TWB determined that the proper construction of the fire resistance rating of mass timber structural elements was important enough, as demonstrated in a series of TWB proposals including this one, to warrant a specific requirement to inspect mass timber connections. The proposal complements the other code change submissions (e.g. Chapters, 7 “Fire and Smoke Protection Features”, 17 “Special Inspections and Tests”, and 23 “Wood”), and recognizes that building officials have the ability to inspect the protection of connections as part of the normal permit inspection process (e.g. footing and foundations, slabs, framing, etc.). The TWB, following input by code officials, did not feel this provision warranted being incorporated into Chapter 17 “Special Inspections and Tests” as this field inspection process did not require any special expertise for inspection nor tools for testing that were outside the capabilities of building officials today. However, the TWB did believe that some form of inspection should take place since the connections of the structural members, and their protection to achieve a fire resistance rating, represent a significant component to the entire design of mass timber buildings.

The Ad Hoc Committee for Tall Wood Buildings (AHC-TWB) was created by the ICC Board of Directors to explore the building science of tall wood buildings with the scope to investigate the feasibility of and take action on developing code changes for these buildings. Members of the AHC-TWB were appointed by the ICC Board of Directors. Since its creation in January, 2016, the AHC-TWB has held multiple open meetings and numerous Work Group conference calls. Related documentation and reports of the TWB are posted on the AHC-TWB website at <https://www.iccsafe.org/codes-tech-support/cs/icc-ad-hoc-committee-on-tall-wood-buildings/>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

Since all of the code proposals related to Mass Timber products are to address new types of building construction, in theory this will not increase the cost of construction, but rather provides design options not currently provided for in the code. The committee took great care to not change the requirements of the pre-existing construction types, and our changes do not increase the cost of construction using those pre-existing construction types.

Proposal # 4362

ADM35-19

ADM36-19

IBC®: [A] 110.3.6; IEBC®: [A] 109.3.6

Proponent: Rebecca Baker, Jefferson County CO, representing the Colorado Chapter ICC (bbaker@co.jefferson.co.us)

2018 International Building Code

Revise as follows:

[A] 110.3.6 **Weather-exposed balcony and walking surface waterproofing.** Where balconies or other elevated walking surfaces ~~are exposed to water from direct or blowing rain, snow or irrigation~~ have *weather-exposed surfaces*, and the structural framing is protected by an impervious moisture barrier, all elements of the impervious moisture barrier system shall not be concealed until inspected and *approved*.

Exception: Where *special inspections* are provided in accordance with Section 1705.1.1, Item 3.

2018 International Existing Building Code

[A] 109.3.6 **Weather-exposed balcony and walking surface waterproofing.** Where the scope of work involves balconies or other elevated walking surfaces ~~exposed to water from direct or blowing rain, snow or irrigation~~ have *weather-exposed surface s*, and the structural framing is protected by an impervious moisture barrier, all elements of the impervious moisture barrier system shall not be concealed until inspected and *approved*.

Exception: Where special inspections are provided in accordance with Section 1705.1.1, Item 3, of the International Building Code.

Reason: The term irrigation was added to the 2018 and goes beyond the scope of previous editions of the code. To verify compliance, landscape irrigation plans would need to become part of the construction documents. The proposed language uses a defined term which will increase consistency and satisfy the intent.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal will help standardize the application of the code.

Proposal # 4461

ADM36-19

ADM37-19 Part I

PART I — IBC®: [A] 110.6; IPC®: [A] 107.2.3; IMC®: [A] 107.2.3; IFGC®: [A] 107.2.3; IEBC®: [A] 109.6; ISPSC®: [A] 106.6; IPSDC®: [A] 107.4; IWUIC®: [A] 110.1.2.3; IFC®: [A] 107.2.2

PART II — IRC®: R109.4

Proponent: Robert DeVries, representing Self (rdevries@nuwool.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE ADMINISTRATIVE CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-BUILDING CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEES.

2018 International Building Code

Revise as follows:

[A] 110.6 Approval required. Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the *building official*. The *building official*, upon notification, shall make the requested inspections and shall either indicate the portion of the construction that is satisfactory as completed, or notify the *permit* holder or his or her agent wherein the same fails to comply with this code. The notification shall be in writing and include specific reference to the code chapter and section number(s) in violation. Any portions that do not comply shall be corrected and such portion shall not be covered or concealed until authorized by the *building official*.

2018 International Plumbing Code

[A] 107.2.3 Approval required. Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the code official. The code official, upon notification, shall make the requested inspections and shall either indicate the portion of the construction that is satisfactory as completed, or notify the permit holder or his or her agent wherein the same fails to comply with this code. The notification shall be in writing and include specific reference to the code chapter and section number(s) in violation. Any portions that do not comply shall be corrected and such portion shall not be covered or concealed until authorized by the code official.

2018 International Mechanical Code

[A] 107.2.3 Approval required. Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the code official. The code official, upon notification, shall make the requested inspections and shall either indicate the portion of the construction that is satisfactory as completed, or notify the permit holder or his or her agent wherein the same fails to comply with this code. The notification shall be in writing and include specific reference to the code chapter and section number(s) in violation. Any portions that do not comply shall be corrected and such portion shall not be covered or concealed until authorized by the code official.

2018 International Fuel Gas Code

[A] 107.2.3 Approval required. Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the code official. The code official, upon notification, shall make the requested inspections and shall either indicate the portion of the construction that is satisfactory as completed, or notify the permit holder or his or her agent wherein the same fails to comply with this code. The notification shall be in writing and include specific reference to the code chapter and section number(s) in violation. Any portions that do not comply shall be corrected and such portion shall not be covered or concealed until authorized by the code official.

2018 International Existing Building Code

[A] 109.6 Approval required. Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the *code official*. The *code official*, on notification, shall make the requested inspections and shall either indicate the portion of the construction that is satisfactory as completed or shall notify the permit holder or an agent of the permit holder wherein the same fails to comply with this code. The notification shall be in writing and include specific reference to the code chapter and section number(s) in violation. Any portions that do not comply shall be corrected and such portion shall not be covered or concealed until authorized by the *code official*.

2018 International Swimming Pool and Spa Code

[A] 106.6 Approval required. Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the code official. The code official, upon notification, shall make the requested inspection and shall either indicate the portion of the construction that is satisfactory as completed, or notify the permit holder or his or her agent wherein the same fails to comply with this ~~code~~-code. The notification shall be in writing and include specific reference to the code chapter and section number(s) in violation. Any portions that do not comply shall be corrected and such portion shall not be covered or concealed until authorized by the code official.

2018 International Private Sewage Disposal Code

[A] 107.4 Approval required. Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval

of the code official. The code official, upon notification, shall make the requested inspections and shall either indicate the portion of the construction that is satisfactory as completed, or notify the permit holder or his or her agent wherein the same fails to comply with this code. The notification shall be in writing and include specific reference to the code chapter and section number(s) in violation. Any portions that do not comply shall be corrected and such portion shall not be covered or concealed until authorized by the code official.

2018 International Wildland-Urban Interface Code

Revise as follows:

[A] 110.1.2.3 Approval required. Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the code official. The code official, upon notification, shall make the requested inspections and shall either indicate the portion of the construction that is satisfactory as completed, or notify the permit holder or his or her agent wherein the same fails to comply with this code. The notification shall be in writing and include specific reference to the code chapter and section number(s) in violation. Any portions that do not comply shall be corrected and such portion shall not be covered or concealed until authorized by the code official.

2018 International Fire Code

[A] 107.2.2 Approval required. Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the *fire code official*. The *fire code official*, on notification, shall make the requested inspections and shall either indicate the portion of the construction that is satisfactory as completed, or notify the permit holder or his or her agent wherein the same fails to comply with this code. The notification shall be in writing and include specific reference to the code chapter and section number(s) in violation. Any portions that do not comply shall be corrected, and such portion shall not be covered or concealed until authorized by the *fire code official*.

Proposal # 5004

ADM37-19 Part I

ADM37-19 Part II

IRC@: R109.4

Proponent: Robert DeVries, representing Self (rdevries@nuwool.com)

2018 International Residential Code

Revise as follows:

R109.4 Approval required. Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the *building official*. The *building official*, upon notification, shall make the requested inspections and shall either indicate the portion of the construction that is satisfactory as completed, or shall notify the *permit* holder or an agent of the *permit* holder wherein the same fails to comply with this code. The notification shall include, in writing, specific reference to the code chapter and section number(s) in violation. Any portions that do not comply shall be corrected and such portion shall not be covered or concealed until authorized by the *building official*.

Reason: As written there is no set method of notification. Putting the violation in writing including the chapter and section number(s) would greatly improve the permit holders understanding of the violation. This would reduce the amount of communication and time required to determine the actual violation. Having the chapter and section number(s) would give the permit holder immediate direction as to how to correct the violation.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

While no cost impact was selected an argument could be made that the permit holder may save money by saving time trying to contact the building official.

Proposal # 5772

ADM37-19 Part II

ADM38-19 Part I

PART I — IBC®: SECTION 111 (New), [A] 111.1 (New), [A] 111.2 (New), [A] 111.3 (New), [A] 111.4 (New); IEBC®: SECTION 110 (New), [A] 110.1 (New), [A] 110.2 (New), [A] 110.3 (New), [A] 110.4 (New)

PART II — IRC®: SECTION R110 (New), R110.1 (New), R110.2 (New), R110.3 (New), R110.4 (New), R110.5 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE ADMINISTRATIVE CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-BUILDING CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Building Code

Revise as follows:

SECTION 111 CERTIFICATE OF OCCUPANCY

[A] 111.1 Change of occupancy. A building or structure shall not be used or occupied in whole or in part, and a change of occupancy of a building or structure or portion thereof shall not be made, until the *building official* has issued a certificate of occupancy therefor as provided herein. Issuance of a certificate of occupancy shall not be construed as an approval of a violation of the provisions of this code or of other ordinances of the jurisdiction. Certificates presuming to give authority to violate or cancel the provisions of this code or other ordinances of the jurisdiction shall not be valid.

Exception: Certificates of occupancy are not required for work exempt from *permits* in accordance with Section 105.2.

[A] 111.2 Certificate issued. After the *building official* inspects the building or structure and does not find violations of the provisions of this code or other laws that are enforced by the department of building safety, the *building official* shall issue a certificate of occupancy that contains the following:

1. The ~~building~~ permit number.
2. The address of the structure.
3. The name and address of the *owner* or the owner's authorized agent.
4. A description of that portion of the structure for which the certificate is issued.
5. A statement that the described portion of the structure has been inspected for compliance with the requirements of this code ~~for the occupancy and division of occupancy and the use for which the proposed occupancy is classified.~~
6. The name of the *building official*.
7. The edition of the code under which the *permit* was issued.
8. The use and occupancy, in accordance with the provisions of Chapter 3.
9. The type of construction as defined in Chapter 6.
10. The design *occupant load*.
11. ~~#~~ Where an *automatic sprinkler system* is provided ~~;~~ and whether the sprinkler system is required.
12. Any special stipulations and conditions of the building *permit*.

[A] 111.3 Temporary occupancy. The *building official* is authorized to issue a temporary certificate of occupancy before the completion of the entire work covered by the *permit*, provided that such portion or portions shall be occupied safely. The *building official* shall set a time period during which the temporary certificate of occupancy is valid.

[A] 111.4 Revocation. The *building official* is authorized to, in writing, suspend or revoke a certificate of occupancy or completion issued under the provisions of this code , in writing, wherever the certificate is issued in error, or on the basis of incorrect information supplied, or where it is determined that the building or structure or portion thereof is in violation of ~~any ordinance or regulation or any of the provisions of this code~~ or other ordinance of the jurisdiction.

2018 International Existing Building Code

SECTION 110 CERTIFICATE OF OCCUPANCY

[A] 110.1 Change of occupancy. ~~Altered areas of a building and relocated buildings~~ A structure shall not be used or occupied in whole or in part, and a change of occupancy of a building structure or portion thereof shall not be made until the *code official* has issued a certificate of occupancy therefor as provided herein. Issuance of a certificate of occupancy shall not be construed as an approval of a violation of the provisions of this code or of other ordinances of the jurisdiction. Certificates presuming to give authority to violate or cancel the provisions of this code or other ordinances of the jurisdiction shall not be valid.

Exception: Certificates of occupancy are not required for work exempt from permits in accordance with Section 105.2.

[A] 110.2 Certificate issued. After the *code official* inspects the building structure and does not find violations of the provisions of this code or other laws that are enforced by the ~~Department of Building Safety department~~, the *code official* shall issue a certificate of occupancy that contains the following:

1. The ~~building~~ permit number.
2. The address of the structure.
3. The name and address of the owner or the owner's authorized agent.
4. A description of that portion of the structure for which the certificate is issued.
5. A statement that the described portion of the structure has been inspected for compliance with the requirements of this code for the occupancy and division of occupancy and the use for which the proposed occupancy is classified.
6. The name of the *code official*.
7. The edition of the code under which the permit was issued.
8. The use and occupancy in accordance with the provisions of the International Building Code .
9. The type of construction as defined in the International Building Code .
10. The design occupant load and any impact the *alteration* has on the design occupant load of the area not within the scope of the work.
11. ~~If fire protection systems are provided, whether the fire protection systems are required.~~ Where an automatic sprinkler system is provided, and whether an automatic sprinkler system is required.
12. Any special stipulations and conditions of the building permit.

[A] 110.3 Temporary occupancy. The *code official* is authorized to issue a temporary certificate of occupancy before the completion of the entire work covered by the permit, provided that such portion or portions shall be occupied safely. The *code official* shall set a time period during which the temporary certificate of occupancy is valid.

[A] 110.4 Revocation. The *code official* is authorized ~~to, in writing, to~~ suspend or revoke a certificate of occupancy or completion issued under the provisions of this code , in writing, wherever the certificate is issued in error or on the basis of incorrect information supplied, or where it is determined that the building or structure or portion thereof is in violation of ~~any ordinance or regulation or any~~ of the provisions of this code or other ordinance of the jurisdiction.

Proposal # 4059

ADM38-19 Part I

ADM38-19 Part II

IRC®: SECTION R110 (New), R110.1 (New), R110.2 (New), R110.3 (New), R110.4 (New), R110.5 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

SECTION R110 CERTIFICATE OF OCCUPANCY

R110.1 Use and Change of occupancy. A building or structure shall not be used or occupied in whole or in part, and a *change of occupancy* ~~or change of use~~ of a building or structure or portion thereof shall not be made, until the *building official* has issued a certificate of occupancy therefor as provided herein. Issuance of a certificate of occupancy shall not be construed as an approval of a violation of the provisions of this code or of other ordinances of the *jurisdiction*. Certificates presuming to give authority to violate or cancel the provisions of this code or other ordinances of the *jurisdiction* shall not be valid.

Exceptions:

1. Certificates of occupancy are not required for work exempt from permits under Section R105.2.
2. Accessory buildings or structures.

R110.2 Change in use. Changes in the character or use of an existing structure shall not be made except as specified in Sections 407 and 408 of the International Existing Building Code.

R110.3 Certificate issued. After the *building official* inspects the building or structure and does not find violations of the provisions of this code or other laws that are enforced by the department of ~~building safety~~, the *building official* shall issue a certificate of occupancy containing the following:

1. The ~~building~~ *permit* number.
2. The address of the structure.
3. The name and address of the owner or the owner's authorized agent.
4. A description of that portion of the structure for which the certificate is issued.
5. A statement that the described portion of the structure has been inspected for compliance with the requirements of this code.
6. The name of the *building official*.
7. The edition of the code under which the *permit* was issued.
8. ~~Where~~ an automatic sprinkler system is provided and whether the sprinkler system is required.
9. Any special stipulations and conditions of the building *permit*.

R110.4 Temporary occupancy. The *building official* is authorized to issue a temporary certificate of occupancy before the completion of the entire work covered by the *permit*, provided that such portion or portions shall be occupied safely. The *building official* shall set a time period during which the temporary certificate of occupancy is valid.

R110.5 Revocation. The *building official* ~~shall, in writing, is authorized to~~ suspend or revoke a certificate of occupancy or completion issued under the provisions of this code, in writing, wherever the certificate is issued in error, or on the basis of incorrect information supplied, or where it is determined that the building or structure or portion thereof is in violation of ~~any ordinance or regulation or any of the provisions of this code. the provisions of this code or other ordinance of the jurisdiction.~~

Reason: The intent of this proposal is to coordinate requirements in the Change of Occupancy Section.

The BCAC is working from the philosophy that ICC is a family of codes, so administrative requirements should be consistent across books. Most administrative and enforcement matters are the same for any code. Those matters unique for a specific code remain unchanged. This is one of a series of proposals being submitted relating to technical, editorial and organizational changes proposed for the Administrative chapters (Chapter 1) in all of the I-Codes.

While the Administrative Committee will consider each proposal independently, the proposals in this package are a correlated set of companion code change proposals.”

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is an editorial change that provides consistency between I-codes.

Proposal # 5727

ADM38-19 Part II

ADM39-19 Part I

PART I — IBC®: SECTION 112, [A] 112.1, [A] 112.2, [A] 112.3; IPC®: SECTION 108, 107.7, 107.6, 108.3; IMC®: SECTION 108, [A] 107.6, [A] 107.5, 108.3; IFGC®: SECTION 108, [A] 107.6, [A] 107.5, 108.3; IEBC®: SECTION 111, [A] 111.1, [A] 111.2, [A] 111.3; IPSC®: SECTION 108, [A] 107.9, [A] 107.8, 108.3; IWUC®: SECTION 113, [A] 113.1, 113.2, [A] 113.2; ISPC®: SECTION 107, [A] 106.19, [A] 106.18, 107.3

PART II — IRC®: SECTION R111, R111.1, R111.2, R111.3

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgac@iccsafe.org); Michael O'Brian, representing FCAC (fcac@iccsafe.org)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE ADMINISTRATIVE CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-BUILDING CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEES.

2018 International Building Code

Revise as follows:

SECTION 112 SERVICE UTILITIES

[A] 112.1 Connection of service utilities. A person shall not make connections from a utility, source of energy, fuel, ~~or power~~, water system or sewer system to any building or system that is regulated by this code for which a permit is required, until ~~released~~ approved by the building official.

[A] 112.2 Temporary connection. The building official shall have the authority to authorize the temporary connection of the building or system to the utility, source of energy, fuel, ~~or power~~, water system or power system for the purpose of testing systems or for use under a temporary approval.

[A] 112.3 Authority to disconnect service utilities. The building official shall have the authority to authorize disconnection of utility service to the building, structure or system regulated by this code and the referenced codes and standards ~~set forth in Section 101.4~~ in case of emergency where necessary to eliminate an immediate hazard to life or property or where such utility connection has been made without the approval required by Section 112.1 or 112.2. The building official shall notify the serving utility, and wherever possible the owner or the owner's authorized agent and occupant of the building, structure or service system of the decision to disconnect prior to taking such action. If not notified prior to disconnecting, the owner, the owner's authorized agent or occupant of the building, structure or service system shall be notified in writing, as soon as practical thereafter.

2018 International Plumbing Code

SECTION 108 SERVICE UTILITIES

~~107-7~~ **108.1 Connection of service utilities.** A person shall not make connections from a utility, source of energy, fuel, power, water system or sewer system to any building or system that is regulated by this code for which a permit is required until authorized by the code official.

~~107-6~~ **108.2 Temporary connection.** The code official shall have the authority to authorize the temporary connection of the building or system to the utility, source of energy, fuel, power, water system or power system for the purpose of testing plumbing systems or for use under a temporary certificate of occupancy approval.

108.3 Authority to disconnect service utilities. The code official shall have the authority to authorize disconnection of utility service to the building, structure or system regulated by this code and the referenced codes and standards in case of emergency where necessary to eliminate an immediate hazard to life or property or where such utility connection has been made without the approval required by Section 108.1 or 108.2. The code official shall notify the serving utility, and wherever possible the owner or the owner's authorized agent and occupant of the building, structure or service system of the decision to disconnect prior to taking such action. If not notified prior to disconnecting, the owner, the owner's authorized agent or occupant of the building, structure or service system shall be notified in writing, as soon as practical thereafter.

2018 International Mechanical Code

SECTION 108 SERVICE UTILITIES

[A] ~~107-6~~ 108.1 Connection of service utilities. A person shall not make connections from a utility, source of energy, fuel or power to any building or system that is regulated by this code for which a permit is required, until authorized by the code official.

[A] ~~107-5~~ 108.2 Temporary connection. The code official shall have the authority to authorize the temporary connection of ~~a mechanical~~ the building or system to the ~~sources~~ utility, source of energy, fuel, power, water system or power system for the purpose of testing ~~mechanical~~

systems or for use under a temporary ~~certificate of occupancy~~ approval.

108.3 Authority to disconnect service utilities. The code official shall have the authority to authorize disconnection of utility service to the building, structure or system regulated by this code and the referenced codes and standards in case of emergency where necessary to eliminate an immediate hazard to life or property or where such utility connection has been made without the approval required by Section 108.1 or 108.2. The code official shall notify the serving utility, and wherever possible the owner or the owner's authorized agent and occupant of the building, structure or service system of the decision to disconnect prior to taking such action. If not notified prior to disconnecting, the owner, the owner's authorized agent or occupant of the building, structure or service system shall be notified in writing, as soon as practical thereafter.

2018 International Fuel Gas Code

SECTION 108 **SERVICE UTILITIES**

[A] ~~107-6~~ 108.1 Connection of service utilities. A person shall not make connections from a utility, source of energy, fuel or power to any building or system that is regulated by this code for which a permit is required until authorized by the code official.

[A] ~~107-5~~ 108.2 Temporary connection. The code official shall have the authority to ~~allow~~ authorize the temporary connection of ~~an installation the building or system to the sources~~ utility, source of energy, fuel, power, water system or power system for the purpose of testing ~~the installation systems~~ or for use under a temporary ~~certificate of occupancy~~ approval.

108.3 Authority to disconnect service utilities. The code official shall have the authority to authorize disconnection of utility service to the building, structure or system regulated by this code and the referenced codes and standards in case of emergency where necessary to eliminate an immediate hazard to life or property or where such utility connection has been made without the approval required by Section 108.1 or 108.2. The code official shall notify the serving utility, and wherever possible the owner or the owner's authorized agent and occupant of the building, structure or service system of the decision to disconnect prior to taking such action. If not notified prior to disconnecting, the owner, the owner's authorized agent or occupant of the building, structure or service system shall be notified in writing, as soon as practical thereafter.

2018 International Existing Building Code

SECTION 111 **SERVICE UTILITIES**

[A] 111.1 Connection of service utilities. A person shall not make connections from a utility, source of energy, fuel, ~~or~~ power, water system or sewer system to any building or system that is regulated by this code for which a permit is required, until *approved* by the *code official*.

[A] 111.2 Temporary connection. The *code official* shall shall have the authority to authorize the temporary connection of the building or system to the utility, source of energy, fuel, ~~or~~ power water system or power system for the purpose of testing systems or for use under a temporary approval.

[A] 111.3 Authority to disconnect service utilities. The *code official* shall have the authority to authorize disconnection of utility service to the building, structure or system regulated by this code and the referenced codes and standards in case of emergency where necessary to eliminate an immediate hazard to life or property or where such utility connection has been made without the approval required by Section 111.1 or 111.2. The *code official* shall notify the serving utility and, wherever possible, the owner or the owner's authorized agent and the occupant of the building, structure or service system of the decision to disconnect prior to taking such action. If not notified prior to disconnecting, the owner, the owner's authorized agent or occupant of the building, structure or service system shall be notified in writing, as soon as practical thereafter.

2018 International Private Sewage Disposal Code

SECTION 108 **SERVICE UTILITIES**

[A] ~~107-9~~ 108.1 Connection of service utilities. No person shall make connections from a utility, source of energy, fuel or power to any building or system that is regulated by this code for which a permit is required until authorized by the code official.

[A] ~~107-8~~ 108.2 Temporary connection. The code official shall have the authority to ~~allow~~ authorize the temporary connection of ~~an installation the building or system to the sources~~ utility, source of energy, fuel, power, water system or power system for the purpose of testing ~~the installation systems~~ or for use under a temporary ~~certificate of occupancy~~ approval.

108.3 Authority to disconnect service utilities. The code official shall have the authority to authorize disconnection of utility service to the building, structure or system regulated by this code and the referenced codes and standards in case of emergency where necessary to eliminate an immediate hazard to life or property or where such utility connection has been made without the approval required by Section 108.1 or 108.2. The code official shall notify the serving utility, and wherever possible the owner or the owner's authorized agent and occupant of the building, structure

or service system of the decision to disconnect prior to taking such action. If not notified prior to disconnecting, the owner, the owner's authorized agent or occupant of the building, structure or service system shall be notified in writing, as soon as practical thereafter.

2018 International Wildland-Urban Interface Code

SECTION 113 SERVICE UTILITIES

[A] 113.1 Connection of service utilities. Any person shall not make connections from a utility, source of energy, fuel, ~~or power,~~ to water system or sewer system to any building or system that is regulated by this code for which a permit is required until ~~released~~ approved by the code official.

113.2 Temporary connection. The code official shall have the authority to authorize the temporary connection of the building or system to the utility, source of energy, fuel, power, water system or power system for the purpose of testing systems or for use under a temporary approval.

[A] ~~113.2~~ 113.3 Authority to disconnect service utilities. The code official shall have the authority to authorize disconnection of utility service to the building, structure or system regulated by this code and the referenced codes and ~~standards set forth in Section 102.4 in standards~~ in case of emergency where necessary to eliminate an immediate hazard to life or property or where such utility connection has been made without the release approval required by Section ~~113.1~~ 113.1 and 113.2. The code official shall notify the serving utility and, where possible, the owner or the owner's authorized agent and the occupant of the building, structure or service system of the decision to disconnect prior to taking such action. If not notified prior to disconnection, the owner, the owner's authorized agent or the occupant of the building, structure or service system shall be notified in writing as soon as practical thereafter.

2018 International Swimming Pool and Spa Code

SECTION 107 SERVICE UTILITIES

[A] ~~106.19~~ 107.1 Connection of service utilities. A person shall not make connections from a utility, source of energy, fuel, power, water system or sewer system to any building or system that is regulated by this code for which a permit is required until authorized by the code official.

[A] ~~106.18~~ 107.2 Temporary connection. The code official shall have the authority to authorize the temporary connection of the building or system to the utility, source of energy, fuel, power, water system or power system for the purpose of testing systems or for use under a temporary approval.

107.3 Authority to disconnect service utilities. The code official shall have the authority to authorize disconnection of utility service to the building, structure or system regulated by this code and the referenced codes and standards in case of emergency where necessary to eliminate an immediate hazard to life or property or where such utility connection has been made without the approval required by Section 107.1 or 107.2. The code official shall notify the serving utility, and wherever possible the owner or the owner's authorized agent and occupant of the building, structure or service system of the decision to disconnect prior to taking such action. If not notified prior to disconnecting, the owner, the owner's authorized agent or occupant of the building, structure or service system shall be notified in writing, as soon as practical thereafter.

Proposal # 4075

ADM39-19 Part I

ADM39-19 Part II

IRC@: SECTION R111, R111.1, R111.2, R111.3

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgcac@iccsafe.org); Michael O'Brian, representing FCAC (fcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

SECTION R111 SERVICE UTILITIES

R111.1 Connection of service utilities. A person shall not make connections from a utility, source of energy, fuel, or power, water system or sewer system to any building or system that is regulated by this code for which a permit is required, until approved by the building official.

R111.2 Temporary connection. The building official shall have the authority to authorize the temporary connection of the building or system to the utility, source of energy, fuel or power, water system or power system for the purpose of testing systems or for use under a temporary approval.

R111.3 Authority to disconnect service utilities. The *building official* shall have the authority to authorize disconnection of utility service to the building, structure or system regulated by this code and the referenced codes and standards ~~set forth in Section R102.4 in~~ in case of emergency where necessary to eliminate an immediate hazard to life or property or where such utility connection has been made without the approval required by Section R111.1 or R111.2. The *building official* shall notify the serving utility and where possible the owner or the owner's authorized agent and occupant of the building, structure or service system of the decision to disconnect prior to taking such action. If not notified prior to disconnection, the owner, the owner's authorized agent or occupant of the building, structure or service system shall be notified in writing as soon as practical thereafter.

Reason: The main purpose of this proposal is coordination between codes for the section on connection to services – including those coming from utilities or generated on-site. Revisions for the section on temporary services is addressed in a separate proposal.

Some of the codes had service utility requirements as part of the inspection section. For consistency across codes, it is proposed to move this to a separate section. Codes have references to codes and standards throughout the document, so a reference back to the list at the beginning of Chapter 1 is not inclusive (IBC, IRC, IWUIC). The list should include all the systems – not all codes included water and sewer systems – so it is proposed to be added as it is currently in the IPC. The authority to disconnect is an important safety feature that needs to be included in all the codes that deal with service utilities. It is proposed to be added to the codes that do not include that provision.

The BCAC is working from the philosophy that ICC is a family of codes, so administrative requirements should be consistent across books. Most administrative and enforcement matters are the same for any code. Those matters unique for a specific code remain unchanged. This is one of a series of proposals being submitted relating to technical, editorial and organizational changes proposed for the Administrative chapters (Chapter 1) in all of the I-Codes.

While the Administrative Committee will consider each proposal independently, the proposals in this package are a correlated set of companion code change proposals.”

The following is the template utilized to create this code change proposal. There may be some differences depending on the unique applications of each code – such as “building/fire/code official”.

IBC

SECTION 112

SERVICE UTILITIES

[A] 112.1 Connection of service utilities. A person shall not make connections from a utility, source of energy, fuel, power, water system or sewer system to any building or system that is regulated by this code for which a *permit* is required, until approved by the *building official*.

[A] 112.2 Temporary connection. The *building official* shall have the authority to authorize the temporary connection of the building or system to the utility, source of energy, fuel, power, water system or power system for the purpose of testing systems or for use under a temporary approval.

[A] 112.3 Authority to disconnect service utilities. The *building official* shall have the authority to authorize disconnection of utility service to the building, structure or system regulated by this code and the referenced codes and standards in case of emergency where necessary to eliminate an immediate hazard to life or property or where such utility connection has been made without the approval required by Section 112.1 or 112.2. The *building official* shall notify the serving utility, and wherever possible the *owner* or the owner's authorized agent and occupant of the building,

structure or service system of the decision to disconnect prior to taking such action. If not notified prior to disconnecting, the *owner*, the owner's authorized agent or occupant of the building, structure or service system shall be notified in writing, as soon as practical thereafter.

This proposal is submitted by the ICC Building Code Action Committee (BCAC), the ICC Fire Code Action Committee (FCAC) and the ICC Plumbing/Mechanical/Gas Code Action Committee (PMG CAC).

BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/building-code-actioncommittee-bcac>.

The FCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes with regard to fire safety and hazardous materials in new and existing buildings and facilities and the protection of life and property in wildland urban interface areas. In 2018 the Fire-CAC has held 3 open meetings. In addition, there were numerous conference calls, Regional Work Group and Task Group meetings for the current code development cycle, which included members of the committees as well as any interested parties, to discuss and debate the proposed changes. Related documentation and reports are posted on the FCAC website at: <https://www.iccsafe.org/codes-tech-support/cs/fire-code-action-committee-fcac/>

The PMGCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance the International Codes or portions thereof that were under the purview of the PMG CAC. In 2017-2018, the PMG CAC held one face-to-face meeting and 11 conference call meetings. Numerous interested parties attended the committee meetings and offered their input. Related documentation and reports are posted on the PMGCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/pmg-code-action-committee-pmgcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is an editorial change that provides consistency between I-codes.

Proposal # 5801

ADM39-19 Part II

ADM40-19 Part I

PART I — IBC®: SECTION 113, [A] 113.1, [A] 113.2, [A] 113.3, 113.4 (New); IEBC®: SECTION 112, [A] 112.1, [A] 112.2, [A] 112.3, 113.4 (New); IFC®: SECTION 109, [A] 109.1, [A] 109.2, [A] 109.3, 109.4 (New); IWUIC®: SECTION 106, [A] 106.1, [A] 106.2, 106.3 (New), 106.4; IPC®: SECTION 109, 109.1 (New), 109.1, 109.3, 109.4, SECTION 110, 109.2; IMC®: SECTION 109, 109.1 (New), [A] 109.1, [A] 109.1.1, 109.3 (New), 109.4, SECTION 110, [A] 109.2; IFGC®: SECTION 109 (IFGC), 109.1, [A] 109.1, 109.3, 109.4, SECTION 110, [A] 109.2; ISPSC®: SECTION 108, 108.1, [A] 108.1, 108.3, 108.4, SECTION 109, [A] 108.2; IPMC®: SECTION 111, 111.1, [A] 111.1, 111.3, 111.4, [A] 111.8, SECTION 112, [A] 111.2; IPSDC®: SECTION 109, 109.1, [A] 109.1, 109.3, 109.4, SECTION 110, [A] 109.2

PART II — IRC®: SECTION R112, R112.1, R112.2, R112.3, R112.4

PART III — IECC: SECTION C109, C109.1, C109.2, C109.3, C109.4

PART IV — IECC: SECTION R109, R109.1, R109.2, R109.3, R109.4

PART V — IGCC®: SECTION 108, 108.1, 108.2, 108.3, 108.4 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Michael O'Brian, representing FCAC (fcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgac@iccsafe.org)

THIS IS A 5 PART CODE CHANGE. PART I WILL BE HEARD BY THE ADMINISTRATIVE CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-BUILDING CODE COMMITTEE. PART III WILL BE HEARD BY THE IECC-COMMERCIAL CODE COMMITTEE. PART IV WILL BE HEARD BY THE IECC-RESIDENTIAL CODE COMMITTEE. PART V WILL BE HEARD BY THE IGCC CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Building Code

Revise as follows:

SECTION 113 ~~BOARD MEANS OF APPEALS~~

[A] 113.1 General. In order to hear and decide appeals of orders, decisions or determinations made by the building official relative to the application and interpretation of this code, there shall be and is hereby created a board of appeals. The board of appeals shall be appointed by the applicable governing authority and shall hold office at its pleasure. The board shall adopt rules of procedure for conducting its business and shall render all decisions and findings in writing to the appellant with a duplicate copy to the building official.

[A] 113.2 Limitations on authority. An application for appeal shall be based on a claim that the true intent of this code or the rules legally adopted thereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an ~~equally good equivalent~~ or better form of construction is proposed. The board shall not have authority to waive requirements of this code or interpret the administration of this code.

[A] 113.3 Qualifications. The board of appeals shall consist of members who are qualified by experience and training to pass on matters pertaining to building construction and are not employees of the jurisdiction.

Add new text as follows:

113.4 Administration. The building official shall take immediate action in accordance with the decision of the board.

2018 International Existing Building Code

Revise as follows:

SECTION 112 ~~BOARD MEANS OF APPEALS~~

[A] 112.1 General. In order to hear and decide appeals of orders, decisions ~~;~~ or determinations made by the code official relative to the application and interpretation of this code, there shall be and is hereby created a board of appeals. The board of appeals shall be appointed by the applicable governing body authority and shall hold office at its pleasure. The board shall adopt rules of procedure for conducting its business and shall render all decisions and findings in writing to the appellant with a duplicate copy to the building official.

[A] 112.2 Limitations on authority. An application for appeal shall be based on a claim that the true intent of this code or the rules legally adopted thereunder have been incorrectly interpreted, the provisions of this code do not fully apply ~~;~~ or an ~~equally good equivalent~~ or better form of construction is proposed. The board shall not have authority to waive requirements of this code or interpret the administration of this code.

[A] 112.3 Qualifications. The board of appeals shall consist of members who are qualified by experience and training to pass on matters pertaining to building construction and are not employees of the jurisdiction.

Add new text as follows:

113.4 Administration. The code official shall take immediate action in accordance with the decision of the board.

2018 International Fire Code

Revise as follows:

SECTION 109 BOARD MEANS OF APPEALS

[A] **109.1 Board of appeals established.** In order to hear and decide appeals of orders, decisions or determinations made by the fire code official relative to the application and interpretation of this code, there shall be and is hereby created a board of appeals. The board of appeals shall be appointed by the applicable governing body authority and shall hold office at its pleasure. ~~The fire code official shall be an ex-officio member of said board but shall not have a vote on any matter before the board.~~ The board shall adopt rules of procedure for conducting its business ; and shall render all decisions and findings in writing to the appellant with a duplicate copy to the fire code official.

[A] **109.2 Limitations on authority.** An application for appeal shall be based on a claim that the true intent of this code or the rules legally adopted hereunder thereunder have been incorrectly interpreted, the provisions of this code do not fully apply ; or an equivalent ~~method of protection or safety~~ or better form of construction is proposed. The board shall not have authority to waive requirements of this code or interpret the administration of this code.

[A] **109.3 Qualifications.** The board of appeals shall consist of members who are qualified by experience and training to pass on matters pertaining to hazards of fire, explosions, hazardous conditions or *fire protection systems*, and are not employees of the jurisdiction.

Add new text as follows:

109.4 Administration. The fire code official shall take immediate action in accordance with the decision of the board.

2018 International Wildland-Urban Interface Code

Revise as follows:

SECTION 106 MEANS OF APPEALS

[A] **106.1 General.** ~~To determine the suitability of alternative materials and methods and to provide for reasonable interpretations of the provisions~~ In order to hear and decide appeals of orders, decisions or determinations made by the code official relative to the application and interpretation of this code, there shall be and is hereby is created a board of appeals consisting of five members who are qualified by experience and training to pass judgment on pertinent matters. The code official, building official and fire chief shall be ex-officio members, and the code official shall act as secretary of the board. The appeals. The board of appeals shall be appointed by the legislative body applicable governing authority and shall hold office at their ~~discretion; its pleasure.~~ The board shall adopt reasonable rules and regulations of procedure for conducting its ~~investigations business~~ and shall render all decisions and findings in writing to the code official, appellant with a duplicate copy to the ~~applicant; code official.~~

[A] **106.2 Limitations of authority.** ~~The board of appeals shall not have authority relative to interpretation of the administrative provisions of this code and~~ An application for appeal shall be based on a claim that the true intent of this code or the rules legally adopted thereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an equivalent or better form of construction is proposed. The board shall not have authority to waive requirements of this code or interpret the administration of this code.

Add new text as follows:

106.3 Qualifications. The board of appeals shall consist of members who are qualified by experience and training and are not employees of the jurisdiction.

Revise as follows:

106.4 Administration. The code official shall take immediate action in accordance with the decision of the board.

2018 International Plumbing Code

SECTION 109 MEANS OF APPEAL APPEALS

Add new text as follows:

109.1 General. In order to hear and decide appeals of orders, decisions or determinations made by the code official relative to the application and interpretation of this code, there shall be and is hereby created a board of appeals. The board of appeals shall be appointed by the applicable governing authority and shall hold office at its pleasure. The board shall adopt rules of procedure for conducting its business and shall render all

decisions and findings in writing to the appellant with a duplicate copy to the code official.

Revise as follows:

~~109.1 109.2 Application for appeal. Limitations on authority.~~ Any person shall have the right to appeal a decision of the code official to the board of appeals. An application for appeal shall be based on a claim that the true intent of this code or the rules legally adopted thereunder have been incorrectly interpreted, the provisions of this code do not fully apply, or an equally good equivalent or better form of construction is proposed. The application shall be filed on a form obtained from the code official within 20 days after the notice was served. board shall not have authority to waive requirements of this code or interpret the administration of this code.

109.3 Qualifications. The board of appeals shall consist of members who are qualified by experience and training and are not employees of the jurisdiction.

109.4 Administration. The code official shall take immediate action in accordance with the decision of the board.

SECTION 110 **BOARD OF APPEALS**

~~109.2 110.1 Membership of board.~~ The board of appeals shall consist of five members appointed by the chief appointing authority as follows: one for 5 years, one for 4 years, one for 3 years, one for 2 years and one for 1 year. Thereafter, each new member shall serve for 5 years or until a successor has been appointed.

2018 International Mechanical Code

SECTION 109 **MEANS OF APPEAL APPEALS**

Add new text as follows:

109.1 General. In order to hear and decide appeals of orders, decisions or determinations made by the code official relative to the application and interpretation of this code, there shall be and is hereby created a board of appeals. The board of appeals shall be appointed by the applicable governing authority and shall hold office at its pleasure. The board shall adopt rules of procedure for conducting its business and shall render all decisions and findings in writing to the appellant with a duplicate copy to the code official.

Revise as follows:

~~[A] 109.1 109.2 Application for appeal. Limitations on authority.~~ A person shall have the right to appeal a decision of the code official to the board of appeals. An application for appeal shall be based on a claim that the true intent of this code or the rules legally adopted thereunder have been incorrectly interpreted, the provisions of this code do not fully apply, or an equally good equivalent or better form of construction is proposed. The application shall be filed on a form obtained from the code official within 20 days after the notice was served. board shall not have authority to waive requirements of this code or interpret the administration of this code.

Delete without substitution:

~~[A] 109.1.1 Limitation of authority.~~ The board of appeals shall not have authority relative to interpretation of the administration of this code nor shall such board be empowered to waive requirements of this code.

Add new text as follows:

109.3 Qualifications. The board of appeals shall consist of members who are qualified by experience and training and are not employees of the jurisdiction.

Revise as follows:

109.4 Administration The code official shall take immediate action in accordance with the decision of the board.

SECTION 110 **BOARD OF APPEALS**

~~[A] 109.2 110.1 Membership of board.~~ The board of appeals shall consist of five members appointed by the chief appointing authority as follows: one for 5 years; one for 4 years; one for 3 years; one for 2 years; and one for 1 year. Thereafter, each new member shall serve for 5 years or until a successor has been appointed.

2018 International Fuel Gas Code

SECTION 109 (IFGC) MEANS OF APPEAL

109.1 General. In order to hear and decide appeals of orders, decisions or determinations made by the code official relative to the application and interpretation of this code, there shall be and is hereby created a board of appeals. The board of appeals shall be appointed by the applicable governing authority and shall hold office at its pleasure. The board shall adopt rules of procedure for conducting its business and shall render all decisions and findings in writing to the appellant with a duplicate copy to the code official.

~~[A] 109.1 109.2 Application for appeal. Limitations on authority.~~ A person shall have the right to appeal a decision of the code official to the board of appeals. An application for appeal shall be based on a claim that the true intent of this code or the rules legally adopted thereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an equally good equivalent or better form of construction is proposed. ~~The application shall be filed on a form obtained from the code official within 20 days after the notice was served. board shall not have authority to waive requirements of this code or interpret the administration of this code.~~

109.3 Qualifications. The board of appeals shall consist of members who are qualified by experience and training and are not employees of the jurisdiction.

109.4 Administration. The code official shall take immediate action in accordance with the decision of the board.

SECTION 110 BOARD OF APPEALS

~~[A] 109.2 110.1 Membership of board.~~ The board of appeals shall consist of five members appointed by the chief appointing authority as follows: one for 5 years; one for 4 years; one for 3 years; one for 2 years and one for 1 year. Thereafter, each new member shall serve for 5 years or until a successor has been appointed.

2018 International Swimming Pool and Spa Code

SECTION 108 MEANS OF APPEAL

108.1 General. In order to hear and decide appeals of orders, decisions or determinations made by the code official relative to the application and interpretation of this code, there shall be and is hereby created a board of appeals. The board of appeals shall be appointed by the applicable governing authority and shall hold office at its pleasure. The board shall adopt rules of procedure for conducting its business and shall render all decisions and findings in writing to the appellant with a duplicate copy to the code official.

~~[A] 108.1 108.2 Application for appeal. Limitations on authority.~~ Any person shall have the right to appeal a decision of the code official to the board of appeals. An application for appeal shall be based on a claim that the true intent of this code or the rules legally adopted ~~there under~~ ~~thereunder~~ have been incorrectly interpreted, the provisions of this code do not fully apply ~~or~~ an equally good equivalent or better form of construction is proposed. ~~The application shall be filed on a form obtained from the code official within 20 days after the notice was served. board shall not have authority to waive requirements of this code or interpret the administration of this code.~~

108.3 Qualifications. The board of appeals shall consist of members who are qualified by experience and training and are not employees of the jurisdiction.

108.4 Administration. The code official shall take immediate action in accordance with the decision of the board.

SECTION 109 BOARD OF APPEALS

~~[A] 108.2 109.1 Membership of board.~~ The board of appeals shall consist of five members appointed by the chief appointing authority as follows: one for 5 years, one for 4 years, one for 3 years, one for 2 years and one for 1 year. Thereafter, each new member shall serve for 5 years or until a successor has been appointed.

2018 International Property Maintenance Code

SECTION 111 MEANS OF APPEAL

111.1 General. In order to hear and decide appeals of orders, decisions or determinations made by the code official relative to the application and interpretation of this code, there shall be and is hereby created a board of appeals. The board of appeals shall be appointed by the applicable governing authority and shall hold office at its pleasure. The board shall adopt rules of procedure for conducting its business and shall render all decisions and findings in writing to the appellant with a duplicate copy to the code official.

~~[A] **111.1 111.2 Application for appeal. Limitations on authority.** Any person directly affected by a decision of the *code official* or a notice or order issued under this code shall have the right to appeal to the board of appeals, provided that a written application for appeal is filed within 20 days after the day the decision, notice or order was served. An application for appeal shall be based on a claim that the true intent of this code or the rules legally adopted thereunder have been incorrectly interpreted, the provisions of this code do not fully apply, ~~or the~~ or an equivalent or better form of construction is proposed. The board shall not have authority to waive requirements of this code ~~are adequately satisfied by other means~~ or interpret the administration of this code.~~

111.3 Qualifications. The board of appeals shall consist of members who are qualified by experience and training and are not employees of the jurisdiction.

111.4 Administration. The code official shall take immediate action in accordance with the decision of the board.

~~[A] **111.8 111.5 Stays of enforcement.** Appeals of notice and orders (other than *Imminent Danger* notices) shall stay the enforcement of the notice and order until the appeal is heard by the appeals board.~~

SECTION 112 **BOARD OF APPEALS**

~~[A] **111.2 112.1 Membership of board.** The board of appeals shall consist of not less than three members who are qualified by experience and training to pass on matters pertaining to property maintenance and who are not employees of the jurisdiction. The *code official* shall be an ex-officio member but shall not vote on any matter before the board. The board shall be appointed by the chief appointing authority, and shall serve staggered and overlapping terms.~~

2018 International Private Sewage Disposal Code

SECTION 109 **MEANS OF APPEAL**

109.1 General. In order to hear and decide appeals of orders, decisions or determinations made by the code official relative to the application and interpretation of this code, there shall be and is hereby created a board of appeals. The board of appeals shall be appointed by the applicable governing authority and shall hold office at its pleasure. The board shall adopt rules of procedure for conducting its business and shall render all decisions and findings in writing to the appellant with a duplicate copy to the code official.

~~[A] **109.1 109.2 Application for appeal. Limitations on authority.** Any person shall have the right to appeal a decision of the code official to the board of appeals. An application for appeal shall be based on a claim that the true intent of this code or the rules legally adopted thereunder ~~has have~~ been incorrectly interpreted, the provisions of this code do not fully apply or an ~~equally good equivalent~~ or better form of construction is proposed. The ~~application shall be filed on a form obtained from the code official within 20 days after the notice was served.~~ board shall not have authority to waive requirements of this code or interpret the administration of this code.~~

109.3 Qualifications. The board of appeals shall consist of members who are qualified by experience and training and are not employees of the jurisdiction.

109.4 Administration The code official shall take immediate action in accordance with the decision of the board.

SECTION 110 **BOARDS OF APPEALS**

~~[A] **109.2 110.1 Membership of board.** The board of appeals shall consist of five members appointed by the chief appointing authority as follows: one for 5 years, one for 4 years, one for 3 years, one for 2 years and one for 1 year. Thereafter, each new member shall serve for 5 years or until a successor has been appointed.~~

Proposal # 4067

ADM40-19 Part I

ADM40-19 Part II

IRC@: SECTION R112, R112.1, R112.2, R112.3, R112.4

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Michael O'Brian, representing FCAC (fcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

SECTION R112 ~~BOARD MEANS OF APPEALS~~

R112.1 General. In order to hear and decide appeals of orders, decisions or determinations made by the building official relative to the application and interpretation of this code, there shall be and is hereby created a board of appeals. The ~~building official shall be an ex officio member of said board but shall not have a vote on any matter before the board.~~ The board of appeals shall be appointed by the applicable governing body authority and shall hold office at its pleasure. The board shall adopt rules of procedure for conducting its business ; and shall render all decisions and findings in writing to the appellant with a duplicate copy to the building official.

R112.2 Limitations on authority. An application for appeal shall be based on a claim that the true intent of this code or the rules legally adopted thereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an equally good equivalent or better form of construction is proposed. The board shall not have authority to waive requirements of this code or interpret the administration of this code.

R112.3 Qualifications. The board of appeals shall consist of members who are qualified by experience and training to pass judgement on matters pertaining to building construction and are not employees of the *jurisdiction*.

R112.4 Administration. The *building official* shall take immediate action in accordance with the decision of the board.

Proposal # 5733

ADM40-19 Part II

ADM40-19 Part III

IECC: SECTION C109, C109.1, C109.2, C109.3, C109.4

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Michael O'Brian, representing FCAC (fcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

2018 International Energy Conservation Code

Revise as follows:

SECTION C109 ~~BOARD MEANS OF APPEALS~~

C109.1 General. In order to hear and decide appeals of orders, decisions or determinations made by the code official relative to the application and interpretation of this code, there shall be and is hereby created a board of appeals. ~~The code official shall be an ex officio member of said board but shall not have a vote on any matter before the board.~~ The board of appeals shall be appointed by the applicable governing body authority and shall hold office at its pleasure. The board shall adopt rules of procedure for conducting its business ; and shall render all decisions and findings in writing to the appellant with a duplicate copy to the code official.

C109.2 Limitations on authority. An application for appeal shall be based on a claim that the true intent of this code or the rules legally adopted thereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an equally good equivalent or better form of construction is proposed. The board shall not have authority to waive requirements of this code or interpret the administration of this code.

C109.3 Qualifications. The board of appeals shall consist of members who are qualified by experience and training and are not employees of the jurisdiction.

C109.4 Administration. The code official shall take immediate action in accordance with the decision of the board.

Proposal # 5734

ADM40-19 Part III

ADM40-19 Part IV

IECC: SECTION R109, R109.1, R109.2, R109.3, R109.4

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Michael O'Brian, representing FCAC (fcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

2018 International Energy Conservation Code

Revise as follows:

SECTION R109 ~~BOARD MEANS OF APPEALS~~

R109.1 General. In order to hear and decide appeals of orders, decisions or determinations made by the code official relative to the application and interpretation of this code, there shall be and is hereby created a board of appeals. ~~The code official shall be an ex officio member of said board but shall not have a vote on any matter before the board.~~ The board of appeals shall be appointed by the applicable governing body authority and shall hold office at its pleasure. The board shall adopt rules of procedure for conducting its business ; and shall render all decisions and findings in writing to the appellant with a duplicate copy to the code official.

R109.2 Limitations on authority. An application for appeal shall be based on a claim that the true intent of this code or the rules legally adopted thereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an equally good equivalent or better form of construction is proposed. The board shall not have authority to waive requirements of this code or interpret the administration of this code.

R109.3 Qualifications. The board of appeals shall consist of members who are qualified by experience and training and are not employees of the jurisdiction.

Revise as follows:

R109.4 Administration. The code official shall take immediate action in accordance with the decision of the board.

Proposal # 5735

ADM40-19 Part IV

ADM40-19 Part V

IGCC@: SECTION 108, 108.1, 108.2, 108.3, 108.4 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Michael O'Brian, representing FCAC (fcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

2018 International Green Construction Code

Revise as follows:

SECTION 108 ~~BOARD MEANS OF APPEALS~~

108.1 General. ~~Appeals~~In order to hear and decide appeals of orders, decisions or determinations made by the authority having jurisdiction relative to the application and interpretation of this code, ~~there shall be made to a Board of Appeals as determined by the and is hereby created a board of appeals.~~ The board of appeals shall be appointed by the applicable governing authority and shall hold office at its pleasure. The board shall adopt rules of procedure for conducting its business, and shall render all decisions and findings in writing to the appellant with a duplicate copy to the authority having jurisdiction.

108.2 Limitations on authority. An application for appeal shall be based on a claim that the true intent of this code or the rules legally adopted there under have been incorrectly interpreted, the provisions of this code do not fully apply or an equivalent or better form of construction is proposed. The board shall not have authority to waive requirements of this code or interpret the administration of this code.

108.3 Qualifications. ~~The members of the board of appeals related to interpretation of this code shall be~~ shall consist of members who are qualified by experience and training in the matters covered by this code and shall not be to pass on matters pertaining to building construction and are not employees of the jurisdiction.

Add new text as follows:

108.4 Administration The authority having jurisdiction shall take immediate action in accordance with the decision of the board.

Reason: The intent is to establish consistent language for the means of appeal throughout the code. The constitution of the board of appeals will be addressed in another change. There is some slight difference in the fire code in the section on limitations on authority and qualification where some differences given the scope of the code are appropriate to remain. The IPMC includes an additional section for stays of enforcement. The BCAC is working from the philosophy that ICC is a family of codes, so administrative requirements should be consistent across books. Most administrative and enforcement matters are the same for any code. Those matters unique for a specific code remain unchanged. This is one of a series of proposals being submitted relating to technical, editorial and organizational changes proposed for the Administrative chapters (Chapter 1) in all of the I-Codes.

While the Administrative Committee will consider each proposal independently, the proposals in this package are a correlated set of companion code change proposals.”

The following is the template utilized to create this code change proposal. There may be some differences depending on the unique applications of each code – such as “building/fire/code official”.

SECTION 113

MEANS OF APPEALS

[A] 113.1 General. In order to hear and decide appeals of orders, decisions or determinations made by the *code official* relative to the application and interpretation of this code, there shall be and is hereby created a board of appeals. The board of appeals shall be appointed by the applicable governing authority and shall hold office at its pleasure. The board shall adopt rules of procedure for conducting its business and shall render all decisions and findings in writing to the appellant with a duplicate copy to the *code official*.

[A] 113.2 Limitations on authority. An application for appeal shall be based on a claim that the true intent of this code or the rules legally adopted thereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an equivalent or better form of construction is proposed. The board shall not have authority to waive requirements of this code or interpret the administration of this code.

[A] 113.3 Qualifications. The board of appeals shall consist of members who are qualified by experience and training and are not employees of the jurisdiction.

[A] 113.4 Administration. The *code official* shall take immediate action in accordance with the decision of the board.

This proposal is submitted by the ICC Building Code Action Committee (BCAC), the ICC Fire Code Action Committee (FCAC), the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC) and the ICC Plumbing/Mechanical/Gas Code Action Committee (PMG CAC).

BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/building-code-actioncommittee-bcac>.

The FCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes with regard to fire safety and hazardous materials in new and existing buildings and facilities and the protection of life and property in wildland urban interface areas. In 2018 the Fire-CAC has held 3 open meetings. In addition, there were numerous conference calls, Regional Work Group and Task Group meetings for the current code development cycle, which included members of the committees as well as any interested parties, to discuss and debate the proposed changes. Related documentation and reports are posted on the FCAC website at: <https://www.iccsafe.org/codes-tech-support/cs/fire-code-action-committee-fcac/>

The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>.

The PMG CAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance the International Codes or portions thereof that were under the purview of the PMG CAC. In 2017-2018, the PMG CAC held one face-to-face meeting and 11 conference call meetings. Numerous interested parties attended the committee meetings and offered their input. Related documentation and reports are posted on the PMGCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/pmg-code-action-committee-pmgcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is an editorial proposal with no change to construction requirements.

Proposal # 5737

ADM40-19 Part V

ADM41-19 Part I

PART I — IBC®: SECTION 115, [A] 115.1, [A] 115.2, 115.3, [A] 115.3; IFC®: SECTION 112, [A] 112.1, [A] 112.2, [A] 112.3, [A] 112.4; IPC®: SECTION 108, 108.5, SECTION 109 (New), 109.1 (New), 109.2 (New), 109.3 (New), 109.4 (New); IMC®: SECTION 108, [A] 108.5, SECTION 109 (New), 109.1 (New), 109.2 (New), 109.3 (New), 109.4 (New); IFGC®: SECTION 108 (IFGC), [A] 108.5, SECTION 109 (New), 109.1 (New), 109.2 (New), 109.3 (New), 109.4 (New); IEBC®: SECTION 114, [A] 114.1, [A] 114.2, 114.3 (New), [A] 114.3; ISPSC®: SECTION 107, [A] 107.5, SECTION 108 (New), 108.1 (New), 108.2 (New), 108.3 (New), 108.4 (New); IPMC®: SECTION 112, [A] 112.1, [A] 112.2, [A] 112.3, [A] 112.4; IPSDC®: SECTION 108, [A] 108.5, 109 (New), 109.1 (New), 109.2 (New), 109.3 (New), 109.4 (New); IWUIC®: SECTION 114, [A] 114.1, [A] 114.2, [A] 114.3, [A] 114.4

PART II — IRC®: SECTION R114, R114.1, R114.2, R114.3 (New),

PART III — IECC: SECTION C108, C108.1, C108.2, C108.3, C108.4

PART IV — IECC: SECTION R108, R108.1, R108.2, R108.3, R108.4

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Michael O'Brian, representing FCAC (fcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgac@iccsafe.org)

THIS IS A 4 PART CODE CHANGE. PART I WILL BE HEARD BY THE ADMINISTRATIVE CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-BUILDING CODE COMMITTEE. PART III WILL BE HEARD BY THE IECC-COMMERCIAL CODE COMMITTEE. PART IV WILL BE HEARD BY THE IECC-RESIDENTIAL CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Building Code

Revise as follows:

SECTION 115 STOP WORK ORDER

[A] 115.1 Authority. Where the *building official* finds any work regulated by this code being performed in a manner ~~either~~ contrary to the provisions of this code or in a dangerous or unsafe manner, the *building official* is authorized to issue a stop work order.

[A] 115.2 Issuance. The stop work order shall be in writing and shall be given to the owner of the property ~~involved~~, the owner's authorized agent or the person performing the work. Upon issuance of a stop work order, the cited work shall immediately cease. The stop work order shall state the reason for the order and the conditions under which the cited work ~~will be permitted~~ is authorized to resume.

115.3 Emergencies. Where an emergency exists, the building official shall not be required to give a written notice prior to stopping the work.

~~**[A] 115.3 115.4 Unlawful continuance. Failure to comply.**~~ Any person who shall continue any work after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be subject to ~~penalties as prescribed by law.~~ finest established by the authority having jurisdiction.

2018 International Fire Code

SECTION 112 STOP WORK ORDER

[A] 112.1 ~~Order.~~ Authority. Where the *fire code official* finds any work regulated by this code being performed in a manner contrary to the provisions of this code, or in a dangerous or unsafe manner, the *fire code official* is authorized to issue a stop work order.

[A] 112.2 Issuance. ~~A~~ The stop work order shall be in writing and shall be given to the owner of the property, ~~or to~~ the owner's authorized agent, ~~or~~ to the person ~~doing~~ performing the work. Upon issuance of a stop work order, the cited work shall immediately cease. The stop work order shall state the reason for the order, ~~and~~ the conditions under which the cited work is authorized to resume.

[A] 112.3 Emergencies. Where an emergency exists, the fire code official shall not be required to give a written notice prior to stopping the work.

[A] 112.4 Failure to comply. Any person who shall continue any work after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be ~~liable to a fine of not less than [AMOUNT] dollars or more than [AMOUNT] dollars.~~ subject to fines established by the authority having jurisdiction.

2018 International Plumbing Code

SECTION 108 VIOLATIONS

Delete without substitution:

~~108.5 Stop work orders.~~ Upon notice from the code official, work on any plumbing system that is being performed contrary to the provisions of this code or in a dangerous or unsafe manner shall immediately cease. Such notice shall be in writing and shall be given to the owner of the property, or to the owner's authorized agent, or to the person performing the work. The notice shall state the conditions under which work is authorized to resume. Where an emergency exists, the code official shall not be required to give a written notice prior to stopping the work. Any person who shall continue any work in or about the structure after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be liable to a fine of not less than [AMOUNT] dollars or more than [AMOUNT] dollars.

Add new text as follows:

SECTION 109 STOP WORK ORDER

109.1 Authority. Where the code official finds any work regulated by this code being performed in a manner contrary to the provisions of this code or in a dangerous or unsafe manner, the code official is authorized to issue a stop work order.

109.2 Issuance. The stop work order shall be in writing and shall be given to the owner of the property, the owner's authorized agent or the person performing the work. Upon issuance of a stop work order, the cited work shall immediately cease. The stop work order shall state the reason for the order and the conditions under which the cited work is authorized to resume.

109.3 Emergencies. Where an emergency exists, the code official shall not be required to give a written notice prior to stopping the work.

109.4 Failure to comply. Any person who shall continue any work after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be subject to fines established by the authority having jurisdiction.

2018 International Mechanical Code

Revise as follows:

SECTION 108 VIOLATIONS

Delete without substitution:

~~[A] 108.5 Stop work orders.~~ Upon notice from the code official that mechanical work is being performed contrary to the provisions of this code or in a dangerous or unsafe manner, such work shall immediately cease. Such notice shall be in writing and shall be given to the owner of the property, or to the owner's authorized agent, or to the person doing the work. The notice shall state the conditions under which work is authorized to resume. Where an emergency exists, the code official shall not be required to give a written notice prior to stopping the work. Any person who shall continue any work on the system after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be liable for a fine of not less than [AMOUNT] dollars or more than [AMOUNT] dollars.

Add new text as follows:

SECTION 109 STOP WORK ORDER

109.1 Authority. Where the code official finds any work regulated by this code being performed in a manner contrary to the provisions of this code or in a dangerous or unsafe manner, the code official is authorized to issue a stop work order.

109.2 Issuance. The stop work order shall be in writing and shall be given to the owner of the property, the owner's authorized agent or the person performing the work. Upon issuance of a stop work order, the cited work shall immediately cease. The stop work order shall state the reason for the order and the conditions under which the cited work is authorized to resume.

109.3 Emergencies. Where an emergency exists, the code official shall not be required to give a written notice prior to stopping the work.

109.4 Failure to comply. Any person who shall continue any work after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be subject to fines established by the authority having jurisdiction.

2018 International Fuel Gas Code

Revise as follows:

SECTION 108 (IFGC) VIOLATIONS

Delete without substitution:

~~[A] 108.5 Stop work orders.~~ Upon notice from the code official that work is being performed contrary to the provisions of this code or in a dangerous or unsafe manner, such work shall immediately cease. Such notice shall be in writing and shall be given to the owner of the property, the owner's authorized agent, or the person doing the work. The notice shall state the conditions under which work is authorized to resume. Where an emergency exists, the code official shall not be required to give a written notice prior to stopping the work. Any person who shall continue any work on the system after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be liable for a fine of not less than [AMOUNT] dollars or more than [AMOUNT] dollars.

Add new text as follows:

SECTION 109 STOP WORK ORDER

109.1 Authority. Where the code official finds any work regulated by this code being performed in a manner contrary to the provisions of this code or in a dangerous or unsafe manner, the code official is authorized to issue a stop work order.

109.2 Issuance. The stop work order shall be in writing and shall be given to the owner of the property, the owner's authorized agent or the person performing the work. Upon issuance of a stop work order, the cited work shall immediately cease. The stop work order shall state the reason for the order and the conditions under which the cited work is authorized to resume.

109.3 Emergencies. Where an emergency exists, the code official shall not be required to give a written notice prior to stopping the work.

109.4 Failure to comply. Any person who shall continue any work after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be subject to fines established by the authority having jurisdiction.

2018 International Existing Building Code

Revise as follows:

SECTION 114 STOP WORK ORDER

[A] 114.1 Authority. Where the code official finds any work regulated by this code being performed in a manner contrary to the provisions of this code or in a dangerous or unsafe manner, the code official is authorized to issue a stop work order.

[A] 114.2 Issuance. The stop work order shall be in writing and shall be given to the owner of the property involved, the owner's authorized agent or to the person doing performing the work. Upon issuance of a stop work order, the cited work shall immediately cease. The stop work order shall state the reason for the order and the conditions under which the cited work will be permitted is authorized to resume.

Add new text as follows:

114.3 Emergencies. Where an emergency exists, the code official shall not be required to give a written notice prior to stopping the work.

Revise as follows:

[A] ~~114.3~~ 114.4 Unlawful continuance. Failure to comply. Any person who shall continue any work after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be subject to penalties as prescribed by law. fines established by the authority having jurisdiction.

2018 International Swimming Pool and Spa Code

SECTION 107 VIOLATIONS

Delete without substitution:

~~[A] 107.5 Stop work orders.~~ Upon notice from the code official, work on any system that is being performed contrary to the provisions of this code or in a dangerous or unsafe manner shall immediately cease. Such notice shall be in writing and shall be given to the owner of the property, or to the owner's authorized agent, or to the person performing the work. The notice shall state the conditions under which work is authorized to resume. Where an emergency exists, the code official shall not be required to give a written notice prior to stopping the work. Any person who shall continue any work in or about the structure after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be liable to a fine of not less than [AMOUNT] dollars or more than [AMOUNT] dollars.

Add new text as follows:

SECTION 108 STOP WORK ORDER

108.1 Authority. Where the code official finds any work regulated by this code being performed in a manner contrary to the provisions of this code or in a dangerous or unsafe manner, the code official is authorized to issue a stop work order.

108.2 Issuance. The stop work order shall be in writing and shall be given to the owner of the property, the owner's authorized agent or the person performing the work. Upon issuance of a stop work order, the cited work shall immediately cease. The stop work order shall state the reason for the order and the conditions under which the cited work is authorized to resume.

108.3 Emergencies. Where an emergency exists, the code official shall not be required to give a written notice prior to stopping the work.

108.4 Failure to comply. Any person who shall continue any work after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be subject to fines established by the authority having jurisdiction.

2018 International Property Maintenance Code

Revise as follows:

SECTION 112 STOP WORK ORDER

~~[A] 112.1 Authority.~~ ~~Whenever~~ Where the code official finds any work regulated by this code being performed in a manner contrary to the provisions of this code or in a dangerous or unsafe manner, the code official is authorized to issue a stop work order.

~~[A] 112.2 Issuance.~~ ~~A~~ The stop work order shall be in writing and shall be given to the owner of the property, ~~to~~ the owner's authorized agent, ~~or to~~ the person ~~doing~~ performing the work. Upon issuance of a stop work order, the cited work shall immediately cease. The stop work order shall state the reason for the order and the conditions under which the cited work is authorized to resume.

~~[A] 112.3 Emergencies.~~ Where an emergency exists, the *code official* shall not be required to give a written notice prior to stopping the work.

~~[A] 112.4 Failure to comply.~~ Any person who shall continue any work after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be ~~liable to a fine of not less than [AMOUNT] dollars or more than [AMOUNT] dollars.~~ subject to fines established by the authority having jurisdiction.

2018 International Private Sewage Disposal Code

SECTION 108 VIOLATIONS

Delete without substitution:

~~[A] 108.5 Stop work orders.~~ Upon notice from the code official, work on any *private sewage disposal system* that is being performed contrary to the provisions of this code or in a dangerous or unsafe manner shall immediately cease. Such notice shall be in writing and shall be given to the owner of the property, to the owner's authorized agent or to the person performing the work. The notice shall state the conditions under which work is authorized to resume. Where an emergency exists, the code official shall not be required to give a written notice prior to stopping the work. Any person who shall continue any work on the system after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be liable to a fine of not less than [AMOUNT] dollars or more than [AMOUNT] dollars.

Add new text as follows:

109 STOP WORK ORDER

109.1 Authority. Where the code official finds any work regulated by this code being performed in a manner contrary to the provisions of this code or in a dangerous or unsafe manner, the code official is authorized to issue a stop work order.

109.2 Issuance. The stop work order shall be in writing and shall be given to the owner of the property, the owner's authorized agent or the person performing the work. Upon issuance of a stop work order, the cited work shall immediately cease. The stop work order shall state the reason for the order and the conditions under which the cited work is authorized to resume.

109.3 Emergencies. Where an emergency exists, the code official shall not be required to give a written notice prior to stopping the work.

109.4 Failure to comply. Any person who shall continue any work after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be subject to fines established by the authority having jurisdiction.

2018 International Wildland-Urban Interface Code

Revise as follows:

SECTION 114 STOP WORK ORDER

[A] 114.1 Authority. Where the code official finds any work regulated by this code being performed in a manner ~~either~~ contrary to the provisions of this code or in a dangerous or unsafe manner, the code official is authorized to issue a stop work order.

[A] 114.2 Issuance. The stop work order shall be in writing and shall be given to the owner of the property ~~involved~~, to the owner's authorized agent or ~~to the person doing performing~~ the work. Upon issuance of a stop work order, the cited work shall immediately cease. The stop work order shall state the reason for the order and the conditions under which the cited work ~~will be permitted~~ is authorized to resume.

[A] 114.3 Emergencies. Where an emergency exists, the code official shall not be required to give a written notice prior to stopping the work.

[A] 114.4 Failure to comply. Any person who shall continue any work after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be ~~liable to a fine of not less than [AMOUNT] dollars or more than [AMOUNT] dollars~~ subject to fines established by the authority having jurisdiction.

Proposal # 4060

ADM41-19 Part I

ADM41-19 Part II

IRC@: SECTION R114, R114.1, R114.2, R114.3 (New),

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Michael O'Brian, representing FCAC (fcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgac@iccsafe.org)

2018 International Residential Code

Revise as follows:

SECTION R114 STOP WORK ORDER

R114.1 ~~Notice to owner or the owner's authorized agent. Authority.~~ ~~Upon notice from~~ Where the building official that work on any building or structure is being executed finds any work regulated by this code being performed in a manner contrary to the provisions of this code or in an a dangerous or unsafe and dangerous manner, such work shall be immediately stopped. The stop work order shall be in writing and shall be given to the owner of the property involved, or to the owner's authorized agent or to the person performing the work and shall state the conditions under which work will be permitted to resume. the building official is authorized to issue a stop work order.

R114.2 ~~Issuance.~~ The stop work order shall be in writing and shall be given to the owner of the property, the owner's authorized agent or the person performing the work. Upon issuance of a stop work order, the cited work shall immediately cease. The stop work order shall state the reason for the order and the conditions under which the cited work is authorized to resume.

Add new text as follows:

R114.3 ~~Emergencies.~~ Where an emergency exists, the code official shall not be required to give a written notice prior to stopping the work.

Revise as follows:

-

~~R114.2 R114.3 Unlawful continuance. Failure to comply.~~ Any person who shall continue any work in or about the structure after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be subject to penalties as prescribed by law. fines established by the authority having jurisdiction.

Proposal # 5728

ADM41-19 Part II

ADM41-19 Part III

IECC: SECTION C108, C108.1, C108.2, C108.3, C108.4

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Michael O'Brian, representing FCAC (fcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgac@iccsafe.org)

2018 International Energy Conservation Code

Revise as follows:

SECTION C108 STOP WORK ORDER

C108.1 Authority. Where the code official finds any work regulated by this code being performed in a manner ~~either~~ contrary to the provisions of this code or in a dangerous or unsafe manner, the code official is authorized to issue a stop work order.

C108.2 Issuance. The stop work order shall be in writing and shall be given to the owner of the property ~~involved~~, the owner's authorized agent ~~or to the person doing performing~~ the work. Upon issuance of a stop work order, the cited work shall immediately cease. The stop work order shall state the reason for the order and the conditions under which the cited work ~~will be permitted~~ is authorized to resume.

C108.3 Emergencies. Where an emergency exists, the *code official* shall not be required to give a written notice prior to stopping the work.

C108.4 Failure to comply. Any person who shall continue any work after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be ~~liable to a fine as set by the applicable governing authority~~ subject to fines established by the authority having jurisdiction.

Proposal # 5729

ADM41-19 Part III

ADM41-19 Part IV

IECC: SECTION R108, R108.1, R108.2, R108.3, R108.4

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Michael O'Brian, representing FCAC (fcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

2018 International Energy Conservation Code

Revise as follows:

SECTION R108 STOP WORK ORDER

R108.1 Authority. Where the code official finds any work regulated by this code being performed in a manner ~~either~~ contrary to the provisions of this code or in a dangerous or unsafe manner, the code official is authorized to issue a stop work order.

R108.2 Issuance. The stop work order shall be in writing and shall be given to the owner of the property ~~involved~~, to the owner's authorized agent, or to the person ~~doing~~ performing the work. Upon issuance of a stop work order, the cited work shall immediately cease. The stop work order shall state the reason for the order and the conditions under which the cited work ~~will be permitted~~ is authorized to resume.

R108.3 Emergencies. Where an emergency exists, the *code official* shall not be required to give a written notice prior to stopping the work.

R108.4 Failure to comply. Any person who shall continue any work after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be subject to ~~a fine as set~~ finest established by the applicable governing authority ~~authority having jurisdiction~~.

Reason: The intent of this proposal is consistency in the Stop Work Order section. Some of the codes have the stop work order buried under the violation section. For consistency it should be its own section. The amount of fees should be removed from the stop work order section so that jurisdictions could update their fee schedule as appropriate and not be associated only with code adoptions. This also addressed the different ways that fees are set.

The BCAC is working from the philosophy that ICC is a family of codes, so administrative requirements should be consistent across books. Most administrative and enforcement matters are the same for any code. Those matters unique for a specific code remain unchanged. This is one of a series of proposals being submitted relating to technical, editorial and organizational changes proposed for the Administrative chapters (Chapter 1) in all of the I-Codes.

While the Administrative Committee will consider each proposal independently, the proposals in this package are a correlated set of companion code change proposals."

The following is the template utilized to create this code change proposal. There may be some differences depending on the unique applications of each code – such as "building/fire/code official".

SECTION 109

STOP WORK ORDER

[A] 109.1 Authority. Where the code official finds any work regulated by this code being performed in a manner contrary to the provisions of this code or in a dangerous or unsafe manner, the code official is authorized to issue a stop work order.

[A] 109.2 Issuance. The stop work order shall be in writing and shall be given to the owner of the property, the owner's authorized agent or the person performing the work. Upon issuance of a stop work order, the cited work shall immediately cease. The stop work order shall state the reason for the order and the conditions under which the cited work is authorized to resume.

[A] 109.3 Emergencies. Where an emergency exists, the code official shall not be required to give a written notice prior to stopping the work.

[A] 109.4 Failure to comply. Any person who shall continue any work after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be subject to fines established by the authority having jurisdiction.

This proposal is submitted by the ICC Building Code Action Committee (BCAC), the ICC Fire Code Action Committee (FCAC), the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC) and the ICC Plumbing/Mechanical/Gas Code Action Committee (PMG CAC).

BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the

proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

The FCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes with regard to fire safety and hazardous materials in new and existing buildings and facilities and the protection of life and property in wildland urban interface areas. In 2018 the Fire-CAC has held 3 open meetings. In addition, there were numerous conference calls, Regional Work Group and Task Group meetings for the current code development cycle, which included members of the committees as well as any interested parties, to discuss and debate the proposed changes. Related documentation and reports are posted on the FCAC website at: <https://www.iccsafe.org/codes-tech-support/cs/fire-code-action-committee-fcac/>

The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>.

The PMG CAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance the International Codes or portions thereof that were under the purview of the PMG CAC. In 2017-2018, the PMG CAC held one face-to-face meeting and 11 conference call meetings. Numerous interested parties attended the committee meetings and offered their input. Related documentation and reports are posted on the PMGCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/pmg-code-action-committee-pmgcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is an editorial change that provides consistency between I-codes.

Proposal # 5730

ADM41-19 Part IV

ADM42-19

IBC®: SECTION 116, [A] 116.1, [A] 116.2, [A] 116.3, [A] 116.4, [A] 116.5; IFC®: SECTION 111, [A] 111.1, [A] 111.1.1, [A] 111.1.2, [A] 111.2, [A] 111.3, [A] 111.4, [A] 111.5 (New); IEBC®: SECTION 115, [A] 115.1, [A] 115.2, [A] 115.3, [A] 115.4, [A] 115.5; IPMC®: SECTION 108, 108.1, 108.1.1, 108.1.2, 108.1.3, 108.1.4, 108.1.5, 108.2, 108.2.1, 108.7, SECTION 107, 107.1, 107.2, 107.3, 107.4, 107.5, 107.6, 108.3, 108.4, 108.4.1, 108.5, 108.6

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Michael O'Brian, representing FCAC (fcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgac@iccsafe.org)

2018 International Building Code

Revise as follows:

SECTION 116 UNSAFE STRUCTURES AND EQUIPMENT

[A] 116.1 **Conditions: Unsafe conditions.** Structures or existing equipment that are or hereafter become unsafe, insanitary or deficient because of inadequate *means of egress* facilities, inadequate light and ventilation, or that constitute a fire hazard, or are otherwise dangerous to human life or the public welfare, or that involve illegal or improper occupancy or inadequate maintenance, shall be deemed an unsafe condition. Unsafe structures shall be taken down and removed or made safe, as the *building official* deems necessary and as provided for in this section. A vacant structure that is not secured against unauthorized entry shall be deemed unsafe.

[A] 116.2 **Record.** The *building official* shall cause a report to be filed on an unsafe condition. The report shall state the occupancy of the structure and the nature of the unsafe condition.

[A] 116.3 **Notice.** If an unsafe condition is found, the *building official* shall serve on the ~~owner, agent or person in control~~ of the structure or the owner's authorized agent, a written notice that describes the condition deemed unsafe and specifies the required repairs or improvements to be made to abate the unsafe condition, or that requires the unsafe structure to be demolished within a stipulated time. Such notice shall require the person thus notified to declare immediately to the *building official* acceptance or rejection of the terms of the order.

[A] 116.4 **Method of service.** Such notice shall be deemed properly served ~~where~~ a copy thereof is served in accordance with one of the following methods:

1. A copy is delivered to the *owner* personally;
2. A copy is sent by certified or registered mail addressed to the *owner* at the last known address with the return receipt requested; ~~or~~
3. A copy is delivered in any other manner as prescribed by local law.

If the certified or registered letter is returned showing that the letter was not delivered, a copy thereof shall be posted in a conspicuous place in or about the structure affected by such notice. Service of such notice in the foregoing manner on the owner's authorized agent ~~or on the person responsible for the structure~~ shall constitute service of notice on the *owner*.

[A] 116.5 **Restoration or Abatement.** Where the structure or equipment determined to be unsafe by the *building official* is restored to a safe condition, ~~to~~ The owner, the owner's authorized agent, operator or occupant of a structure, premises or equipment deemed unsafe by the code official shall abate or cause to be abated or corrected such unsafe conditions either by repair, rehabilitation, demolition or other approved corrective action. To the extent that repairs, *alterations* or *additions* are made or a change of occupancy occurs during the restoration of the structure, such *repairs, alterations, additions* and change of occupancy shall comply with the requirements of the International Existing Building Code .

2018 International Fire Code

SECTION 111 UNSAFE BUILDINGS STRUCTURE OR EQUIPMENT

[A] 111.1 **General.** If during the inspection of a premises, a ~~building or~~ structure, or any building system, in whole or in part, constitutes a clear and inimical threat to human life, safety or health, the *fire code official* shall issue such notice or orders to remove or remedy the conditions as shall be deemed necessary in accordance with this section, and shall refer the building to the building-structure or equipment department for any repairs, *alterations*, remodeling, removing or demolition required.

[A] 111.1.1 **Unsafe conditions.** Structures or existing equipment that are or hereafter become unsafe, insanitary or deficient because of inadequate *means of egress*, inadequate light and ventilation, that constitute a fire hazard, are otherwise dangerous to human life or the public welfare, or involve illegal or improper occupancy or inadequate maintenance, shall be deemed an unsafe condition. Unsafe structures shall be taken down and removed or made safe, as the fire code official deems necessary and as provided for in this section. A vacant structure that is not secured against unauthorized entry ~~as required by Section 311~~ shall be deemed unsafe.

[A] 111.1.2 **Structural hazards.** Where an apparent structural hazard is caused by the faulty installation, operation or malfunction of any of the

items or devices governed by this code, the *fire code official* shall immediately notify the building code official in accordance with Section 110.1.

[A] 111.2 Evacuation. The *fire code official* or the fire department official in charge of an incident shall be authorized to order the immediate evacuation of any occupied ~~building structure~~ deemed unsafe where such ~~building structure~~ has hazardous conditions that present imminent danger to ~~building structure~~ occupants. Persons so notified shall immediately leave the structure or premises and shall not enter or re-enter until authorized to do so by the *fire code official* or the fire department official in charge of the incident.

[A] 111.3 Record. The fire code official shall cause a report to be filed on an unsafe condition. The report shall state the occupancy of the structure and the nature of the unsafe condition.

[A] 111.4 Notice. If an unsafe condition is found, the fire code official shall serve on the owner of the structure or, the owner's authorized agent a written notice that describes the condition deemed unsafe and specifies the required repairs or improvements to be made to abate the unsafe condition, or that requires the unsafe building to be demolished within a stipulated time. Such notice shall require the person thus notified to declare immediately to the code official acceptance or rejection of the terms of the order.

Add new text as follows:

[A] 111.5 Method of service. Such notice shall be deemed properly served if where a copy thereof is served in accordance with one of the following methods:

1. A copy is delivered to the owner personally.
2. A copy is sent by certified or registered mail addressed to the owner at the last known address with the return receipt requested.
3. A copy is delivered in any other manner as prescribed by local law.

If the certified or registered letter is returned showing that the letter was not delivered, a copy thereof shall be posted in a conspicuous place in or about the structure affected by such notice. Service of such notice in the foregoing manner upon the owner's authorized agent shall constitute service of notice upon the owner.

Revise as follows:

[A] ~~111.4~~ 111.6 Abatement. Restoration of abatement. The structure or equipment determined to be unsafe by the fire code official is permitted to be restored to a safe condition. The owner, the owner's authorized agent, operator or occupant of a ~~building structure~~, or premises ~~equipment~~ deemed unsafe by the *fire code official* shall abate or cause to be abated or corrected such unsafe conditions either by repair, rehabilitation, demolition or other *approved* corrective action. To the extent that repairs, alterations, or additions are made or a change of occupancy occurs during the restoration of the structure, such repairs, alterations, additions, or change of occupancy shall comply with the requirements of Section 105.1.5 and the International Existing Building Code.

[A] ~~111.3~~ 111.7 Summary abatement. Where conditions exist that are deemed hazardous to life and property, the *fire code official* or fire department official in charge of the incident is authorized to abate summarily such hazardous conditions that are in violation of this code.

2018 International Existing Building Code

SECTION 115 UNSAFE BUILDINGS-STRUCTURES AND EQUIPMENT

[A] 115.1 ~~Conditions. Unsafe conditions.~~ Buildings, ~~structures~~ Structures or existing equipment that are or hereafter become *unsafe*, *insanitary* or deficient because of *inadequate means of egress facilities*, *inadequate light and ventilation*, or that constitute a fire hazard, or are otherwise dangerous to human life or the public welfare, or that involve illegal or improper occupancy or inadequate maintenance, shall be deemed an unsafe condition. Unsafe structures shall be taken down ~~and~~ removed or made safe as the *code official* deems necessary and as provided for in this code. A vacant structure that is not secured against unauthorized entry shall be deemed unsafe.

[A] 115.2 Record. The *code official* shall cause a report to be filed on an unsafe condition. The report shall state the occupancy of the structure and the nature of the *unsafe* condition.

[A] 115.3 Notice. If an *unsafe* condition is found, the *code official* shall serve on the owner ~~of the structure or the~~ owner's authorized agent ~~or person in control of the structure~~ a written notice that describes the condition deemed *unsafe* and specifies the required *repairs* or improvements to be made to abate the *unsafe* condition, or that requires the *unsafe* building to be demolished within a stipulated time. Such notice shall require the person thus notified to declare immediately to the *code official* acceptance or rejection of the terms of the order.

[A] 115.4 Method of service. Such notice shall be deemed properly served ~~if~~ where a copy thereof is served in accordance with one of the following methods:

1. A copy is delivered to the owner ~~or the owner's authorized agent~~ personally;
2. A copy is sent by certified or registered mail addressed to the owner ~~or the owner's authorized agent~~ at the last known address with the return receipt requested ~~and~~ delivered
3. A copy is delivered in any other manner as prescribed by local law.

If the certified or registered letter is returned showing that the letter was not delivered, a copy thereof shall be posted in a conspicuous place in or about the structure affected by such notice. Service of such notice in the foregoing manner on the owner's authorized agent ~~or on the person responsible for the structure~~ shall constitute service of notice on the owner.

[A] 115.5 Restoration- Restoration or abatement. ~~The building structure~~ or equipment determined to be *unsafe* by the *code official* is permitted to be restored to a safe condition. The owner, the owner's authorized agent, operator or occupant of a structure, premises or equipment deemed unsafe by the code official shall abate or cause to be abated or corrected such unsafe conditions either by repair, rehabilitation, demolition or other approved corrective action. To the extent that *repairs, alterations, or additions* are made or a *change of occupancy* occurs during the restoration of the ~~building structure~~, such *repairs, alterations, additions, or change of occupancy* shall comply with the requirements of this code.

2018 International Property Maintenance Code

SECTION 108 UNSAFE STRUCTURES AND EQUIPMENT

108.1 General- Unsafe conditions. When a structure or equipment is found by the *code official* to be unsafe, or when a structure is found unfit for human *occupancy*, or is found unlawful, such structure shall be *condemned* pursuant to the provisions of this code.

108.1.1 Unsafe structures. An unsafe structure is one that is found to be dangerous to the life, health, property or safety of the public or the *occupants* of the structure by not providing minimum safeguards to protect or warn *occupants* in the event of fire, or because such structure contains unsafe equipment or is so damaged, decayed, dilapidated, structurally unsafe or of such faulty construction or unstable foundation, that partial or complete collapse is possible.

108.1.2 Unsafe equipment. Unsafe equipment includes any boiler, heating equipment, elevator, moving stairway, electrical wiring or device, flammable liquid containers or other equipment on the *premises* or within the structure that is in such disrepair or condition that such equipment is a hazard to life, health, property or safety of the public or *occupants* of the *premises* or structure.

108.1.3 Structure unfit for human occupancy. A structure is unfit for human *occupancy* whenever the *code official* finds that such structure is unsafe, unlawful or, because of the degree to which the structure is in disrepair or lacks maintenance, is insanitary, vermin or rat infested, contains filth and contamination, or lacks *ventilation*, illumination, sanitary or heating facilities or other essential equipment required by this code, or because the location of the structure constitutes a hazard to the *occupants* of the structure or to the public.

108.1.4 Unlawful structure. An unlawful structure is one found in whole or in part to be occupied by more persons than permitted under this code, or was erected, altered or occupied contrary to law.

108.1.5 Dangerous structure or premises. For the purpose of this code, any structure or *premises* that has any or all of the conditions or defects described as follows shall be considered to be dangerous:

1. Any door, aisle, passageway, stairway, exit or other means of egress that does not conform to the *approved* building or fire code of the jurisdiction as related to the requirements for existing buildings.
2. The walking surface of any aisle, passageway, stairway, exit or other means of egress is so warped, worn loose, torn or otherwise unsafe as to not provide safe and adequate means of egress.
3. Any portion of a building, structure or appurtenance that has been damaged by fire, earthquake, wind, flood, *deterioration, neglect, abandonment, vandalism* or by any other cause to such an extent that it is likely to partially or completely collapse, or to become *detached* or dislodged.
4. Any portion of a building, or any member, appurtenance or ornamentation on the exterior thereof that is not of sufficient strength or stability, or is not so *anchored, attached* or fastened in place so as to be capable of resisting natural or artificial loads of one and one-half the original designed value.
5. The building or structure, or part of the building or structure, because of dilapidation, *deterioration, decay, faulty construction*, the removal or movement of some portion of the ground necessary for the support, or for any other reason, is likely to partially or completely collapse, or some portion of the foundation or underpinning of the building or structure is likely to fail or give way.
6. The building or structure, or any portion thereof, is clearly unsafe for its use and *occupancy*.
7. The building or structure is *neglected, damaged, dilapidated, unsecured* or abandoned so as to become an attractive nuisance to children who might play in the building or structure to their danger, becomes a harbor for vagrants, criminals or immoral persons, or enables persons to resort to the building or structure for committing a nuisance or an unlawful act.
8. Any building or structure has been constructed, exists or is maintained in violation of any specific requirement or prohibition applicable to such building or structure provided by the *approved* building or fire code of the jurisdiction, or of any law or ordinance to such an extent as to present either a substantial risk of fire, building collapse or any other threat to life and safety.
9. A building or structure, used or intended to be used for dwelling purposes, because of inadequate maintenance, dilapidation, decay, damage, faulty construction or arrangement, inadequate light, *ventilation, mechanical or plumbing system*, or otherwise, is determined by the *code official* to be insanitary, unfit for human habitation or in such a condition that is likely to cause sickness or disease.
10. Any building or structure, because of a lack of sufficient or proper fire-resistance-rated construction, fire protection systems, electrical system, fuel connections, mechanical system, plumbing system or other cause, is determined by the *code official* to be a

threat to life or health.

11. Any portion of a building remains on a site after the demolition or destruction of the building or structure or whenever any building or structure is abandoned so as to constitute such building or portion thereof as an attractive nuisance or hazard to the public.

108.2 Closing of vacant structures. If the structure is vacant and unfit for human habitation and *occupancy*, and is not in danger of structural collapse, the *code official* is authorized to post a placard of condemnation on the *premises* and order the structure closed up so as not to be an attractive nuisance. Upon failure of the *owner* or owner's authorized agent to close up the *premises* within the time specified in the order, the *code official* shall cause the *premises* to be closed and secured through any available public agency or by contract or arrangement by private persons and the cost thereof shall be charged against the real estate upon which the structure is located and shall be a lien upon such real estate and shall be collected by any other legal resource.

108.2.1 Authority to disconnect service utilities. The *code official* shall have the authority to authorize disconnection of utility service to the building, structure or system regulated by this code and the referenced codes and standards set forth in Section 102.7 in case of emergency where necessary to eliminate an immediate hazard to life or property or where such utility connection has been made without approval. The *code official* shall notify the serving utility and, whenever possible, the *owner* or owner's authorized agent and *occupant* of the building, structure or service system of the decision to disconnect prior to taking such action. If not notified prior to disconnection the *owner*, owner's authorized agent or *occupant* of the building structure or service system shall be notified in writing as soon as practical thereafter.

~~108.7~~ **108.3 Record.** The *code official* shall cause a report to be filed on an unsafe condition. The report shall state the *occupancy* of the structure and the nature of the unsafe condition.

Delete without substitution:

~~SECTION 107~~ ~~NOTICES AND ORDERS~~

Revise as follows:

~~107.1~~ **108.4 Notice to person responsible.** Whenever the *code official* determines that there has been a violation of this code or has grounds to believe that a violation has occurred, notice shall be given in the manner prescribed in Sections ~~107.2 and 107.3~~ to the person responsible for the violation 108.4.1 and 108.4.2 to the owner or the owner's authorized agent, as specified in this code. Notices for condemnation procedures shall comply with Section 108.3.

~~107.2~~ **108.4.1 Form.** Such ~~notice prescribed in Section 107.1 shall~~ notice shall be in accordance with all of the following:

1. Be in writing.
2. Include a description of the real estate sufficient for identification.
3. Include a statement of the violation or violations and why the notice is being issued.
4. Include a correction order allowing a reasonable time to make the repairs and improvements required to bring the *dwelling unit* or structure into compliance with the provisions of this code.
5. Inform the property *owner* or owner's authorized agent of the right to appeal.
6. Include a statement of the right to file a lien in accordance with Section 106.3.

~~107.3~~ **108.4.2 Method of service.** Such notice shall be deemed to be properly served if where a copy thereof is served in accordance with one of the following methods: delivered personally, or

1. A copy is delivered personally.
2. A copy is sent by certified or first-class registered mail addressed to the owner at the last known address with the return receipt requested.
3. A copy is delivered in any other manner as prescribed by local law.

If the certified or registered letter last known address. If the notice is returned showing that the letter was not delivered, a copy thereof shall be posted in a conspicuous place in or about the structure affected by such notice. Service of such notice in the foregoing manner upon the owner's agent or upon the person responsible for the structure shall constitute service of notice upon the owner.

107.4 108.5 Unauthorized tampering. Signs, tags or seals posted or affixed by the *code official* shall not be mutilated, destroyed or tampered with, or removed without authorization from the *code official*.

Delete without substitution:

~~107.5 Penalties.~~ Penalties for noncompliance with orders and notices shall be as set forth in Section 106.4.

Revise as follows:

~~107.6~~ **108.6 Transfer of ownership.** It shall be unlawful for the owner of any *dwelling unit* or structure who has received a compliance order or

upon whom a notice of violation has been served to sell, transfer, mortgage, lease or otherwise dispose of such *dwelling unit* or structure to another until the provisions of the compliance order or notice of violation have been complied with, or until such *owner* or the owner's authorized agent shall first furnish the grantee, transferee, mortgagee or lessee a true copy of any compliance order or notice of violation issued by the *code official* and shall furnish to the *code official* a signed and notarized statement from the grantee, transferee, mortgagee or lessee, acknowledging the receipt of such compliance order or notice of violation and fully accepting the responsibility without condition for making the corrections or repairs required by such compliance order or notice of violation.

Delete without substitution:

~~**108.3 Notice.** Whenever the *code official* has condemned a structure or equipment under the provisions of this section, notice shall be posted in a conspicuous place in or about the structure affected by such notice and served on the *owner*, *owner's* authorized agent or the person or persons responsible for the structure or equipment in accordance with Section 107.3. If the notice pertains to equipment, it shall be placed on the condemned equipment. The notice shall be in the form prescribed in Section 107.2.~~

Revise as follows:

~~**108.4 108.7 Placarding.** Upon failure of the *owner*, *owner's* authorized agent or person responsible to comply with the notice provisions within the time given, the *code official* shall post on the *premises* or on defective equipment a placard bearing the word "Condemned" and a statement of the penalties provided for occupying the *premises*, operating the equipment or removing the placard. Such notice shall be posted in a conspicuous place in or about the structure affected by such notice. If the notice pertains to equipment, it shall be placed on the condemned equipment.~~

~~**108.4.1 108.7.1 Placard removal.** The *code official* shall remove the condemnation placard whenever the defect or defects upon which the condemnation and placarding action were based have been eliminated. Any person who defaces or removes a condemnation placard without the approval of the *code official* shall be subject to the penalties provided by this code.~~

~~**108.5 108.8 Prohibited occupancy.** Any occupied structure condemned and placarded by the *code official* shall be vacated as ordered by the *code official*. Any person who shall occupy a placarded *premises* or shall operate placarded equipment, and any *owner* ; or *owner's* authorized agent or person responsible for the *premises* who shall let anyone occupy a placarded *premises* or operate placarded equipment shall be liable for the penalties provided by this code.~~

~~**108.6 108.9 Abatement methods: Restoration or abatement.** The structure or equipment determined to be unsafe by the code official is permitted to be restored to a safe condition. The *owner*, *owner's* authorized agent, *operator* or *occupant* of a ~~building structure,~~*premises* or equipment deemed unsafe by the *code official* shall abate or cause to be abated or corrected such unsafe conditions either by repair, rehabilitation, demolition or other *approved* corrective action. To the extent that repairs, alterations, or additions are made or a change of occupancy occurs during the restoration of the structure, such repairs, alterations, additions, or change of occupancy shall comply with the requirements of the International Existing Building Code.~~

Reason: The intent is the coordination of the requirements in the section dealing with **Unsafe Structures and Equipment** in the IBC, IFC, IEBC and IPMC.

- Consistently use "structure" instead of "building" or "building or structure"
- "Owner's authorized agent" was added extensively last cycle. A person responsible for the premises is an owner's authorized agent – so the language can be removed. "Operator" has not been removed because it is a defined term in the IPMC.
- Similar language for Unsafe Conditions (IBC 116.1, IFC 111.1.1, IEBC 115.1, IPMC 108.1)
- Similar language for Record (IBC 116.2, IFC 111.3, IEBC 115.2, IPMC 108.3)
- Similar language for Notice (IBC 116.3, IFC 111.4, IEBC 115.3, IPMC 108.4 & 108.5)
- Similar language for Method of service (IBC 116.4, IFC 111.5, IEBC 115.4, IPMC 107.3)
- IFC should include requirements for record, notice and method of service.
- IFC and IPMC has a section on abatement, and IBC and IEBC have a section on restoration. Both include provisions for bring the structure into a safe condition, so both should be permitted/addressed in all four codes. (IBC 116.5, IFC 111.6, IEBC 115.5, IPMC 108.6)

The IPMC has some duplication of requirements in Section 107 and 108. It was decided that moving Section 107 into 108 would provide clarity and allow further coordination.

The BCAC is working from the philosophy that ICC is a family of codes, so administrative requirements should be consistent across books. Most administrative and enforcement matters are the same for any code. Those matters unique for a specific code remain unchanged. This is one of a series of proposals being submitted relating to technical, editorial and organizational changes proposed for the Administrative chapters (Chapter 1) in all of the I-Codes.

While the Administrative Committee will consider each proposal independently, the proposals in this package are a correlated set of companion code change proposals."

The following is the template utilized to create this code change proposal. There may be some differences depending on the unique applications of each code – such as "building/fire/code official".

SECTION 116 UNSAFE STRUCTURES AND EQUIPMENT

[A] 116.1 Unsafe Conditions. Structures or existing equipment that are or hereafter become unsafe, insanitary or deficient because of inadequate *means of egress* facilities, inadequate light and ventilation, or that constitute a fire hazard, or are otherwise dangerous to human life or the public welfare, or that involve illegal or improper occupancy or inadequate maintenance, shall be deemed an unsafe condition. Unsafe structures shall be taken down and removed or made safe, as the *building official* deems necessary and as provided for in this section. A vacant structure that is not secured against unauthorized entry shall be deemed unsafe.

[A] 116.2 Record. The *building official* shall cause a report to be filed on an unsafe condition. The report shall state the occupancy of the structure and the nature of the unsafe condition.

[A] 116.3 Notice. If an unsafe condition is found, the *building official* shall serve on the *owner* of the structure or the owner's authorized agent, a written notice that describes the condition deemed unsafe and specifies the required repairs or improvements to be made to abate the unsafe condition, or that requires the unsafe structure to be demolished within a stipulated time. Such notice shall require the person thus notified to declare immediately to the *building official* acceptance or rejection of the terms of the order.

[A] 116.4 Method of service. Such notice shall be deemed properly served where a copy thereof is served in accordance with one of the following methods:

1. A copy is delivered to the *owner* personally;
2. A copy is sent by certified or registered mail addressed to the *owner* at the last known address with the return receipt requested; or
3. A copy is delivered in any other manner as prescribed by local law.

If the certified or registered letter is returned showing that the letter was not delivered, a copy thereof shall be posted in a conspicuous place in or about the structure affected by such notice. Service of such notice in the foregoing manner upon the owner's authorized agent shall constitute service of notice upon the *owner*.

[A] 116.5 Restoration or Abatement. Where the structure or equipment determined to be unsafe by the *building official* is restored to a safe condition. The *owner*, the owner's authorized agent, operator or occupant of a structure, premises or equipment deemed unsafe by the *code official* shall abate or cause to be abated or corrected such unsafe conditions either by repair, rehabilitation, demolition or other *approved* corrective action. To the extent that repairs, *alterations* or *additions* are made or a change of occupancy occurs during the restoration of the structure, such *repairs*, *alterations*, *additions* and change of occupancy shall comply with the requirements of Section 105.2.2 and the *International Existing Building Code*.

This proposal is submitted by the ICC Building Code Action Committee (BCAC), the ICC Fire Code Action Committee (FCAC) and the ICC Plumbing/Mechanical/Gas Code Action Committee (PMG CAC)

BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

The FCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes with regard to fire safety and hazardous materials in new and existing buildings and facilities and the protection of life and property in wildland urban interface areas. In 2018 the Fire-CAC has held 3 open meetings. In addition, there were numerous conference calls, Regional Work Group and Task Group meetings for the current code development cycle, which included members of the committees as well as any interested parties, to discuss and debate the proposed changes. Related documentation and reports are posted on the FCAC website at: <https://www.iccsafe.org/codes-tech-support/cs/fire-code-action-committee-fcac/>

The PMG CAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance the International Codes or portions thereof that were under the purview of the PMG CAC. In 2017-2018, the PMG CAC held one face-to-face meeting and 11 conference call meetings. Numerous interested parties attended the committee meetings and offered their input. Related documentation and reports are posted on the PMGCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/pmg-code-action-committee-pmgcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is an editorial change that provides consistency between I-codes.

ADM43-19 Part I

PART I — IBC®: B, SECTION B101, [A] B101.1, B101.1 (New), B101.2 (New), B101.2.1 (New), [A] B101.2, [A] B101.2.2, [A] B101.2.1, B101.3.3 (New), [A] B101.2.4, [A] B101.2.6, [A] B101.2.5, [A] B101.2.7, B101.3.8 (New), [A] B101.2.3, [A] B101.3, [A] B101.3.1, B101.5.2 (New), [A] B101.3.2, [A] B101.3.3, B101.6 (New), [A] B101.4, [A] B101.4.1, [A] B101.4.2, B101.8 (New); IEBC®: APPENDIX A (New), SECTION A101 (New), A101.1 (New), A101.2 (New), A101.2.1 (New), A101.2.2 (New), A101.3 (New), A101.3.1 (New), A101.3.2 (New), A101.3.3 (New), A101.3.4 (New), A101.3.5 (New), A101.3.6 (New), A101.3.7 (New), A101.3.8 (New), A101.4 (New), A101.5 (New), A101.5.1 (New), A101.5.2 (New), A101.5.3 (New), A101.6 (New), A101.7 (New), A101.7.1 (New), A101.7.2 (New), A101.8 (New); IFC®: A, SECTION A101, A101.1, A101.2 (New), A101.2.1 (New), A101.2.2 (New), A101.2, A101.2.1, A101.2.2, A101.2.3, A101.2.4, A101.2.5, A101.3, A101.3.1, A101.3.1 (New), A101.3.2 (New), A101.3.2, A101.3.4 (New), A101.5, A101.9, A101.8, A101.3.7 (New), A101.3.3, A101.10, A101.7, A101.5.1 (New), A101.4, A101.5.3 (New), A101.6, A101.7 (New), A101.7.1 (New), A101.7.2 (New), A101.8 (New); IFGC®: APPENDIX A (New), A101 (New), A101.1 (New), A101.2 (New), A101.2.1 (New), A101.2.2 (New), [A] 109.2, [A] 109.2.1, [A] 109.2.2, A101.3.3 (New), [A] 109.2.3, [A] 109.2.5, [A] 109.2.4, [A] 109.2.6, A101.3.8 (New), [A] 109.4.1, [A] 109.3, [A] 109.4, A101.5.2 (New), [A] 109.5, A101.6 (New), [A] 109.6, [A] 109.6.1, [A] 109.6.2, [A] 109.7; IMC®: APPENDIX A (New), SECTION A101 (New), A101.1 (New), A101.2 (New), A101.2.1 (New), A101.2.2 (New), [A] 109.2, [A] 109.2.1, [A] 109.2.2, A101.3.3, [A] 109.2.3, [A] 109.2.5, [A] 109.2.4, [A] 109.2.6, A101.3.8 (New), [A] 109.4.1, [A] 109.3, [A] 109.4, A101.5.2 (New), [A] 109.5, A101.6 (New), [A] 109.6, [A] 109.6.1, [A] 109.6.2, [A] 109.7; IPC®: APPENDIX A (New), SECTION A101 (New), A101.1 (New), A101.2 (New), A101.2.1 (New), A101.2.2 (New), 109.2, 109.2.1, 109.2.2, A101.3.3 (New), 109.2.3, 109.2.5, 109.2.4, 109.2.6, A101.3.8 (New), 109.4.1, 109.3, 109.4, A101.5.2 (New), 109.5, A101.6 (New), 109.6, 109.6.1, 109.6.2, 109.7; IPSC®: APPENDIX A (New), SECTION A101 (New), A101.1 (New), A101.2 (New), A101.2.1 (New), A101.2.2 (New), [A] 109.2, [A] 109.2.1, [A] 109.2.2, A101.3.3 (New), [A] 109.2.3, [A] 109.2.5, [A] 109.2.4, [A] 109.2.6, A101.3.8 (New), [A] 109.4.1, [A] 109.3, [A] 109.4, A101.5.2 (New), [A] 109.5, A101.6 (New), [A] 109.6, [A] 109.6.1, [A] 109.6.2, [A] 109.7; IPMC®: APPENDIX A (New), SECTION A101 (New), A101.1 (New), A101.2 (New), A101.2.1 (New), [A] 111.8, [A] 111.2, A101.3.1 (New), [A] 111.2.1, A101.3.3 (New), [A] 111.2.2, [A] 111.2.4, [A] 111.2.3, [A] 111.2.5, A101.3.8 (New), [A] 111.4.1, [A] 111.3, [A] 111.4, A101.5.2 (New), [A] 111.5, A101.6 (New), [A] 111.6, [A] 111.6.1, [A] 111.6.2, [A] 111.7; ISPC®: APPENDIX A (New), SECTION A101 (New), A101.1 (New), A101.2 (New), A101.2.1 (New), A101.2.2 (New), [A] 108.2, [A] 108.2.1, [A] 108.2.2, A101.3.3 (New), [A] 108.2.3, [A] 108.2.5, [A] 108.2.4, [A] 108.2.6, A101.3.8 (New), [A] 108.4.1, [A] 108.3, [A] 108.4, A101.5.2 (New), [A] 108.5, A101.6 (New), [A] 108.6, [A] 108.6.1, [A] 108.6.2, [A] 108.7; IWUIC®: SECTION 106, [A] 106.1, A (New), SECTION A101 (New), A101.1 (New), A101.2 (New), A101.2.1 (New), A101.2.2 (New), A101.3 (New), A101.3.1 (New), A101.3.2 (New), A101.3.3 (New), A101.3.4 (New), A101.3.5 (New), A101.3.6 (New), A101.3.7 (New), A101.3.8 (New), A101.4 (New), A101.5 (New), A101.5.1 (New), A101.5.2 (New), A101.5.3 (New), A101.6 (New), A101.7 (New), A101.7.1 (New), A101.7.2 (New), A101.8 (New)

PART II — IRC®: APPENDIX A (New), SECTION A101 (New), A101.1 (New), A101.2 (New), A101.2.1 (New), A101.2.2 (New), A101.3 (New), A101.3.1 (New), A101.3.2 (New), A101.3.3 (New), A101.3.4 (New), A101.3.5 (New), A101.3.6 (New), A101.3.7 (New), A101.3.8 (New), A101.4 (New), A101.5 (New), A101.5.1 (New), A101.5.2 (New), A101.5.3 (New), A101.6 (New), A101.7 (New), A101.7.1 (New), A101.7.2 (New), A101.8 (New)

PART III — IECC: APPENDIX CA (New), SECTION CA101 (New), CA101.1 (New), CA101.2 (New), CA101.2.1 (New), CA101.2.2 (New), CA101.3 (New), CA101.3.1 (New), CA101.3.2 (New), CA101.3.3 (New), CA101.3.4 (New), CA101.3.5 (New), CA101.3.6 (New), CA101.3.7 (New), CA101.3.8 (New), CA101.4 (New), CA101.5 (New), CA101.5.1 (New), CA101.5.2 (New), CA101.5.3 (New), CA101.6 (New), CA101.7 (New), CA101.7.1 (New), CA101.7.2 (New), CA101.8 (New)

PART IV — IECC: Appendix RA (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgac@iccsafe.org); Michael O'Brian, representing FCAC (fcac@iccsafe.org)

THIS IS A 4 PART CODE CHANGE. PART I WILL BE HEARD BY THE ADMINISTRATIVE CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-BUILDING CODE COMMITTEE. PART III WILL BE HEARD BY THE IECC-COMMERCIAL CODE COMMITTEE. PART IV WILL BE HEARD BY THE IECC-RESIDENTIAL CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Building Code

APPENDIX B BOARD OF APPEALS

Revise as follows:

SECTION B101 GENERAL

Delete without substitution:

~~[A] B101.1 Application.~~ Applications for appeal shall be obtained from the building official. Applications shall be filed within 20 days after notice has been served.

Add new text as follows:

B101.1 Scope. A board of appeals shall be established within the jurisdiction for the purpose of hearing applications for modification of the requirements of this code pursuant to the provisions of Section 113 (Means of Appeals). The board shall be established and operated in accordance with this section, and shall be authorized to hear evidence from appellants and the building official pertaining to the application and intent of this code for the purpose of issuing orders pursuant to these provisions.

B101.2 Application for appeal. Any person shall have the right to appeal a decision of the building official to the board. An application for appeal shall be based on a claim that the intent of this code or the rules legally adopted hereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an equally good or better form of construction is proposed. The application shall be filed on a form obtained from the building official within 20 days after the notice was served.

B101.2.1 Limitation of authority. The board shall not have authority to waive requirements of this code or interpret the administration of this code.

B101.2 Stays of enforcement. Appeals of notice and orders, other than Imminent Danger notices, shall stay the enforcement of the notice and order until the appeal is heard by the board.

Revise as follows:

[A] ~~B101.2~~ **B101.3 Membership of board.** The board of appeals shall consist of ~~persons~~ five voting members appointed by the chief appointing authority of the jurisdiction. Each member shall serve for [INSERT NUMBER OF YEARS] years or until a successor has been appointed. The board member's terms shall be staggered at intervals, so as to provide continuity. The code official shall be an ex officio member of said board but shall not vote on any matter before the board, as follows:

1. One for 5 years; one for 4 years; one for 3 years; one for 2 years; and one for 1 year.
2. Thereafter, each new member shall serve for 5 years or until a successor has been appointed.

The building official shall be an ex officio member of said board but shall have no vote on any matter before the board.

[A] ~~B101.2.2~~ **B101.3.1 Qualifications.** The board of appeals shall consist of five individuals, who are qualified by experience and training to pass on matters pertaining to building construction and are not employees of the jurisdiction ~~one from each of the following professions or disciplines:~~

1. Registered design professional with architectural experience or a builder or superintendent of building construction with not fewer than 10 years of experience, 5 of which shall have been in responsible charge of work.
2. Registered design professional with structural engineering experience.
3. Registered design professional with mechanical and plumbing engineering experience or a mechanical contractor with not fewer than 10 years of experience, 5 of which shall have been in responsible charge of work.
4. Registered design professional with electrical engineering experience or an electrical contractor with not fewer than 10 years of experience, 5 of which shall have been in responsible charge of work.
5. Registered design professional with fire protection engineering experience or a fire protection contractor with not fewer than 10 years of experience, 5 of which shall have been in responsible charge of work.

[A] ~~B101.2.1~~ **B101.3.2 Alternate members.** The chief appointing authority ~~shall is authorized to~~ appoint two alternate members who shall be called by the board chairperson to hear appeals during the absence or disqualification of a member. Alternate members shall possess the qualifications required for board membership, and shall be appointed for 5 years, ~~the same term~~ or until a successor has been appointed.

Add new text as follows:

B101.3.3 Vacancies. Vacancies shall be filled for an unexpired term in the same manner in which original appointments are required to be made.

Revise as follows:

[A] ~~B101.2.4~~ **B101.3.4 Chairperson.** The board shall annually select one of its members to serve as chairperson.

[A] ~~B101.2.6~~ **B101.3.5 Secretary.** The chief ~~administrative officer~~ appointing authority shall designate a qualified clerk to serve as secretary to the board. The secretary shall file a detailed record of all proceedings ~~in the office of the chief administrative officer,~~ which shall set forth the reasons for the board's decision, the vote of each member, the absence of a member and any failure of a member to vote.

[A] ~~B101.2.5~~ **B101.3.6 Disqualification-Conflict of member interest.** A member shall not hear an appeal in which that member has ~~a with any~~ personal, professional or financial ~~interest~~ interest in a matter before the board shall declare such interest and refrain from participating in discussions, deliberations and voting on such matters.

[A] ~~B101.2.7~~ **B101.3.7 Compensation of members.** Compensation of members shall be determined by law.

Add new text as follows:

B101.3.8 Removal from the board. A member shall be removed from the board prior to the end of their terms only for cause. Any member with continued absence from regular meeting of the board may be removed at the discretion of the chief appointing authority.

Revise as follows:

[A] ~~B101.2.3~~ **B101.4 Rules and procedures.** The board ~~is authorized to shall~~ establish policies and procedures necessary to carry out its duties consistent with the provisions of this code and applicable state law. The procedures shall not require compliance with strict rules of evidence, but shall mandate that only relevant information be presented.

[A] ~~B101.3~~ **B101.5 Notice of meeting.** The board shall meet upon notice from the chairperson, within 10 days of the filing of an appeal or at stated periodic meetings.

[A] ~~B101.3.1~~ **B101.5.1 Open hearing.** All hearings before the board shall be open to the public. The appellant, the appellant's representative, the building official and any person whose interests are affected shall be given an opportunity to be heard.

Add new text as follows:

B101.5.2 Quorum. Three members of the board shall constitute a quorum.

Delete without substitution:

[A] ~~B101.3.2~~ **Procedure.** ~~The board shall adopt and make available to the public through the secretary procedures under which a hearing will be conducted. The procedures shall not require compliance with strict rules of evidence, but shall mandate that only relevant information be received.~~

Revise as follows:

[A] ~~B101.3.3~~ **B101.5.3 Postponed hearing.** When five members are not present to hear an appeal, either the appellant or the appellant's representative shall have the right to request a postponement of the hearing.

Add new text as follows:

B101.6 Legal counsel. The jurisdiction shall furnish legal counsel to the board to provide members with general legal advice concerning matters before them for consideration. Members shall be represented by legal counsel at the jurisdiction's expense in all matters arising from service within the scope of their duties.

Revise as follows:

[A] ~~B101.4~~ **B101.7 Board decision.** The board shall modify or reverse the decision of the *building official* by a concurring vote of two-thirds of its members. ~~The board shall only modify or reverse the decision of the code official by a concurring vote of three or more members.~~

[A] ~~B101.4.1~~ **B101.7.1 Resolution.** The decision of the board shall be by resolution. ~~Certified copies shall be~~ Every decision shall be promptly filed in writing in the office of the code official within three days and shall be open to the public for inspection. A certified copy shall be furnished to the appellant or the appellant's representative and to the *building code official*.

[A] ~~B101.4.2~~ **B101.7.2 Administration.** The *building official* shall take immediate action in accordance with the decision of the board.

Add new text as follows:

B101.8 Court review. Any person, whether or not a previous party of the appeal, shall have the right to apply to the appropriate court for a writ of certiorari to correct errors of law. Application for review shall be made in the manner and time required by law following the filing of the decision in the office of the chief administrative officer.

2018 International Existing Building Code

APPENDIX A BOARD OF APPEALS

SECTION A101 GENERAL

A101.1 Scope. A board of appeals shall be established within the jurisdiction for the purpose of hearing applications for modification of the requirements of this code pursuant to the provisions of Section 112. The board shall be established and operated in accordance with this section, and shall be authorized to hear evidence from appellants and the code official pertaining to the application and intent of this code for the purpose of issuing orders pursuant to these provisions.

A101.2 Application for appeal. Any person shall have the right to appeal a decision of the code official to the board. An application for appeal shall be based on a claim that the intent of this code or the rules legally adopted hereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an equally good or better form of construction is proposed. The application shall be filed on a form obtained from the code official within 20 days after the notice was served.

A101.2.1 Limitation of authority. The board shall not have authority to waive requirements of this code or interpret the administration of this code.

A101.2.2 Stays of enforcement. Appeals of notice and orders, other than Imminent Danger notices, shall stay the enforcement of the notice and order until the appeal is heard by the board.

A101.3 Membership of board. The board shall consist of five voting members appointed by the chief appointing authority of the jurisdiction. Each member shall serve for [INSERT NUMBER OF YEARS] years or until a successor has been appointed. The board member's terms shall be staggered at intervals, so as to provide continuity. The code official shall be an ex officio member of said board but shall not vote on any matter before the board.

A101.3.1 Qualifications. The board shall consist of five individuals, who are qualified by experience and training to pass on matters pertaining to building construction and are not employees of the jurisdiction.

A101.3.2 Alternate members. The chief appointing authority is authorized to appoint two alternate members who shall be called by the board chairperson to hear appeals during the absence or disqualification of a member. Alternate members shall possess the qualifications required for board membership, and shall be appointed for the same term or until a successor has been appointed.

A101.3.3 Vacancies. Vacancies shall be filled for an unexpired term in the same manner in which original appointments are required to be made.

A101.3.4 Chairperson. The board shall annually select one of its members to serve as chairperson.

A101.3.5 Secretary. The chief appointing authority shall designate a qualified clerk to serve as secretary to the board. The secretary shall file a detailed record of all proceedings which shall set forth the reasons for the board's decision, the vote of each member, the absence of a member and any failure of a member to vote.

A101.3.6 Conflict of interest. A member with any personal, professional or financial interest in a matter before the board shall declare such interest and refrain from participating in discussions, deliberations and voting on such matters.

A101.3.7 Compensation of members. Compensation of members shall be determined by law.

A101.3.8 Removal from the board. A member shall be removed from the board prior to the end of their terms only for cause. Any member with continued absence from regular meeting of the board may be removed at the discretion of the chief appointing authority.

A101.4 Rules and procedures. The board shall establish policies and procedures necessary to carry out its duties consistent with the provisions of this code and applicable state law. The procedures shall not require compliance with strict rules of evidence, but shall mandate that only relevant information be presented.

A101.5 Notice of meeting. The board shall meet upon notice from the chairperson, within 10 days of the filing of an appeal or at stated periodic intervals.

A101.5.1 Open hearing. All hearings before the board shall be open to the public. The appellant, the appellant's representative, the code official and any person whose interests are affected shall be given an opportunity to be heard.

A101.5.2 Quorum. Three members of the board shall constitute a quorum.

A101.5.3 Postponed hearing. When five members are not present to hear an appeal, either the appellant or the appellant's representative shall have the right to request a postponement of the hearing.

A101.6 Legal counsel. The jurisdiction shall furnish legal counsel to the board to provide members with general legal advice concerning matters before them for consideration. Members shall be represented by legal counsel at the jurisdiction's expense in all matters arising from service within the scope of their duties.

A101.7 Board decision. The board shall only modify or reverse the decision of the code official by a concurring vote of three or more members.

A101.7.1 Resolution. The decision of the board shall be by resolution. Every decision shall be promptly filed in writing in the office of the code official within three days and shall be open to the public for inspection. A certified copy shall be furnished to the appellant or the appellant's representative and to the code official.

A101.7.2 Administration. The code official shall take immediate action in accordance with the decision of the board.

A101.8 Court review. Any person, whether or not a previous party of the appeal, shall have the right to apply to the appropriate court for a writ of certiorari to correct errors of law. Application for review shall be made in the manner and time required by law following the filing of the decision in the office of the chief administrative officer.

2018 International Fire Code

APPENDIX A BOARD OF APPEALS

Revise as follows:

SECTION A101 GENERAL

A101.1 Scope. A board of appeals shall be established within the jurisdiction for the purpose of hearing applications for modification of the requirements of ~~the International Fire Code~~ this code pursuant to the provisions of Section ~~108 of the International Fire Code~~ 109. The board shall be established and operated in accordance with this section, and shall be authorized to hear evidence from appellants and the fire code official pertaining to the application and intent of this code for the purpose of issuing orders pursuant to these provisions.

Add new text as follows:

A101.2 Application for appeal. Any person shall have the right to appeal a decision of the fire code official to the board. An application for appeal shall be based on a claim that the intent of this code or the rules legally adopted hereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an equally good or better form of construction is proposed. The application shall be filed on a form obtained from the fire code official within 20 days after the notice was served.

A101.2.1 Limitation of authority. The board shall not have authority to waive requirements of this code or interpret the administration of this code.

A102.2.2 Stays of enforcement. Appeals of notice and orders, other than Imminent Danger notices, shall stay the enforcement of the notice and order until the appeal is heard by the board.

Delete without substitution:

A101.2 Membership. ~~The membership of the board shall consist of five voting members having the qualifications established by this section. Members shall be nominated by the fire code official or the chief administrative officer of the jurisdiction, subject to confirmation by a majority vote of the governing body. Members shall serve without remuneration or compensation, and shall be removed from office prior to the end of their appointed terms only for cause.~~

A101.2.1 Design professional. ~~One member shall be a practicing design professional registered in the practice of engineering or architecture in the state in which the board is established.~~

A101.2.2 Fire protection engineering professional. ~~One member shall be a qualified engineer, technologist, technician or safety professional trained in fire protection engineering, fire science or fire technology. Qualified representatives in this category shall include fire protection contractors and certified technicians engaged in fire protection system design.~~

A101.2.3 Industrial safety professional. ~~One member shall be a registered industrial or chemical engineer, certified hygienist, certified safety professional, certified hazardous materials manager or comparably qualified specialist experienced in chemical process safety or industrial safety.~~

A101.2.4 General contractor. ~~One member shall be a contractor regularly engaged in the construction, alteration, maintenance, repair or remodeling of buildings or building services and systems regulated by the code.~~

A101.2.5 General industry or business representative. ~~One member shall be a representative of business or industry not represented by a member from one of the other categories of board members described in Sections A101.2.1 through A101.2.4.~~

Revise as follows:

A101.3 Terms-Membership of office, board. ~~Members shall be appointed for terms of 4 years. Members shall not be reappointed to serve more than two consecutive full terms. The board shall consist of five voting members appointed by the chief appointing authority of the jurisdiction. Each member shall serve for [INSERT NUMBER OF YEARS] years or until a successor has been appointed. The board member's terms shall be staggered at intervals, so as to provide continuity. The fire code official shall be an ex officio member of said board but shall not vote on any matter before the board.~~

Delete without substitution:

A101.3.1 Initial appointments. ~~Of the members first appointed, two shall be appointed for a term of 1 year, two for a term of 2 years, one for a term of 3 years.~~

Add new text as follows:

A101.3.1 Qualifications. The board shall consist of members who are qualified by experience and training to pass on matters pertaining to hazards of fire, explosions, hazardous conditions or fire protection systems, and are not employees of the jurisdiction.

A101.3.2 Alternate members. The chief appointing authority is authorized to appoint two alternate members who shall be called by the board chairperson to hear appeals during the absence or disqualification of a member. Alternate members shall possess the qualifications required for board membership, and shall be appointed for the same term or until a successor has been appointed.

Revise as follows:

~~A101.3.2~~ **A101.3.3 Vacancies.** Vacancies shall be filled for an unexpired term in the same manner in which original appointments are required to be made. ~~Members appointed to fill a vacancy in an unexpired term shall be eligible for reappointment to two full terms.~~

Add new text as follows:

A101.3.4 Chairperson. The board shall annually select one of its members to serve as chairperson.

Revise as follows:

~~A101.5~~ **A101.3.5 Secretary of board.** ~~The *fire code official* shall act as secretary of the board and shall keep~~ chief appointing authority shall designate a qualified clerk to serve as secretary to the board. The secretary shall file a detailed record of all its proceedings, which shall set forth the reasons for its decisions, the board's decision, the vote of each member, the absence of a member and any failure of a member to vote.

Delete without substitution:

~~A101.9 Decisions.~~ ~~Every decision shall be promptly filed in writing in the office of the *fire code official* and shall be open to public inspection. A certified copy shall be sent by mail or otherwise to the appellant, and a copy shall be kept publicly posted in the office of the *fire code official* for 2 weeks after filing.~~

Revise as follows:

~~A101.8~~ **A101.3.6 Conflict of interest.** ~~Members with a material~~ A member with any personal, professional or financial interest in a matter before the board shall declare such interest and refrain from participating in discussions, deliberations and voting on such matters.

Add new text as follows:

A101.3.7 Compensation of members. Compensation of members shall be determined by law.

Revise as follows:

~~A101.3.3~~ **A101.3.8 Removal from office the board.** ~~Members~~ A member shall be removed from office the board prior to the end of their terms only for cause. Continued absence of any member cause. Any member with continued absence from regular meetings meeting of the board shall, may be removed at the discretion of the applicable governing body, render any such member liable to immediate removal from office. chief appointing authority.

~~A101.10~~ **A101.4 Procedures. Rules and procedures.** ~~The board shall be operated in accordance with the Administrative Procedures Act of the state in which it is established or shall establish rules and regulations for its own procedure not inconsistent~~ establish policies and procedures necessary to carry out its duties consistent with the provisions of this code and applicable state law. The procedures shall not require compliance with strict rules of evidence, but shall mandate that only relevant information be presented.

~~A101.7~~ **A101.5 Meetings. Notice of meetings.** ~~The board shall meet at regular intervals, to be determined by the chairman. In any event, the board shall meet upon notice from the chairperson, within 10 days after notice of the filing of appeal has been received. an appeal or at stated periodic intervals.~~

Add new text as follows:

A101.5.1 Open hearing. All hearings before the board shall be open to the public. The appellant, the appellant's representative, the fire code official and any person whose interests are affected shall be given an opportunity to be heard.

Revise as follows:

~~A101.4~~ **A101.5.2 Quorum.** ~~Three members of the board shall constitute a quorum. In varying the application of any provisions of this code or in modifying an order of the *fire code official*, affirmative votes of the majority present, but not less than three, shall be required.~~

Add new text as follows:

A101.5.3 Postponed hearing. When five members are not present to hear an appeal, either the appellant or the appellant's representative shall have the right to request a postponement of the hearing.

Revise as follows:

A101.6 Legal counsel. The jurisdiction shall furnish legal counsel to the board to provide members with general legal advice concerning matters before them for consideration. consideration. Members shall be represented by legal counsel at the jurisdiction's expense in all matters arising from service within the scope of their duties.

Add new text as follows:

A101.7 Board decision. The board shall only modify or reverse the decision of the fire code official by a concurring vote of three or more members.

A101.7.1 Resolution. The decision of the board shall be by resolution. Every decision shall be promptly filed in writing in the office of the fire code official within three days and shall be open to the public for inspection. A certified copy shall be furnished to the appellant or the appellant's representative and to the fire code official.

A101.7.2 Administration. The fire code official shall take immediate action in accordance with the decision of the board.

A101.8 Court review. Any person, whether or not a previous party of the appeal, shall have the right to apply to the appropriate court for a writ of certiorari to correct errors of law. Application for review shall be made in the manner and time required by law following the filing of the decision in the office of the chief administrative officer.

2018 International Fuel Gas Code

APPENDIX A BOARD OF APPEALS

A101 GENERAL

A101.1 Scope. A board of appeals shall be established within the jurisdiction for the purpose of hearing applications for modification of the requirements of this code pursuant to the provisions of Section 109 (Means of Appeals). The board shall be established and operated in accordance with this section, and shall be authorized to hear evidence from appellants and the code official pertaining to the application and intent of this code for the purpose of issuing orders pursuant to these provisions.

A101.2 Application for appeal. Any person shall have the right to appeal a decision of the code official to the board. An application for appeal shall be based on a claim that the intent of this code or the rules legally adopted hereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an equally good or better form of construction is proposed. The application shall be filed on a form obtained from the code official within 20 days after the notice was served.

A101.2.1 Limitation of authority. The board shall not have authority to waive requirements of this code or interpret the administration of this code.

A101.2.2 Stays of enforcement. Appeals of notice and orders, other than Imminent Danger notices, shall stay the enforcement of the notice and order until the appeal is heard by the board.

Revise as follows:

[A] ~~109-2~~ A101.3 Membership of board. The board of appeals shall consist of five voting members appointed by the chief appointing authority as follows: one for 5 years; one for 4 years; one for 3 years; one for 2 years and one for 1 year. Thereafter, each new of the jurisdiction. Each member shall serve for 5 [INSERT NUMBER OF YEARS] years or until a successor has been appointed. The board member's terms shall be staggered at intervals, so as to provide continuity. The code official shall be an ex officio member of said board but shall not vote on any matter before the board.

[A] ~~109-2-1~~ A101.3.1 Qualifications. The board of appeals shall consist of five individuals, who are qualified by experience and training to pass on matters pertaining to building construction and are not employees of the jurisdiction, one from each of the following professions or disciplines:

1. Registered design professional who is a registered architect; or a builder or superintendent of building construction with not less than 10 years' experience, 5 of which shall have been in responsible charge of work.
2. Registered design professional with structural engineering or architectural experience.
3. Registered design professional with fuel gas and plumbing engineering experience; or a fuel gas contractor with not less than 10 years' experience, 5 of which shall have been in responsible charge of work.
4. Registered design professional with electrical engineering experience; or an electrical contractor with not less than 10 years' experience, 5 of which shall have been in responsible charge of work.
5. Registered design professional with fire protection engineering experience; or a fire protection contractor with not less than 10 years' experience, 5 of which shall have been in responsible charge of work.

[A] ~~109-2-2~~ A101.3.2 Alternate members. The chief appointing authority shall is authorized to appoint two alternate members who shall be called by the board chairman chairperson to hear appeals during the absence or disqualification of a member. Alternate members shall possess the qualifications required for board membership, and shall be appointed for 5 years, the same term or until a successor has been appointed.

Add new text as follows:

A101.3.3 Vacancies. Vacancies shall be filled for an unexpired term in the same manner in which original appointments are required to be made.

Revise as follows:

[A] ~~109-2-3~~ A101.3.4 Chairman, Chairperson. The board shall annually select one of its members to serve as chairman chairperson.

[A] ~~109-2.5~~ A101.3.5 Secretary. The chief administrative officer ~~appointing authority~~ shall designate a qualified clerk to serve as secretary to the board. The secretary shall file a detailed record of all proceedings ~~in the office of the chief administrative officer;~~ which shall set forth the reasons for the board's decision, the vote of each member, the absence of a member and any failure of a member to vote.

[A] ~~109-2.4~~ A101.3.6 Disqualification **Conflict of member: interest. A member shall not hear an appeal in which that member has ~~a~~ with any personal, professional or financial interest in a matter before the board shall declare such interest and refrain from participating in discussions, deliberations and voting on such matters.**

[A] ~~109-2.6~~ A101.3.7 Compensation of members. Compensation of members shall be determined by law.

Add new text as follows:

A101.3.8 Removal from the board. A member shall be removed from the board prior to the end of their terms only for cause. Any member with continued absence from regular meeting of the board may be removed at the discretion of the chief appointing authority.

Revise as follows:

[A] ~~109-4.1~~ A101.4 Procedure. **Rules and procedures. The board shall ~~adopt and make available to the public through the secretary procedures under which a hearing will be conducted;~~ establish policies and procedures necessary to carry out its duties consistent with the provisions of this code and applicable state law. The procedures shall not require compliance with strict rules of evidence, but shall mandate that only relevant information be ~~received;~~ presented.**

[A] ~~109-3~~ A101.5 Notice of meeting. The board shall meet upon notice from the ~~chairman~~ chairperson, within 10 days of the filing of an appeal ~~or at stated periodic meetings;~~ intervals.

Add new text as follows:

A101.5.1 Open hearing. All hearings before the board shall be open to the public. The appellant, the appellant's representative, the code official and any person whose interests are affected shall be given an opportunity to be heard.

A101.5.2 Quorum. Three members of the board shall constitute a quorum.

Revise as follows:

[A] ~~109-5~~ A101.5.3 Postponed hearing. ~~Where~~ When five members are not present to hear an appeal, either the appellant or the appellant's representative shall have the right to request a postponement of the hearing.

Add new text as follows:

A101.6 Legal counsel. The jurisdiction shall furnish legal counsel to the board to provide members with general legal advice concerning matters before them for consideration. Members shall be represented by legal counsel at the jurisdiction's expense in all matters arising from service within the scope of their duties.

Revise as follows:

[A] ~~109-6~~ A101.7 Board decision. The board shall only modify or reverse the decision of the code official by a concurring vote of three or more members.

[A] ~~109-6.1~~ A101.7.1 Resolution. The decision of the board shall be by resolution. ~~Certified copies shall be~~ Every decision shall be promptly filed in writing in the office of the code official within three days and shall be open to the public for inspection. A certified copy shall be furnished to the appellant or the appellant's representative and to the code official.

[A] ~~109-6.2~~ A101.7.2 Administration. The code official shall take immediate action in accordance with the decision of the board.

[A] ~~109-7~~ A101.8 Court review. Any person, whether or not a previous party ~~to~~ of the appeal, shall have the right to apply to the appropriate court for a writ of certiorari to correct errors of law. Application for review shall be made in the manner and time required by law following the filing of the decision in the office of the chief administrative officer.

2018 International Mechanical Code

Add new text as follows:

APPENDIX A **BOARD OF APPEALS**

SECTION A101 **GENERAL**

A101.1 Scope. A board of appeals shall be established within the jurisdiction for the purpose of hearing applications for modification of the requirements of this code pursuant to the provisions of Section 109 (Means of Appeals). The board shall be established and operated in accordance with this section, and shall be authorized to hear evidence from appellants and the code official pertaining to the application and intent of this code for the purpose of issuing orders pursuant to these provisions.

A101.2 Application for appeal. Any person shall have the right to appeal a decision of the code official to the board. An application for appeal shall be based on a claim that the intent of this code or the rules legally adopted hereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an equally good or better form of construction is proposed. The application shall be filed on a form obtained from the code official within 20 days after the notice was served.

A101.2.1 Limitation of authority. The board shall not have authority to waive requirements of this code or interpret the administration of this code.

A101.2.2 Stays of enforcement. Appeals of notice and orders, other than Imminent Danger notices, shall stay the enforcement of the notice and order until the appeal is heard by the board.

Revise as follows:

[A] ~~409.2~~ A101.3 Membership of board. The board of appeals shall consist of five voting members appointed by the chief appointing authority as follows: one for 5 years; one for 4 years; one for 3 years; one for 2 years; and one for 1 year. Thereafter, each new of the jurisdiction. Each member shall serve for 5 [INSERT NUMBER OF YEARS] years or until a successor has been appointed. The board member's terms shall be staggered at intervals, so as to provide continuity. The code official shall be an ex officio member of said board but shall not vote on any matter before the board.

[A] ~~409.2.1~~ A101.3.1 Qualifications. The board of appeals shall consist of five individuals, who are qualified by experience and training to pass on matters pertaining to building construction and are not employees of the jurisdiction, one from each of the following professions or disciplines:

1. *Registered design professional who is a registered architect; or a builder or superintendent of building construction with not less than 10 years' experience, 5 of which shall have been in responsible charge of work.*
2. *Registered design professional with structural engineering or architectural experience.*
3. *Registered design professional with mechanical and plumbing engineering experience; or a mechanical contractor with not less than 10 years' experience, 5 of which shall have been in responsible charge of work.*
4. *Registered design professional with electrical engineering experience; or an electrical contractor with not less than 10 years' experience, 5 of which shall have been in responsible charge of work.*
5. *Registered design professional with fire protection engineering experience; or a fire protection contractor with not less than 10 years' experience, 5 of which shall have been in responsible charge of work.*

[A] ~~409.2.2~~ A101.3.2 Alternate members. The chief appointing authority shall is authorized to appoint two alternate members who shall be called by the board chairman chairperson to hear appeals during the absence or disqualification of a member. Alternate members shall possess the qualifications required for board membership, and shall be appointed for 5 years, the same term or until a successor has been appointed.

A101.3.3 Vacancies. Vacancies shall be filled for an unexpired term in the same manner in which original appointments are required to be made.

[A] ~~409.2.3~~ A101.3.4 Chairman. Chairperson. The board shall annually select one of its members to serve as chairman chairperson.

[A] ~~409.2.5~~ A101.3.5 Secretary. The chief administrative officer appointing authority shall designate a qualified clerk to serve as secretary to the board. The secretary shall file a detailed record of all proceedings in the office of the chief administrative officer, which shall set forth the reasons for the board's decision, the vote of each member, the absence of a member and any failure of a member to vote.

[A] ~~409.2.4~~ A101.3.6 Disqualification Conflict of member: interest. A member shall not hear an appeal in which that member has a with any personal, professional or financial interest in a matter before the board shall declare such interest and refrain from participating in discussions, deliberations and voting on such matters.

[A] ~~409.2.6~~ A101.3.7 Compensation of members. Compensation of members shall be determined by law.

Add new text as follows:

A101.3.8 Removal from the board. A member shall be removed from the board prior to the end of their terms only for cause. Any member with continued absence from regular meeting of the board may be removed at the discretion of the chief appointing authority.

Revise as follows:

[A] ~~409.4.1~~ A101.4 Procedure. Rules and procedures. The board shall adopt and make available to the public through the secretary procedures under which a hearing will be conducted, establish policies and procedures necessary to carry out its duties consistent with the provisions of this code and applicable state law. The procedures shall not require compliance with strict rules of evidence, but shall mandate that only relevant information be received presented.

[A] ~~409.3~~ A101.5 Notice of meeting. The board shall meet upon notice from the chairman chairperson, within 10 days of the filing of an appeal, or at stated periodic meetings intervals.

[A] ~~109.4~~ **A101.5.1 Open hearing.** ~~Hearings~~ All hearings before the board shall be open to the public. The appellant, the appellant's representative, the code official and any person whose interests are affected shall be given an opportunity to be heard.

Add new text as follows:

A101.5.2 Quorum. Three members of the board shall constitute a quorum.

Revise as follows:

[A] ~~109.5~~ **A101.5.3 Postponed hearing.** When five members are not present to hear an appeal, either the appellant or the appellant's representative shall have the right to request a postponement of the hearing.

Add new text as follows:

A101.6 Legal counsel. . The jurisdiction shall furnish legal counsel to the board to provide members with general legal advice concerning matters before them for consideration. Members shall be represented by legal counsel at the jurisdiction's expense in all matters arising from service within the scope of their duties.

Revise as follows:

[A] ~~109.6~~ **A101.7 Board decision.** The board shall only modify or reverse the decision of the code official by a concurring vote of three or more members.

[A] ~~109.6.1~~ **A101.7.1 Resolution.** The decision of the board shall be by resolution. ~~Certified copies shall be~~ Every decision shall be promptly filed in writing in the office of the code official within three days and shall be open to the public for inspection. A certified copy shall be furnished to the appellant or the appellant's representative and to the code official.

[A] ~~109.6.2~~ **A101.7.2 Administration.** The code official shall take immediate action in accordance with the decision of the board.

[A] ~~109.7~~ **A101.8 Court review.** Any person, whether or not a previous party of the appeal, shall have the right to apply to the appropriate court for a writ of certiorari to correct errors of law. Application for review shall be made in the manner and time required by law following the filing of the decision in the office of the chief administrative officer.

2018 International Plumbing Code

Add new text as follows:

APPENDIX A BOARD OF APPEALS

SECTION A101 GENERAL

A101.1 Scope. A board of appeals shall be established within the jurisdiction for the purpose of hearing applications for modification of the requirements of this code pursuant to the provisions of Section XXX (Means of Appeals). The board shall be established and operated in accordance with this section, and shall be authorized to hear evidence from appellants and the code official pertaining to the application and intent of this code for the purpose of issuing orders pursuant to these provisions.

A101.2 Application for appeal. Any person shall have the right to appeal a decision of the code official to the board. An application for appeal shall be based on a claim that the intent of this code or the rules legally adopted hereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an equally good or better form of construction is proposed. The application shall be filed on a form obtained from the code official within 20 days after the notice was served.

A101.2.1 Limitation of authority. The board shall not have authority to waive requirements of this code or interpret the administration of this code.

A101.2.2 Stays of enforcement. Appeals of notice and orders, other than Imminent Danger notices, shall stay the enforcement of the notice and order until the appeal is heard by the board.

Revise as follows:

~~109.2~~ **A101.3 Membership of board.** The board of appeals shall consist of five voting members appointed by the chief appointing authority ~~as follows: one for 5 years, one for 4 years, one for 3 years, one for 2 years and one for 1 year. Thereafter, each new~~ of the jurisdiction. Each member shall serve for 5 [INSERT NUMBER OF YEARS] years or until a successor has been appointed. The board member's terms shall be staggered at intervals, so as to provide continuity. The code official shall be an ex officio member of said board but shall not vote on any matter before the board.

~~109.2.1~~ **A101.3.1 Qualifications.** The board of appeals shall consist of five individuals, who are qualified by experience and training to pass on matters pertaining to building construction and are not employees of the jurisdiction. ~~one from each of the following professions or disciplines:~~

1. Registered design professional who is a registered architect; or a builder or superintendent of building construction with not less than 10 years' experience, 5 years of which shall have been in responsible charge of work.
2. Registered design professional with structural engineering or architectural experience.
3. Registered design professional with mechanical and plumbing engineering experience; or a mechanical and plumbing contractor with not less than 10 years' experience, 5 years of which shall have been in responsible charge of work.
4. Registered design professional with electrical engineering experience; or an electrical contractor with not less than 10 years' experience, 5 years of which shall have been in responsible charge of work.
5. Registered design professional with fire protection engineering experience; or a fire protection contractor with not less than 10 years' experience, 5 years of which shall have been in responsible charge of work.

~~409-2.2~~ **A101.3.2 Alternate members.** The chief appointing authority ~~shall~~ is authorized to appoint two alternate members who shall be called by the board ~~chairman~~ chairperson to hear appeals during the absence or disqualification of a member. Alternate members shall possess the qualifications required for board membership, and shall be appointed for ~~5 years~~ the same term or until a successor has been appointed.

Add new text as follows:

A101.3.3 Vacancies. Vacancies shall be filled for an unexpired term in the same manner in which original appointments are required to be made.

Revise as follows:

~~409-2.3~~ **A101.3.4 Chairman- Chairperson.** The board shall annually select one of its members to serve as ~~chairman~~ chairperson.

~~409-2.5~~ **A101.3.5 Secretary.** The chief ~~administrative officer~~ appointing authority shall designate a qualified clerk to serve as secretary to the board. The secretary shall file a detailed record of all proceedings ~~in the office of the chief administrative officer, which shall set forth the reasons for the board's decision, the vote of each member, the absence of a member and any failure of a member to vote.~~

~~409-2.4~~ **A101.3.6 Disqualification-Conflict of member interest.** A member ~~shall not hear an appeal in which that member has with~~ any personal, professional or financial ~~interest.~~ interest in a matter before the board shall declare such interest and refrain from participating in discussions, deliberations and voting on such matters.

~~409-2.6~~ **A101.3.7 Compensation of members.** Compensation of members shall be determined by law.

Add new text as follows:

A101.3.8 Removal from the board. A member shall be removed from the board prior to the end of their terms only for cause. Any member with continued absence from regular meeting of the board may be removed at the discretion of the chief appointing authority.

Revise as follows:

~~409-4.1~~ **A101.4 Procedure, Rules and procedures.** The board shall ~~adopt and make available to the public through the secretary procedures under which a hearing will be conducted.~~ establish policies and procedures necessary to carry out its duties consistent with the provisions of this code and applicable state law. The procedures shall not require compliance with strict rules of evidence, but shall mandate that only relevant information be ~~received.~~ presented.

~~409-3~~ **A101.5 Notice of meeting.** The board shall meet upon notice from the ~~chairman~~ chairperson, within 10 days of the filing of an appeal or at stated periodic ~~meetings.~~ intervals.

~~409-4~~ **A101.5.1 Open hearing.** ~~Hearings-~~ All hearings before the board shall be open to the public. The appellant, the appellant's representative, the code official and any person whose interests are affected shall be given an opportunity to be heard.

Add new text as follows:

A101.5.2 Quorum. Three members of the board shall constitute a quorum.

Revise as follows:

~~409-5~~ **A101.5.3 Postponed hearing.** When five members are not present to hear an appeal, either the appellant or the appellant's representative shall have the right to request a postponement of the hearing.

Add new text as follows:

A101.6 Legal counsel. The jurisdiction shall furnish legal counsel to the board to provide members with general legal advice concerning matters before them for consideration. Members shall be represented by legal counsel at the jurisdiction's expense in all matters arising from service within the scope of their duties.

Revise as follows:

~~109-6~~ **A101.7 Board decision.** The board shall only modify or reverse the decision of the code official by a concurring vote of three or more members.

~~109-6.1~~ **A101.7.1 Resolution.** The decision of the board shall be by resolution. ~~Certified copies shall be~~ Every decision shall be promptly filed in writing in the office of the code official within three days and shall be open to the public for inspection. A certified copy shall be furnished to the appellant or the appellant's representative and to the code official.

~~109-6.2~~ **A101.7.2 Administration.** The code official shall take immediate action in accordance with the decision of the board.

~~109-7~~ **A101.8 Court review.** Any person, whether or not a previous party of the appeal, shall have the right to apply to the appropriate court for a writ of certiorari to correct errors of law. Application for review shall be made in the manner and time required by law following the filing of the decision in the office of the chief administrative officer.

2018 International Private Sewage Disposal Code

Add new text as follows:

APPENDIX A BOARD OF APPEALS

SECTION A101 GENERAL

A101.1 Scope. A board of appeals shall be established within the jurisdiction for the purpose of hearing applications for modification of the requirements of this code pursuant to the provisions of Section 109 (Means of Appeals). The board shall be established and operated in accordance with this section, and shall be authorized to hear evidence from appellants and the code official pertaining to the application and intent of this code for the purpose of issuing orders pursuant to these provisions.

A101.2 Application for appeal. Any person shall have the right to appeal a decision of the code official to the board. An application for appeal shall be based on a claim that the intent of this code or the rules legally adopted hereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an equally good or better form of construction is proposed. The application shall be filed on a form obtained from the code official within 20 days after the notice was served.

A101.2.1 Limitation of authority. The board shall not have authority to waive requirements of this code or interpret the administration of this code.

A101.2.2 Stays of enforcement. Appeals of notice and orders, other than Imminent Danger notices, shall stay the enforcement of the notice and order until the appeal is heard by the board.

Revise as follows:

[A] ~~109-2~~ **A101.3 Membership of board.** The board of appeals shall consist of five voting members appointed by the chief appointing authority as follows: one for 5 years, one for 4 years, one for 3 years, one for 2 years and one for 1 year. Thereafter, each new of the jurisdiction. Each member shall serve for 5 [INSERT NUMBER OF YEARS] years or until a successor has been appointed. The board member's terms shall be staggered at intervals, so as to provide continuity. The code official shall be an ex officio member of said board but shall not vote on any matter before the board.

[A] ~~109-2.1~~ **A101.3.1 Qualifications.** The board of appeals shall consist of five individuals, who are qualified by experience and training to pass on matters pertaining to building construction and are not employees of the jurisdiction, one from each of the following professions or disciplines.

1. Registered design professional who is a registered architect; or a builder or superintendent of building construction with not less than 10 years' experience, 5 years of which shall have been in responsible charge of work.
2. Registered design professional with structural engineering or architectural experience.
3. Registered design professional with mechanical and plumbing engineering experience; or a mechanical and plumbing contractor with not less than 10 years' experience, 5 years of which shall have been in responsible charge of work.
4. Registered design professional with electrical engineering experience; or an electrical contractor with not less than 10 years' experience, 5 years of which shall have been in responsible charge of work.
5. Registered design professional with fire protection engineering experience; or a fire protection contractor with not less than 10 years' experience, 5 years of which shall have been in responsible charge of work.

[A] ~~109-2.2~~ **A101.3.2 Alternate members.** The chief appointing authority shall be authorized to appoint two alternate members who shall be called by the board chairman chairperson to hear appeals during the absence or disqualification of a member. Alternate members shall possess the qualifications required for board membership, and shall be appointed for 5 years the same term or until a successor has been appointed.

Add new text as follows:

A101.3.3 Vacancies. Vacancies shall be filled for an unexpired term in the same manner in which original appointments are required to be made.

Revise as follows:

[A] ~~109.2.3~~ **A101.3.4 Chairman- Chairperson.** The board shall annually select one of its members to serve as ~~chairman- chairperson.~~

[A] ~~109.2.5~~ **A101.3.5 Secretary.** The chief ~~administrative officer-appointing authority~~ shall designate a qualified clerk to serve as secretary to the board. The secretary shall file a detailed record of all proceedings in the office of the chief administrative officer, which shall set forth the reasons for the board's decision, the vote of each member, the absence of a member and any failure of a member to vote.

[A] ~~109.2.4~~ **A101.3.6 Disqualification Conflict of a member- interest.** A member ~~shall not hear an appeal in which that member has~~ with any personal, professional or financial interest in a matter before the board shall declare such interest and refrain from participating in discussions, deliberations and voting on such matters.

[A] ~~109.2.6~~ **A101.3.7 Compensation of members.** Compensation of members shall be determined by law.

Add new text as follows:

A101.3.8 Removal from the board. A member shall be removed from the board prior to the end of their terms only for cause. Any member with continued absence from regular meeting of the board may be removed at the discretion of the chief appointing authority.

Revise as follows:

[A] ~~109.4.1~~ **A101.4 Procedure- Rules and procedures.** The board shall ~~adopt and make available to the public through the secretary procedures under which a hearing will be conducted-~~ establish policies and procedures necessary to carry out its duties consistent with the provisions of this code and applicable state law. The procedures shall not require compliance with strict rules of evidence, but shall mandate that only relevant information be ~~received-~~ presented.

Add new text as follows:

[A] **A101.5 Notice of meeting.** The board shall meet upon notice from the chairperson, within 10 days of the filing of an appeal or at stated periodic intervals.

Revise as follows:

[A] ~~109.4~~ **A101.5.1 Open hearing. Hearings-** All hearings before the board shall be open to the public. The appellant, the appellant's representative, the code official and any person whose interests are affected shall be given an opportunity to be heard.

Add new text as follows:

A101.5.2 Quorum. Three members of the board shall constitute a quorum.

Revise as follows:

[A] ~~109.5~~ **A101.5.3 Postponed hearing.** When five members are not present to hear an appeal, either the appellant or the appellant's representative shall have the right to request a postponement of the hearing.

Add new text as follows:

A101.6 Legal counsel. The jurisdiction shall furnish legal counsel to the board to provide members with general legal advice concerning matters before them for consideration. Members shall be represented by legal counsel at the jurisdiction's expense in all matters arising from service within the scope of their duties.

Revise as follows:

[A] ~~109.6~~ **A101.7 Board decision.** The board shall only modify or reverse the decision of the code official by a concurring vote of three or more members.

[A] ~~109.6.1~~ **A101.7.1 Resolution.** The decision of the board shall be by resolution. ~~Certified copies shall be~~ Every decision shall be promptly filed in writing in the office of the code official within three days and shall be open to the public for inspection. A certified copy shall be furnished to the appellant or the appellant's representative and to the code official.

[A] ~~109.6.2~~ **A101.7.2 Administration.** The code official shall take immediate action in accordance with the decision of the board.

[A] ~~109.7~~ **A101.8 Court review.** Any person, whether or not a previous party of the appeal, shall have the right to apply to the appropriate court for a writ of certiorari to correct errors of law. Application for review shall be made in the manner and time required by law following the filing of the decision in the office of the chief administrative officer.

2018 International Property Maintenance Code

Add new text as follows:

APPENDIX A BOARD OF APPEALS

SECTION A101 GENERAL

A101.1 Scope. A board of appeals shall be established within the jurisdiction for the purpose of hearing applications for modification of the requirements of this code pursuant to the provisions of Section 111 (Means of Appeals). The board shall be established and operated in accordance with this section, and shall be authorized to hear evidence from appellants and the code official pertaining to the application and intent of this code for the purpose of issuing orders pursuant to these provisions.

A101.2 Application for appeal. Any person shall have the right to appeal a decision of the code official to the board. An application for appeal shall be based on a claim that the intent of this code or the rules legally adopted hereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an equally good or better form of construction is proposed. The application shall be filed on a form obtained from the code official within 20 days after the notice was served.

A101.2.1 Limitation of authority. The board shall not have authority to waive requirements of this code or interpret the administration of this code.

Revise as follows:

[A] ~~111.8~~ **A101.2.2 Stays of enforcement.** Appeals of notice and orders ~~(other than Imminent Danger notices)~~ shall stay the enforcement of the notice and order until the appeal is heard by the ~~appeals~~ board.

[A] ~~111.2~~ **A101.3 Membership of board.** The board of appeals shall consist of ~~not less than three members who are qualified by experience and training to pass on matters pertaining to property maintenance and who are not employees of the jurisdiction. The five voting members appointed by the chief appointing authority of the jurisdiction. Each member shall serve for [INSERT NUMBER OF YEARS] years or until a successor has been appointed. The board member's terms shall be staggered at intervals, so as to provide continuity. The code official shall be an ex-officio ex officio member of said board but shall not vote on any matter before the board. The board shall be appointed by the chief appointing authority, and shall serve staggered and overlapping terms.~~

Add new text as follows:

A101.3.1 Qualifications. The board shall consist of five individuals, who are qualified by experience and training to pass on matters pertaining to building construction and are not employees of the jurisdiction.

Revise as follows:

[A] ~~111.2.1~~ **A101.3.2 Alternate members.** The chief appointing authority shall ~~appoint not less than~~ is authorized to appoint two alternate members who shall be called by the board ~~chairman chairperson~~ to hear appeals during the absence or disqualification of a member. Alternate members shall possess the qualifications required for board ~~membership~~ membership, and shall be appointed for the same term or until a successor has been appointed.

Add new text as follows:

A101.3.3 Vacancies. Vacancies shall be filled for an unexpired term in the same manner in which original appointments are required to be made.

Revise as follows:

[A] ~~111.2.2~~ **A101.3.4 Chairman: Chairperson.** The board shall annually select one of its members to serve as ~~chairman~~ chairperson.

[A] ~~111.2.4~~ **A101.3.5 Secretary.** The chief ~~administrative officer~~ appointing authority shall designate a qualified ~~person~~ clerk to serve as secretary to the board. The secretary shall file a detailed record of all proceedings ~~in the office of the chief administrative officer, which shall set forth the reasons for the board's decision, the vote of each member, the absence of a member and any failure of a member to vote.~~

[A] ~~111.2.3~~ **A101.3.6 Disqualification Conflict of member: interest.** A member shall ~~not hear an appeal in which that member has a~~ with any personal, professional or financial interest in a matter before the board shall declare such interest and refrain from participating in discussions, deliberations and voting on such matters.

[A] ~~111.2.5~~ **A101.3.7 Compensation of members.** Compensation of members shall be determined by law.

Add new text as follows:

A101.3.8 Removal from the board. A member shall be removed from the board prior to the end of their terms only for cause. Any member with continued absence from regular meeting of the board may be removed at the discretion of the chief appointing authority.

Revise as follows:

[A] ~~111.4.1~~ A101.4 Procedure. Rules and procedures. The board shall ~~adopt and make available to the public through the secretary procedures under which a hearing will be conducted. establish policies and procedures necessary to carry out its duties consistent with the provisions of this code and applicable state law.~~ The procedures shall not require compliance with strict rules of evidence, but shall mandate that only relevant information be ~~received. presented.~~

[A] ~~111.3~~ A101.5 Notice of meeting. The board shall meet upon notice from the ~~chairman~~ chairperson, within ~~20~~ 10 days of the filing of an appeal ; or at stated periodic ~~meetings. intervals.~~

Add new text as follows:

[A] A101.5.1 Open hearing. All hearings before the board shall be open to the public. The appellant, the appellant's representative, the code official and any person whose interests are affected shall be given an opportunity to be heard.

A101.5.2 Quorum. Three members of the board shall constitute a quorum.

Revise as follows:

[A] ~~111.5~~ A101.5.3 Postponed hearing. When ~~the full board is five members are~~ not present to hear an appeal, either the appellant or the appellant's representative shall have the right to request a postponement of the hearing.

Add new text as follows:

A101.6 Legal counsel. The jurisdiction shall furnish legal counsel to the board to provide members with general legal advice concerning matters before them for consideration. Members shall be represented by legal counsel at the jurisdiction's expense in all matters arising from service within the scope of their duties.

Revise as follows:

[A] ~~111.6~~ A101.7 Board decision. The board shall only modify or reverse the decision of the code official ~~only~~ by a concurring vote of a ~~majority of the total number of appointed board three or more~~ members.

[A] ~~111.6.1~~ A101.7.1 Records and copies. Resolution. The decision of the board shall be ~~recorded. Copies shall be~~ by resolution. Every decision shall be promptly filed in writing in the office of the code official within three days and shall be open to the public for inspection. A certified copy shall be furnished to the appellant or the appellant's representative and to the code official.

[A] ~~111.6.2~~ A101.7.2 Administration. The code official shall take immediate action in accordance with the decision of the board.

[A] ~~111.7~~ A101.8 Court review. Any person, whether or not a previous party of the appeal, shall have the right to apply to the appropriate court for a writ of certiorari to correct errors of law. Application for review shall be made in the manner and time required by law following the filing of the decision in the office of the chief administrative officer.

2018 International Swimming Pool and Spa Code

Add new text as follows:

APPENDIX A **BOARD OF APPEALS**

SECTION A101 **GENERAL**

A101.1 Scope. A board of appeals shall be established within the jurisdiction for the purpose of hearing applications for modification of the requirements of this code pursuant to the provisions of Section 108 (Means of Appeals). The board shall be established and operated in accordance with this section, and shall be authorized to hear evidence from appellants and the code official pertaining to the application and intent of this code for the purpose of issuing orders pursuant to these provisions.

A101.2 Application for appeal. Any person shall have the right to appeal a decision of the code official to the board. An application for appeal shall be based on a claim that the intent of this code or the rules legally adopted hereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an equally good or better form of construction is proposed. The application shall be filed on a form obtained from the code official within 20 days after the notice was served.

A101.2.1 Limitation of authority. The board shall not have authority to waive requirements of this code or interpret the administration of this code.

A101.2.2 Stays of enforcement. Appeals of notice and orders, other than Imminent Danger notices, shall stay the enforcement of the notice and order until the appeal is heard by the board.

Revise as follows:

[A] ~~108-2~~ A101.3 Membership of board. The board of ~~appeals~~ shall consist of five voting members appointed by the chief appointing authority ~~as follows: one for 5 years, one for 4 years, one for 3 years, one for 2 years and one for 1 year. Thereafter, each new~~ of the jurisdiction. Each member shall serve for ~~5~~ [INSERT NUMBER OF YEARS] years or until a successor has been appointed. The board member's terms shall be staggered at intervals, so as to provide continuity. The code official shall be an ex officio member of said board but shall not vote on any matter before the board.

[A] ~~108-2-1~~ A101.3.1 Qualifications. The board of ~~appeals~~ shall consist of five individuals, who are qualified by experience and training to pass on matters pertaining to building construction and are not employees of the jurisdiction. ~~one from each of the following professions or disciplines:~~

- ~~1. Registered design professional who is a registered architect; or a builder or superintendent of building construction with not less than 10 years' experience, 5 years of which shall have been in responsible charge of work.~~
- ~~2. Registered design professional with structural engineering or architectural experience.~~
- ~~3. Registered design professional with mechanical and plumbing engineering experience; or a mechanical and plumbing contractor with not less than 10 years' experience, 5 years of which shall have been in responsible charge of work.~~
- ~~4. Registered design professional with electrical engineering experience; or an electrical contractor with not less than 10 years' experience, 5 years of which shall have been in responsible charge of work.~~
- ~~5. Registered design professional with pool or spa experience; or a contractor with not less than 10 years' experience, 5 years of which shall have been in responsible charge of work.~~

[A] ~~108-2-2~~ A101.3.2 Alternate members. The chief appointing authority ~~shall is~~ authorized to appoint two alternate members who shall be called by the board ~~chairman-chairperson~~ to hear appeals during the absence or disqualification of a member. Alternate members shall possess the qualifications required for board membership, and shall be appointed for ~~5 years~~ the same term or until a successor has been appointed.

Add new text as follows:

A101.3.3 Vacancies. Vacancies shall be filled for an unexpired term in the same manner in which original appointments are required to be made.

Revise as follows:

[A] ~~108-2-3~~ A101.3.4 ~~Chairman- Chairperson.~~ The board shall annually select one of its members to serve as ~~chairman- chairperson.~~

[A] ~~108-2-5~~ A101.3.5 Secretary. The chief ~~administrative officer- appointing authority~~ shall designate a qualified clerk to serve as secretary to the board. The secretary shall file a detailed record of ~~proceedings in the office of the chief administrative officer- all proceedings~~ which shall set forth the reasons for the board's decision, the vote of each member, the absence of a member and any failure of a member to vote.

[A] ~~108-2-4~~ A101.3.6 ~~Disqualification-Conflict of member- interest.~~ A member shall not hear an appeal in which that member has ~~with~~ any personal, professional or financial ~~interest- interest~~ in a matter before the board shall declare such interest and refrain from participating in discussions, deliberations and voting on such matters.

[A] ~~108-2-6~~ A101.3.7 Compensation of members. Compensation of members shall be determined by law.

Add new text as follows:

A101.3.8 Removal from the board. A member shall be removed from the board prior to the end of their terms only for cause. Any member with continued absence from regular meeting of the board may be removed at the discretion of the chief appointing authority.

Revise as follows:

[A] ~~108-4-1~~ A101.4 ~~Procedure- Rules and procedures.~~ The board shall ~~adopt and make available to the public through the secretary procedures under which a hearing will be conducted- establish policies and procedures necessary to carry out its duties consistent with the provisions of this code and applicable state law.~~ The procedures shall not require compliance with strict rules of evidence, but shall mandate that only relevant information be ~~received- presented.~~

[A] ~~108-3~~ A101.5 Notice of meeting. The board shall meet upon notice from the ~~chairman- chairperson,~~ within 10 days of the filing of an appeal or at stated periodic ~~meetings- intervals.~~

[A] ~~108-4~~ A101.5.1 Open hearing. ~~Hearings- All hearings~~ before the board shall be open to the public. The appellant, the appellant's representative, the code official and any person whose interests are affected shall be given an opportunity to be heard.

Add new text as follows:

A101.5.2 Quorum. Three members of the board shall constitute a quorum.

Revise as follows:

[A] ~~108-5~~ A101.5.3 Postponed hearing. When five members are not present to hear an appeal, either the appellant or the appellant's representative shall have the right to request a postponement of the hearing.

Add new text as follows:

A101.6 Legal counsel. The jurisdiction shall furnish legal counsel to the board to provide members with general legal advice concerning matters before them for consideration. Members shall be represented by legal counsel at the jurisdiction's expense in all matters arising from service within the scope of their duties.

Revise as follows:

[A] ~~108-6~~ **A101.7 Board decision.** The board shall only modify or reverse the decision of the code official by a concurring vote of three or more members.

[A] ~~108-6.1~~ **A101.7.1 Resolution.** ~~The decision of the board shall be by resolution. Certified copies shall be~~ Every decision shall be promptly filed in writing in the office of the code official within three days and shall be open to the public for inspection. A certified copy shall be furnished to the appellant or the appellant's representative and to the code official.

[A] ~~108-6.2~~ **A101.7.2 Administration.** The code official shall take immediate action in accordance with the decision of the board.

[A] ~~108-7~~ **A101.8 Court review.** Any person, whether or not a previous party of the appeal, shall have the right to apply to the appropriate court for a writ of certiorari to correct errors of law. Application for review shall be made in the manner and time required by law following the filing of the decision in the office of the chief administrative officer.

2018 International Wildland-Urban Interface Code

SECTION 106 APPEALS

[A] **106.1 General.** ~~To determine the suitability of alternative materials and methods and to provide for reasonable interpretations of the provisions of this code, there shall be and hereby is created a board of appeals consisting of five members who are qualified by experience and training to pass judgment on pertinent matters. The code official, building official and fire chief shall be ex officio members, and the code official shall act as secretary of the board. The board of appeals shall be appointed by the legislative body and shall hold office at their discretion. The board shall adopt reasonable rules and regulations for conducting its investigations and shall render decisions and findings in writing to the code official, with a duplicate copy to the applicant.~~

Add new text as follows:

A **BOARD OF APPEALS**

SECTION A101 **GENERAL**

A101.1 Scope. A board of appeals shall be established within the jurisdiction for the purpose of hearing applications for modification of the requirements of this code pursuant to the provisions of Section 106 (Means of Appeals). The board shall be established and operated in accordance with this section, and shall be authorized to hear evidence from appellants and the building official pertaining to the application and intent of this code for the purpose of issuing orders pursuant to these provisions.

A101.2 Application for appeal. Any person shall have the right to appeal a decision of the code official to the board. An application for appeal shall be based on a claim that the intent of this code or the rules legally adopted hereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an equally good or better form of construction is proposed. The application shall be filed on a form obtained from the code official within 20 days after the notice was served.

A101.2.1 Limitation of authority. The board shall not have authority to waive requirements of this code or interpret the administration of this code.

A101.2.2 Stays of enforcement. Appeals of notice and orders, other than Imminent Danger notices, shall stay the enforcement of the notice and order until the appeal is heard by the board.

A101.3 Membership of board. The board shall consist of five voting members appointed by the chief appointing authority of the jurisdiction. Each member shall serve for [INSERT NUMBER OF YEARS] years or until a successor has been appointed. The board member's terms shall be staggered at intervals, so as to provide continuity. The code official shall be an ex officio member of said board but shall not vote on any matter before the board.

A101.3.1 Qualifications. The board shall consist of five individuals, who are qualified by experience and training to pass on matters pertaining to building construction and are not employees of the jurisdiction.

A101.3.2 Alternate members. The chief appointing authority is authorized to appoint two alternate members who shall be called by the board chairperson to hear appeals during the absence or disqualification of a member. Alternate members shall possess the qualifications required for board membership, and shall be appointed for the same term or until a successor has been appointed.

A101.3.3 Vacancies. Vacancies shall be filled for an unexpired term in the same manner in which original appointments are required to be made.

A101.3.4 Chairperson. The board shall annually select one of its members to serve as chairperson.

A101.3.5 Secretary. The chief appointing authority shall designate a qualified clerk to serve as secretary to the board. The secretary shall file a detailed record of all proceedings which shall set forth the reasons for the board's decision, the vote of each member, the absence of a member and any failure of a member to vote.

A101.3.6 Conflict of interest. A member with any personal, professional or financial interest in a matter before the board shall declare such interest and refrain from participating in discussions, deliberations and voting on such matters.

A101.3.7 Compensation of members. Compensation of members shall be determined by law.

A101.3.8 Removal from the board. A member shall be removed from the board prior to the end of their terms only for cause. Any member with continued absence from regular meeting of the board may be removed at the discretion of the chief appointing authority.

A101.4 Rules and procedures. The board shall establish policies and procedures necessary to carry out its duties consistent with the provisions of this code and applicable state law. The procedures shall not require compliance with strict rules of evidence, but shall mandate that only relevant information be presented.

A101.5 Notice of meeting. The board shall meet upon notice from the chairperson, within 10 days of the filing of an appeal or at stated periodic intervals.

A101.5.1 Open hearing. All hearings before the board shall be open to the public. The appellant, the appellant's representative, the code official and any person whose interests are affected shall be given an opportunity to be heard.

A101.5.2 Quorum. Three members of the board shall constitute a quorum.

A101.5.3 Postponed hearing. When five members are not present to hear an appeal, either the appellant or the appellant's representative shall have the right to request a postponement of the hearing.

A101.6 Legal counsel. The jurisdiction shall furnish legal counsel to the board to provide members with general legal advice concerning matters before them for consideration. Members shall be represented by legal counsel at the jurisdiction's expense in all matters arising from service within the scope of their duties.

A101.7 Board decision. The board shall only modify or reverse the decision of the code official by a concurring vote of three or more members.

A101.7.1 Resolution. The decision of the board shall be by resolution. Every decision shall be promptly filed in writing in the office of the code official within three days and shall be open to the public for inspection. A certified copy shall be furnished to the appellant or the appellant's representative and to the code official.

A101.7.2 Administration. The code official shall take immediate action in accordance with the decision of the board.

A101.8 Court review. Any person, whether or not a previous party of the appeal, shall have the right to apply to the appropriate court for a writ of certiorari to correct errors of law. Application for review shall be made in the manner and time required by law following the filing of the decision in the office of the chief administrative officer.

Proposal # 4123

ADM43-19 Part I

ADM43-19 Part II

IRC®: APPENDIX A (New), SECTION A101 (New), A101.1 (New), A101.2 (New), A101.2.1 (New), A101.2.2 (New), A101.3 (New), A101.3.1 (New), A101.3.2 (New), A101.3.3 (New), A101.3.4 (New), A101.3.5 (New), A101.3.6 (New), A101.3.7 (New), A101.3.8 (New), A101.4 (New), A101.5 (New), A101.5.1 (New), A101.5.2 (New), A101.5.3 (New), A101.6 (New), A101.7 (New), A101.7.1 (New), A101.7.2 (New), A101.8 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Pennie Feehan (pmgcac@iccsafe.org); Michael O'Brian (fcac@iccsafe.org)

2018 International Residential Code

Add new text as follows:

APPENDIX A BOARD OF APPEALS

SECTION A101 GENERAL

A101.1 Scope. A board of appeals shall be established within the jurisdiction for the purpose of hearing applications for modification of the requirements of this code pursuant to the provisions of Section R112 (Means of Appeals). The board shall be established and operated in accordance with this section, and shall be authorized to hear evidence from appellants and the code official pertaining to the application and intent of this code for the purpose of issuing orders pursuant to these provisions.

A101.2 Application for appeal. Any person shall have the right to appeal a decision of the building official to the board. An application for appeal shall be based on a claim that the intent of this code or the rules legally adopted hereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an equally good or better form of construction is proposed. The application shall be filed on a form obtained from the building official within 20 days after the notice was served.

A101.2.1 Limitation of authority. The board shall not have authority to waive requirements of this code or interpret the administration of this code.

A101.2.2 Stays of enforcement. Appeals of notice and orders, other than Imminent Danger notices, shall stay the enforcement of the notice and order until the appeal is heard by the board.

A101.3 Membership of board. The board shall consist of five voting members appointed by the chief appointing authority of the jurisdiction. Each member shall serve for [INSERT NUMBER OF YEARS] years or until a successor has been appointed. The board member's terms shall be staggered at intervals, so as to provide continuity. The building official shall be an ex officio member of said board but shall not vote on any matter before the board.

A101.3.1 Qualifications. The board shall consist of five individuals, who are qualified by experience and training to pass on matters pertaining to building construction and are not employees of the jurisdiction.

A101.3.2 Alternate members. The chief appointing authority is authorized to appoint two alternate members who shall be called by the board chairperson to hear appeals during the absence or disqualification of a member. Alternate members shall possess the qualifications required for board membership, and shall be appointed for the same term or until a successor has been appointed.

A101.3.3 Vacancies. Vacancies shall be filled for an unexpired term in the same manner in which original appointments are required to be made.

A101.3.4 Chairperson. The board shall annually select one of its members to serve as chairperson.

A101.3.5 Secretary. The chief appointing authority shall designate a qualified clerk to serve as secretary to the board. The secretary shall file a detailed record of all proceedings which shall set forth the reasons for the board's decision, the vote of each member, the absence of a member and any failure of a member to vote.

A101.3.6 Conflict of interest. A member with any personal, professional or financial interest in a matter before the board shall declare such interest and refrain from participating in discussions, deliberations and voting on such matters.

A101.3.7 Compensation of members. Compensation of members shall be determined by law.

A101.3.8 Removal from the board. A member shall be removed from the board prior to the end of their terms only for cause. Any member with continued absence from regular meeting of the board may be removed at the discretion of the chief appointing authority.

A101.4 Rules and procedures. The board shall establish policies and procedures necessary to carry out its duties consistent with the provisions of this code and applicable state law. The procedures shall not require compliance with strict rules of evidence, but shall mandate that only relevant information be presented.

A101.5 Notice of meeting. The board shall meet upon notice from the chairperson, within 10 days of the filing of an appeal or at stated periodic intervals.

A101.5.1 Open hearing. All hearings before the board shall be open to the public. The appellant, the appellant's representative, the code official and any person whose interests are affected shall be given an opportunity to be heard.

A101.5.2 Quorum. Three members of the board shall constitute a quorum.

A101.5.3 Postponed hearing. When five members are not present to hear an appeal, either the appellant or the appellant's representative shall have the right to request a postponement of the hearing.

A101.6 Legal counsel. The jurisdiction shall furnish legal counsel to the board to provide members with general legal advice concerning matters before them for consideration. Members shall be represented by legal counsel at the jurisdiction's expense in all matters arising from service within the scope of their duties.

A101.7 Board decision. The board shall only modify or reverse the decision of the building official by a concurring vote of three or more members.

A101.7.1 Resolution. The decision of the board shall be by resolution. Every decision shall be promptly filed in writing in the office of the building official within three days and shall be open to the public for inspection. A certified copy shall be furnished to the appellant or the appellant's representative and to the building official.

A101.7.2 Administration. The building official shall take immediate action in accordance with the decision of the board.

A101.8 Court review. Any person, whether or not a previous party of the appeal, shall have the right to apply to the appropriate court for a writ of certiorari to correct errors of law. Application for review shall be made in the manner and time required by law following the filing of the decision in the office of the chief administrative officer.

Proposal # 5719

ADM43-19 Part II

ADM43-19 Part III

IECC: APPENDIX CA (New), SECTION CA101 (New), CA101.1 (New), CA101.2 (New), CA101.2.1 (New), CA101.2.2 (New), CA101.3 (New), CA101.3.1 (New), CA101.3.2 (New), CA101.3.3 (New), CA101.3.4 (New), CA101.3.5 (New), CA101.3.6 (New), CA101.3.7 (New), CA101.3.8 (New), CA101.4 (New), CA101.5 (New), CA101.5.1 (New), CA101.5.2 (New), CA101.5.3 (New), CA101.6 (New), CA101.7 (New), CA101.7.1 (New), CA101.7.2 (New), CA101.8 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Pennie Feehan (pmgcac@iccsafe.org); Michael O'Brian (fcac@iccsafe.org)

2018 International Energy Conservation Code

Add new text as follows:

APPENDIX CA BOARD OF APPEALS-COMMERCIAL

SECTION CA101 GENERAL

CA101.1 Scope. A board of appeals shall be established within the jurisdiction for the purpose of hearing applications for modification of the requirements of this code pursuant to the provisions of Section C109 (Means of Appeals). The board shall be established and operated in accordance with this section, and shall be authorized to hear evidence from appellants and the code official pertaining to the application and intent of this code for the purpose of issuing orders pursuant to these provisions.

CA101.2 Application for appeal. Any person shall have the right to appeal a decision of the code official to the board. An application for appeal shall be based on a claim that the intent of this code or the rules legally adopted hereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an equally good or better form of construction is proposed. The application shall be filed on a form obtained from the code official within 20 days after the notice was served.

CA101.2.1 Limitation of authority. The board shall not have authority to waive requirements of this code or interpret the administration of this code.

CA101.2.2 Stays of enforcement. Appeals of notice and orders, other than Imminent Danger notices, shall stay the enforcement of the notice and order until the appeal is heard by the board.

CA101.3 Membership of board. The board shall consist of five voting members appointed by the chief appointing authority of the jurisdiction. Each member shall serve for [INSERT NUMBER OF YEARS] years or until a successor has been appointed. The board member's terms shall be staggered at intervals, so as to provide continuity. The code official shall be an ex officio member of said board but shall not vote on any matter before the board.

CA101.3.1 Qualifications. The board shall consist of five individuals, who are qualified by experience and training to pass on matters pertaining to building construction and are not employees of the jurisdiction.

CA101.3.2 Alternate members. The chief appointing authority is authorized to appoint two alternate members who shall be called by the board chairperson to hear appeals during the absence or disqualification of a member. Alternate members shall possess the qualifications required for board membership, and shall be appointed for the same term or until a successor has been appointed.

CA101.3.3 Vacancies. Vacancies shall be filled for an unexpired term in the same manner in which original appointments are required to be made.

CA101.3.4 Chairperson. The board shall annually select one of its members to serve as chairperson.

CA101.3.5 Secretary. The chief appointing authority shall designate a qualified clerk to serve as secretary to the board. The secretary shall file a detailed record of all proceedings which shall set forth the reasons for the board's decision, the vote of each member, the absence of a member and any failure of a member to vote.

CA101.3.6 Conflict of interest. A member with any personal, professional or financial interest in a matter before the board shall declare such interest and refrain from participating in discussions, deliberations and voting on such matters.

CA101.3.7 Compensation of members. Compensation of members shall be determined by law.

CA101.3.8 Removal from the board. A member shall be removed from the board prior to the end of their terms only for cause. Any member with continued absence from regular meeting of the board may be removed at the discretion of the chief appointing authority.

CA101.4 Rules and procedures. The board shall establish policies and procedures necessary to carry out its duties consistent with the provisions of this code and applicable state law. The procedures shall not require compliance with strict rules of evidence, but shall mandate that only relevant

information be presented.

CA101.5 Notice of meeting. The board shall meet upon notice from the chairperson, within 10 days of the filing of an appeal or at stated periodic intervals.

CA101.5.1 Open hearing. All hearings before the board shall be open to the public. The appellant, the appellant's representative, the code official and any person whose interests are affected shall be given an opportunity to be heard.

CA101.5.2 Quorum. Three members of the board shall constitute a quorum.

CA101.5.3 Postponed hearing. When five members are not present to hear an appeal, either the appellant or the appellant's representative shall have the right to request a postponement of the hearing.

CA101.6 Legal counsel. The jurisdiction shall furnish legal counsel to the board to provide members with general legal advice concerning matters before them for consideration. Members shall be represented by legal counsel at the jurisdiction's expense in all matters arising from service within the scope of their duties.

CA101.7 Board decision. The board shall only modify or reverse the decision of the code official by a concurring vote of three or more members.

CA101.7.1 Resolution. The decision of the board shall be by resolution. Every decision shall be promptly filed in writing in the office of the code official within three days and shall be open to the public for inspection. A certified copy shall be furnished to the appellant or the appellant's representative and to the code official.

CA101.7.2 Administration. The code official shall take immediate action in accordance with the decision of the board.

CA101.8 Court review. Any person, whether or not a previous party of the appeal, shall have the right to apply to the appropriate court for a writ of certiorari to correct errors of law. Application for review shall be made in the manner and time required by law following the filing of the decision in the office of the chief administrative officer.

Proposal # 5720

ADM43-19 Part III

ADM43-19 Part IV

IECC: Appendix RA (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Pennie Feehan (pmgcac@iccsafe.org); Michael O'Brian (fcac@iccsafe.org)

2018 International Energy Conservation Code

Add new text as follows:

APPENDIX RA **BOARD OF APPEALS-RESIDENTIAL** **SECTION RA101** **GENERAL**

RA101.1 Scope. A board of appeals shall be established within the jurisdiction for the purpose of hearing applications for modification of the requirements of this code pursuant to the provisions of Section R109 (Means of Appeals). The board shall be established and operated in accordance with this section, and shall be authorized to hear evidence from appellants and the code official pertaining to the application and intent of this code for the purpose of issuing orders pursuant to these provisions.

RA101.2 Application for appeal. Any person shall have the right to appeal a decision of the code official to the board. An application for appeal shall be based on a claim that the intent of this code or the rules legally adopted hereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an equally good or better form of construction is proposed. The application shall be filed on a form obtained from the code official within 20 days after the notice was served.

RA101.2.1 Limitation of authority. The board shall not have authority to waive requirements of this code or interpret the administration of this code.

RA101.2.2 Stays of enforcement. Appeals of notice and orders, other than Imminent Danger notices, shall stay the enforcement of the notice and order until the appeal is heard by the board.

RA101.3 Membership of board. The board shall consist of five voting members appointed by the chief appointing authority of the jurisdiction. Each member shall serve for [INSERT NUMBER OF YEARS] years or until a successor has been appointed. The board member's terms shall be staggered at intervals, so as to provide continuity. The code official shall be an ex officio member of said board but shall not vote on any matter before the board.

RA101.3.1 Qualifications. The board shall consist of five individuals, who are qualified by experience and training to pass on matters pertaining to building construction and are not employees of the jurisdiction.

RA101.3.2 Alternate members. The chief appointing authority is authorized to appoint two alternate members who shall be called by the board chairperson to hear appeals during the absence or disqualification of a member. Alternate members shall possess the qualifications required for board membership, and shall be appointed for the same term or until a successor has been appointed.

RA101.3.3 Vacancies. Vacancies shall be filled for an unexpired term in the same manner in which original appointments are required to be made.

RA101.3.4 Chairperson. The board shall annually select one of its members to serve as chairperson.

RA101.3.5 Secretary. The chief appointing authority shall designate a qualified clerk to serve as secretary to the board. The secretary shall file a detailed record of all proceedings which shall set forth the reasons for the board's decision, the vote of each member, the absence of a member and any failure of a member to vote.

RA101.3.6 Conflict of interest. A member with any personal, professional or financial interest in a matter before the board shall declare such interest and refrain from participating in discussions, deliberations and voting on such matters.

RA101.3.7 Compensation of members. Compensation of members shall be determined by law.

RA101.3.8 Removal from the board. A member shall be removed from the board prior to the end of their terms only for cause. Any member with continued absence from regular meeting of the board may be removed at the discretion of the chief appointing authority.

RA101.4 Rules and procedures. The board shall establish policies and procedures necessary to carry out its duties consistent with the provisions of this code and applicable state law. The procedures shall not require compliance with strict rules of evidence, but shall mandate that only relevant information be presented.

RA101.5 Notice of meeting. The board shall meet upon notice from the chairperson, within 10 days of the filing of an appeal or at stated periodic

intervals.

RA101.5.1 Open hearing. All hearings before the board shall be open to the public. The appellant, the appellant's representative, the code official and any person whose interests are affected shall be given an opportunity to be heard.

RA101.5.2 Quorum. Three members of the board shall constitute a quorum.

RA101.5.3 Postponed hearing. When five members are not present to hear an appeal, either the appellant or the appellant's representative shall have the right to request a postponement of the hearing.

RA101.6 Legal counsel. The jurisdiction shall furnish legal counsel to the board to provide members with general legal advice concerning matters before them for consideration. Members shall be represented by legal counsel at the jurisdiction's expense in all matters arising from service within the scope of their duties.

RA101.7 Board decision. The board shall only modify or reverse the decision of the code official by a concurring vote of three or more members.

RA101.7.1 Resolution. The decision of the board shall be by resolution. Every decision shall be promptly filed in writing in the office of the code official within three days and shall be open to the public for inspection. A certified copy shall be furnished to the appellant or the appellant's representative and to the code official.

RA101.7.2 Administration. The code official shall take immediate action in accordance with the decision of the board.

RA101.8 Court review. Any person, whether or not a previous party of the appeal, shall have the right to apply to the appropriate court for a writ of certiorari to correct errors of law. Application for review shall be made in the manner and time required by law following the filing of the decision in the office of the chief administrative officer.

Reason: The intent of this proposal is to have a consistent set of requirements for the Board of Appeals. The right for someone to have an appeal is addressed in a separate proposal for Means of Appeals. Currently the IBC and IFC have these requirements in an appendix, while other codes either don't have it at all or have it in the text. It was felt that appendix was a more appropriate place to allow for the jurisdiction to establish their own criteria, or to use this appendix as a template.

The BCAC is working from the philosophy that ICC is a family of codes, so administrative requirements should be consistent across books. Most administrative and enforcement matters are the same for any code. Those matters unique for a specific code remain unchanged. This is one of a series of proposals being submitted relating to technical, editorial and organizational changes proposed for the Administrative chapters (Chapter 1) in all of the I-Codes.

While the Administrative Committee will consider each proposal independently, the proposals in this package are a correlated set of companion code change proposals."

The following is the template utilized to create this code change proposal. There may be some differences depending on the unique applications of each code – such as "building/fire/code official".

APPENDIX A

BOARD OF APPEALS

SECTION A101

GENERAL

A101.1 Scope. A board of appeals shall be established within the jurisdiction for the purpose of hearing applications for modification of the requirements of this code pursuant to the provisions of Section XXX (Means of Appeals). The board shall be established and operated in accordance with this section, and shall be authorized to hear evidence from appellants and the *code official* pertaining to the application and intent of this code for the purpose of issuing orders pursuant to these provisions.

A101.2 Application for appeal. Any person shall have the right to appeal a decision of the *code official* to the board. An application for appeal shall be based on a claim that the intent of this code or the rules legally adopted hereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an equally good or better form of construction is proposed. The application shall be filed on a form obtained from the *code official* within 20 days after the notice was served.

A101.2.1 Limitation of authority. The board shall not have authority to waive requirements of this code or interpret the administration of this code.

A101.2.2 Stays of enforcement. Appeals of notice and orders, other than Imminent Danger notices, shall stay the enforcement of the notice and order until the appeal is heard by the board.

A101.3 Membership of board. The board shall consist of five voting members appointed by the chief appointing authority of the jurisdiction. Each member shall serve for [INSERT NUMBER OF YEARS] years or until a successor has been appointed. The board member's terms shall be staggered at intervals, so as to provide continuity. The *code official* shall be an ex officio member of said board but shall not vote on any matter before the board.

A101.3.1 Qualifications. The board shall consist of five individuals, who are qualified by experience and training to pass on matters pertaining to building construction and are not employees of the jurisdiction.

A101.3.2 Alternate members. The chief appointing authority may appoint two alternate members who shall be called by the board chairperson to hear appeals during the absence or disqualification of a member. Alternate members shall possess the qualifications required for board membership, and shall be appointed for the same term or until a successor has been appointed.

A101.3.3 Vacancies. Vacancies shall be filled for an unexpired term in the same manner in which original appointments are required to be made.

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A101.3.5 Secretary. The chief appointing authority shall designate a qualified clerk to serve as secretary to the board. The secretary shall file a detailed record of all proceedings which shall set forth the reasons for the board's decision, the vote of each member, the absence of a member and any failure of a member to vote.

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A101.5.1 Open hearing. All hearings before the board shall be open to the public. The appellant, the appellant's representative, the *code official* and any person whose interests are affected shall be given an opportunity to be heard.

A101.5.2 Quorum. Three members of the board shall constitute a quorum.

A101.5.3 Postponed hearing. When five members are not present to hear an appeal, either the appellant or the appellant's representative shall have the right to request a postponement of the hearing.

A101.6 Legal counsel. The jurisdiction shall furnish legal counsel to the board to provide members with general legal advice concerning matters before them for consideration. Members shall be represented by legal counsel at the jurisdiction's expense in all matters arising from service within the scope of their duties.

A101.7 Board decision. The board shall only modify or reverse the decision of the *code official* by a concurring vote of three or more members.

A101.7.1 Resolution. The decision of the board shall be by resolution. Every decision shall be promptly filed in writing in the office of the *code official* within three days and shall be open to the public for inspection. A certified copy shall be furnished to the appellant or the appellant's representative and to the *code official*.

A101.7.2 Administration. The *code official* shall take immediate action in accordance with the decision of the board.

A101.8 Court review. Any person, whether or not a previous party of the appeal, shall have the right to apply to the appropriate court for a writ of certiorari to correct errors of law. Application for review shall be made in the manner and time required by law following the filing of the decision in the office of the chief administrative officer.

This proposal is submitted by the ICC Building Code Action Committee (BCAC), the ICC Fire Code Action Committee (FCAC), the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC) and the ICC Plumbing/Mechanical/Gas Code Action Committee (PMG CAC).

BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

The FCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes with regard to fire safety and hazardous materials in new and existing buildings and facilities and the protection of life and property in wildland urban interface areas. In 2018 the Fire-CAC has held 3 open meetings. In addition, there were numerous conference calls, Regional Work Group and Task Group meetings for the current code development cycle, which included members of the committees as well as any interested parties, to discuss and debate the proposed changes. Related documentation and reports are posted on the FCAC website at: <https://www.iccsafe.org/codes-tech-support/cs/fire-code-action-committee-fcac/>

The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>.

The PMG CAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance the International Codes or portions thereof that were under the purview of the PMG CAC. In 2017-2018, the PMG CAC held one face-to-face meeting and 11 conference call meetings. Numerous interested parties attended the committee meetings and offered their input. Related documentation and reports are posted on the PMGCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/pmg-code-action-committee-pmgcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is an editorial correlation and an option for jurisdictions to follow.

Proposal # 5721

ADM43-19 Part IV

ADM44-19

Appendix O (New)

Proponent: Gary Lewis, City of Summit NJ, representing City of Summit NJ (glewis@cityofsummit.org); Don Havener, representing Self (dhavener@cosentini.com); Raymond Grill, representing Self (ray.grill@arup.com)

2018 International Building Code

Add new text as follows:

APPENDIX O **PERFORMANCE-BASED APPLICATION**

O101.1 Introduction. The following administrative provisions are excerpted from the ICC Performance Code for Buildings and Facilities. These can be used in conjunction with the Alternate Methods provisions in Chapter 1, or for a review of submittals such as those in Section 909 or elsewhere requiring a rational analysis or performance-based design to provide a recognized framework for the code official in terms of the design expertise needed, the necessary submittals, a review framework and related items. While not every step is required in every instance, these model provisions serve as the starting point for the formulation of an effective submittal and corresponding thorough review.

O101.2 Qualifications. Registered design professionals shall possess the knowledge, skills and abilities necessary to demonstrate compliance with this code.

O101.3 Construction document preparation. Construction documents required by this code shall be prepared in adequate detail and submitted for review and approval in accordance with Section 107.

O101.3.1 Review. Construction documents submitted in accordance with this code shall be reviewed for code compliance with the appropriate code provisions in accordance with Section 107.

O101.4 Construction. Construction shall comply with the approved construction documents submitted in accordance with this code, and shall be verified and approved to demonstrate compliance with this code.

O101.4.1 Facility operating policies and procedures. Policies, operations, training and procedures shall comply with approved documents submitted in accordance with this code, and shall be verified and approved to demonstrate compliance with this code.

O101.4.2 Maintenance. Maintenance of the performance-based design shall be ensured throughout the life of the building or portion thereof.

O101.4.3 Changes. The owner or the owner's authorized agent shall be responsible to ensure that any change to the facility, process, or system does not increase the hazard level beyond that originally designed without approval and that changes shall be documented in accordance with the code.

O101.5 Documentation. The registered design professional shall prepare appropriate documentation for the project that clearly provides the design approach and rationale for design submittal, construction and future use of the building, facility or process.

O101.5.1 Reports and Manuals. The design report shall document the steps taken in the design analysis, clearly identifying the criteria, parameters, inputs, assumptions, sensitivities and limitations involved in the analysis. The design report shall clearly identify bounding conditions, assumptions and sensitivities that clarify the expected uses and limitations of the performance analysis. This report shall verify that the design approach is in compliance with the applicable codes and acceptable methods and shall be submitted for concurrence by the code official prior to the construction documents being completed. The report shall document the design features to be incorporated based on the analysis. The design report shall address the following:

1. Project scope.
2. Goals and objectives.
3. Performance criteria.
4. Hazard scenarios.
5. Design fire loads and hazards.
6. Final design.
7. Evaluation.
8. Bounding conditions and critical design assumptions.
9. Critical design features.
10. System design and operational requirements.
11. Operational and maintenance requirements.
12. Commissioning testing requirements and acceptance criteria.
13. Frequency of certificate renewal.
14. Supporting documents and references.

15. Preliminary site and floor plans.

O101.5.2 Design Submittal. Applicable construction documents shall be submitted to the code official for review. The documents shall be submitted in accordance with the jurisdiction's procedures and in sufficient detail to obtain appropriate permits.

O101.6 Review. Construction documents submitted in accordance with this code shall be reviewed for code compliance with the appropriate code provisions.

O101.6.1 Peer review. The owner or the owner's authorized agent shall be responsible for retaining and furnishing the services of a registered design professional or recognized expert, who will perform as a peer reviewer, where required and approved by the code official.

O101.6.2 Costs. The costs of special services, including contract review, where required by the code official, shall be borne by the owner or the owner's authorized agent.

O101.7 Permits. Prior to the start of construction, appropriate permits shall be obtained in accordance with the jurisdiction's procedures and applicable codes.

O101.8 Verification of compliance. Upon completion of the project, documentation shall be prepared that verifies performance and prescriptive code provisions have been met. Where required by the code official, the registered design professional shall file a report that verifies bounding conditions are met.

O101.9 Extent of documentation. Approved construction documents, the operations and maintenance manual, inspection and testing records, and certificates of occupancy with conditions shall be included in the project documentation of the code official's records.

O101.10 Analysis of change. The registered design professional shall evaluate the existing building, facilities, premises, processes, contents and the applicable documentation of the proposed change as it affects portions of the building, facility, premises, processes and contents that were previously designed for compliance under a performance-based code. Prior to any change that was not documented in a previously approved design, the registered design professional shall examine the applicable design documents, bounding conditions, operation and maintenance manuals, and deed restrictions.

Reason: This proposal does not generate any new code requirements, but rather provides an optional design, review and approval framework for use by the code official. Typical uses would include cases of alternate methods in Chapter 1, select areas of the IBC that require a rational analysis such as Section 909 and elsewhere. The proposed Appendix simply extracts the relevant administrative provisions from the ICC Performance Code into a more concise, usable appendix format for a jurisdiction confronted with such a need. Currently there are multiple, varying jurisdictional rules and procedures in many communities regarding procedure and none in even more. The code official is often left alone to reach decisions not just on the merits of a design, but must first also decide on the submittal and review process.

As an Appendix, it is entirely optional to a jurisdiction. It can be adopted, adopted with local modifications, or even used on a case-by-case basis as part of a Memorandum of Understanding or similar legal agreement between the jurisdiction and the owner/design team. It simply represents another tool for the jurisdiction to reach for in cases of need; it neither encourages nor creates any additional opportunity for performance-based design.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

As this provision is an Appendix and, as such, remains optional to the jurisdiction, it imparts no new code requirements and, therefore, no new costs. In fact, by potentially addressing these administrative process issues at the outset, use of the Appendix could realistically result in cost savings.

Proposal # 637

ADM44-19

ADM45-19

IBC®: APPENDIX O (New), O101.1, O102.1, O103.1 (New)

Proponent: Ali Fattah, City of San Diego, representing City of San Diego (afattah@sandiego.gov)

2018 International Building Code

Add new text as follows:

APPENDIX O APPROVAL OF PRODUCT EVALUATION AND LISTING AGENCIES

O101.1 Purpose. The purpose of this appendix is to provide the Building Official criteria to assist in the consideration and approval of products and systems supported by product listings and product evaluation reports. The Building Official is authorized to accept research reports and product listings as proof of compliance with the International Building Code under the authority in Section 104.11 and as defined in Section 1703.4.2. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety. Where the alternative material, design or method of construction.

O102.1 Definitions. Approved Agency – See Section 202

Approved Listing Agency - Any agency approved by the Building Official which is in the business of listing and labeling and which makes available at least an annual published report of such listings in which specific information is included that the product has been tested to recognized standards and found to comply.

Approved Testing Agency - An agency which is determined by the Building Official to have adequate personnel and expertise to carry out the testing of systems, materials types of construction, fixtures or appliances.

Approved Source See Section 202

Label - See Section 202

Research report – A report published by an approved source to provide technical evaluation that a new or alternative material, product, design or method of construction complies with the intent of the International Building Code and includes supporting data, and where necessary, to assist in the approval of materials or assemblies not specifically provided for in the code.

O103.1 Qualifications. Listing Agencies issuing a product Listing, and Approved Sources issuing a Research Report, shall be accredited by an approved accreditation body as to competence and capability in compliance with Sections 1703.1.1 through 1703.1.3. Approved Product Listing or Approved Sources issuing product evaluation reports satisfy the following requirements:

Reason: This code change is necessary to address the significant increase in the number of testing agencies and engineering firms as well as industry associations developing product certification programs. The proposed Appendix offers an option for the Building Official to adopt the rules and criteria necessary criteria to evaluate the qualifications of the listing or product evaluation agency seeking recognition and approval. The Appendix can be applied to the IBC and IRC so a separate code change is not being proposed for the IRC. All jurisdictions adopt a building code in addition to one or more of the other codes that are members of the ICC family of codes so jurisdictions adopting the IBC have the option to adopt the proposed Appendix .

The code change also seeks to lay the ground work the formation of a body to create acceptance criteria used by all agencies. If one is not created then ICC Evaluation Service or IAPMO's Uniform Evaluation Service will be the only agencies we know that develop and publish evaluation criteria. Uniform acceptance criteria prevent venue shopping and improve the integrity of the process so that outcomes of the evaluations are reasonably similar. When the legacy Uniform Building Code published UBC Standards in volume 3 such standards existed and were regularly referenced. Unfortunately this is no longer true in today's competitive market place.

ICC created its subsidiaries ICC ES and IAS to service the needs of the Building Official and manufacturers to create an accreditation process for testing agencies and product evaluation agencies producing research reports amongst others. They also created a service that produces research reports on behalf of the Building Official. The outcome of these evaluations and listings need to be accepted by the Building Official to be implemented. The technical reviews are performed on behalf of the Building Official so as not to require each jurisdiction to develop their own internal process for accepting building products.

A healthy competitive market with firms producing product listings and research reports has resulted in the need to create rules that facilitate approval or disapproval of these agencies and to create uniformity in the industry.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This code change is mainly process related and does not impose new requirements. Most agencies function as proposed in the code change.

Proposal # 2339

ADM45-19

ADM46-19 Part I

PART I — IBC®: [A] 107.1; IFC®: [A] 105.4.2; IEBC®: [A] 106.1; IPC®: [A] 106.3.1; IMC®: [A] 106.3.1; IFGC®: [A] 106.3.1; ISPSC®: [A] 105.3; IPSC®: [A] 106.2.1; IWUIC®: [A] 108.1

PART II — IRC®: R106.1

PART III — IECC: C103.1

PART IV — IECC: R103.1

Proponent: Micah Chappell, representing Department of Construction and Inspections (micah.chappell@seattle.gov)

THIS IS A 4 PART CODE CHANGE. PART I WILL BE HEARD BY THE ADMINISTRATIVE CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-BUILDING CODE COMMITTEE. PART III WILL BE HEARD BY THE IECC-COMMERCIAL CODE COMMITTEE. PART IV WILL BE HEARD BY THE IECC-RESIDENTIAL CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Building Code

[A] 107.1 General. Submittal documents consisting of *construction documents*, statement of *special inspections*, geotechnical report and other data shall be submitted in two or more sets, or in a digital format where allowed by the building official, with each *permit* application. The *construction documents* shall be prepared by a *registered design professional* where required by the statutes of the jurisdiction in which the project is to be constructed. Where special conditions exist, the *building official* is authorized to require additional *construction documents* to be prepared by a *registered design professional*.

Exception: The *building official* is authorized to waive the submission of *construction documents* and other data not required to be prepared by a *registered design professional* if it is found that the nature of the work applied for is such that review of *construction documents* is not necessary to obtain compliance with this code.

2018 International Fire Code

[A] 105.4.2 Information on construction documents. *Construction documents* shall be drawn to scale on suitable material. ~~Electronic media documents~~ Documents in a digital format are allowed to be submitted where *approved* by the *fire code official*. *Construction documents* shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that it will conform to the provisions of this code and relevant laws, ordinances, rules and regulations as determined by the *fire code official*.

2018 International Existing Building Code

[A] 106.1 General. Submittal documents consisting of construction documents, special inspection and structural observation programs, investigation and evaluation reports, and other data shall be submitted in two or more sets, or in a digital format where allowed by the building official, with each application for a permit. The construction documents shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed. Where special conditions exist, the *code officials* authorized to require additional construction documents to be prepared by a registered design professional.

Exception: The *code official* is authorized to waive the submission of construction documents and other data not required to be prepared by a registered design professional if it is found that the nature of the work applied for is such that reviewing of construction documents is not necessary to obtain compliance with this code.

2018 International Plumbing Code

[A] 106.3.1 Construction documents. Construction documents, engineering calculations, diagrams and other such data shall be submitted in two or more sets, or in a digital format where allowed by the building official, with each application for a permit. The code official shall require construction documents, computations and specifications to be prepared and designed by a registered design professional where required by state law. Construction documents shall be drawn to scale and shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that the work conforms to the provisions of this code. Construction documents for buildings more than two stories in height shall indicate where penetrations will be made for pipes, fittings and components and shall indicate the materials and methods for maintaining required structural safety, fire-resistance rating and fireblocking.

Exception: The code official shall have the authority to waive the submission of construction documents, calculations or other data if the nature of the work applied for is such that reviewing of construction documents is not necessary to determine compliance with this code.

2018 International Mechanical Code

[A] 106.3.1 Construction documents. *Construction documents*, engineering calculations, diagrams and other data shall be submitted in two or more sets, or in a digital format where allowed by the building official, with each application for a permit. The code official shall require *construction documents*, computations and specifications to be prepared and designed by a *registered design professional* where required by state law. Where

special conditions exist, the code official is authorized to require additional *construction documents* to be prepared by a *registered design professional*. *Construction documents* shall be drawn to scale and shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that the work conforms to the provisions of this code. *Construction documents* for buildings more than two stories in height shall indicate where penetrations will be made for mechanical systems, and the materials and methods for maintaining required structural safety, fire-resistance rating and fireblocking.

Exception: The code official shall have the authority to waive the submission of *construction documents*, calculations or other data if the nature of the work applied for is such that reviewing of *construction documents* is not necessary to determine compliance with this code.

2018 International Fuel Gas Code

[A] 106.3.1 Construction documents. *Construction documents*, engineering calculations, diagrams and other data shall be submitted in two or more sets, or in a digital format where allowed by the building official, with each application for a permit. The code official shall require *construction documents*, computations and specifications to be prepared and designed by a registered design professional where required by state law. *Construction documents* shall be drawn to scale and shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that the work conforms to the provisions of this code. *Construction documents* for buildings more than two stories in height shall indicate where penetrations will be made for installations and shall indicate the materials and methods for maintaining required structural safety, fire-resistance rating and fireblocking.

Exception: The code official shall have the authority to waive the submission of *construction documents*, calculations or other data if the nature of the work applied for is such that reviewing of *construction documents* is not necessary to determine compliance with this code.

2018 International Swimming Pool and Spa Code

[A] 105.3 Construction documents. Construction documents, engineering calculations, diagrams and other such data shall be submitted in two or more sets, or in a digital format where allowed by the building official, with each application for a permit. The code official shall require construction documents, computations and specifications to be prepared and designed by a registered design professional where required by state law. Construction documents shall be drawn to scale and shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that the work conforms to the provisions of this code.

2018 International Private Sewage Disposal Code

[A] 106.2.1 Construction documents. An application for a permit shall be accompanied by not less than two copies of construction documents drawn to scale, or in a digital format where allowed by the building official, with sufficient clarity and detail dimensions showing the nature and character of the work to be performed. Specifications shall include pumps and controls, dose volume, elevation differences (vertical lift), pipe friction loss, pump performance curve, pump model and pump manufacturer. The code official is permitted to waive the requirements for filing construction documents where the work involved is of a minor nature. Where the quality of the materials is essential for conformity to this code, specific information shall be given to establish such quality, and this code shall not be cited, or the term "legal" or its equivalent used as a substitute for specific information.

2018 International Wildland-Urban Interface Code

[A] 108.1 General. Plans, engineering calculations, diagrams and other data shall be submitted in not fewer than two sets, or in a digital format where allowed by the building official, with each application for a permit. The construction documents shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed. Where special conditions exist, the code official is authorized to require additional documents to be prepared by a registered design professional.

Exception: Submission of plans, calculations, construction inspection requirements and other data, if it is found that the nature of the work applied for is such that reviewing of plans is not necessary to obtain compliance with this code.

ADM46-19 Part II

IRC@: R106.1

Proponent: Micah Chappell, representing Department of Construction and Inspections (micah.chappell@seattle.gov)

2018 International Residential Code

Revise as follows:

R106.1 Submittal documents. Submittal documents consisting of *construction documents*, and other data shall be submitted in two or more sets, or in a digital format where allowed by the building official, with each application for a *permit*. The *construction documents* shall be prepared by a registered *design professional* where required by the statutes of the *jurisdiction* in which the project is to be constructed. Where special conditions exist, the *building official* is authorized to require additional *construction documents* to be prepared by a registered *design professional*.

Exception: The *building official* is authorized to waive the submission of *construction documents* and other data not required to be prepared by a registered *design professional* if it is found that the nature of the work applied for is such that reviewing of *construction documents* is not necessary to obtain compliance with this code.

Proposal # 5819

ADM46-19 Part II

ADM46-19 Part III

IECC: C103.1

Proponent: Micah Chappell, representing Department of Construction and Inspections (micah.chappell@seattle.gov)

2018 International Energy Conservation Code

C103.1 General. Construction documents and other supporting data shall be submitted in one or more sets, or in a digital format where allowed by the building official, with each application for a permit. The construction documents shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed. Where special conditions exist, the *code official* is authorized to require necessary construction documents to be prepared by a registered design professional.

Exception: The *code official* is authorized to waive the requirements for construction documents or other supporting data if the *code official* determines they are not necessary to confirm compliance with this code.

Proposal # 5820

ADM46-19 Part III

ADM46-19 Part IV

IECC: R103.1

Proponent: Micah Chappell, representing Department of Construction and Inspections (micah.chappell@seattle.gov)

2018 International Energy Conservation Code

R103.1 General. Construction documents, technical reports and other supporting data shall be submitted in one or more sets, or in a digital format where allowed by the building official, with each application for a permit. The construction documents and technical reports shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed. Where special conditions exist, the *code official* is authorized to require necessary construction documents to be prepared by a registered design professional.

Exception: The *code official* is authorized to waive the requirements for construction documents or other supporting data if the *code official* determines they are not necessary to confirm compliance with this code.

Reason: There is nothing in the administrative section of the code allowing digital formats of construction document sets. Most building departments in the country accept digital applications, plans and other submittal documents. This should be recognized in the text of the codes.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This only clarifies that the building official can accept digital documents. There is no increase in cost to anyone.

Proposal # 5821

ADM46-19 Part IV

ADM47-IBC-19

IBC®: AA Chapter 35, AAMA Chapter 35, ACI Chapter 35, AISI Chapter 35, ANSI Chapter 35, APA Chapter 35, ASABE Chapter 35, ASCE/SEI Chapter 35, ASME Chapter 35, 35 ASSE, ASSE Chapter 35, ASTM Chapter 35, AWC Chapter 35, AWWA Chapter 35, AWS Chapter 35, BHMA Chapter 35, CSA Chapter 35, DASMA Chapter 35, DOC Chapter 35, FM Chapter 35, GA Chapter 35, NAAMM Chapter 35, NCMA Chapter 35, NFPA Chapter 35, PCI Chapter 35, PTI Chapter 35, SBCA Chapter 35, SPRI Chapter 35, TIA Chapter 35, TMS Chapter 35, UL Chapter 35, ULC Chapter 35, 35 WRI

AA		Aluminum Association	
Standard Reference Number	Title	Referenced in Code(s):	
ADM1 2015 <u>ADM1</u> — <u>2020</u>	Aluminum Design Manual: Part 4— A Specification — <u>Specification</u> for Aluminum Structures	IBC®	

AAMA		American Architectural Manufacturers Association	
Standard Reference Number	Title	Referenced in Code(s):	
711 16 <u>711</u> — <u>20</u>	Voluntary Specification for Self Adhering Flashing Used for Installation of Exterior Wall Fenestration Products	IBC®	IRC®
714 15 <u>714</u> — <u>20</u>	Voluntary Specification for Liquid Applied Flashing Used to Create a Water-resistive Seal around Exterior Wall Openings in Buildings	IBC®	IRC®

ACI		American Concrete Institute	
Standard Reference Number	Title	Referenced in Code(s):	
318 14 <u>318</u> — <u>19</u>	Building Code Requirements for Structural Concrete	IBC®	IRC®

AISI		American Iron and Steel Institute	
Standard Reference Number	Title	Referenced in Code(s):	
AISI S100— 16 / <u>S1</u> - <u>18</u>	North American Specification for the Design of Cold-formed Steel Structural Members, 2016, <u>with Supplement 1, dated 2018</u>	IBC®	IRC®
AISI S202 — 15 <u>S202</u> — <u>20</u>	Code of Standard Practice for Cold-formed Steel <u>Structural Framing</u> , 2015 <u>2020</u>	IBC®	
AISI S220 — 15 <u>S220</u> — <u>20</u>	North American Standard for Cold-formed Steel Framing—Nonstructural Members, 2015 <u>2020</u>	IBC®	IRC®
AISI S230 — 15 <u>S230</u> — <u>18</u>	Standard for Cold-formed Steel Framing—Prescriptive Method for One- and Two-family Dwellings, 2015 <u>2018</u>	IBC®	IRC®
AISI S240 — 15 <u>S240</u> — <u>20</u>	North American Standard for Cold-Formed Steel Structuring Framing, 2015 <u>2020</u>	IBC®	IRC®
AISI S400 — 15 / <u>S1</u> — 16 <u>S400</u> — <u>20</u>	North American Standard for Seismic Design of Cold-formed Steel Structural Systems, 2015 , <u>with Supplement 1, dated 2016-</u> <u>2020</u>	IBC®	

ANSI		American National Standards Institute	
Standard Reference Number	Title	Referenced in Code(s):	
A13.1 — 2015 <u>A13.1</u> — <u>2020</u>	Scheme for the Identification of Piping Systems	IBC®	IFC®
A108.1A — 16 <u>A108.1A</u> — <u>17</u>	Installation of Ceramic Tile in the Wet-set Method, with Portland Cement Mortar	IBC®	IRC®
A108.1B — 99 <u>A108.1B</u> — <u>17</u>	Installation of Ceramic Tile, Quarry Tile on a Cured Portland Cement Mortar Setting Bed with Dry-set or Latex-Portland Mortar	IBC®	IRC®
A108.4 — 99 <u>A108.4</u> — <u>09</u>	Installation of Ceramic Tile with Organic Adhesives or Water-cleanable Tile-setting Epoxy Adhesive	IBC®	IRC®

A108.5—09 <u>A108.5—19</u>	Installation of Ceramic Tile with Dry-set Portland Cement Mortar or Latex-Portland Cement Mortar	IBC®	IRC®
A108.6—09 <u>A108.6—19</u>	Installation of Ceramic Tile with Chemical-resistant, Water Cleanable Tile-setting and -grouting Epoxy	IBC®	IRC®
A108.8—09 <u>A108.8—19</u>	Installation of Ceramic Tile with Chemical-resistant Furan Resin Mortar and Grout	IBC®	
A108.9—09 <u>A108.9—19</u>	Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout	IBC®	
A108.10—09 <u>A108.10—17</u>	Installation of Grout in Tilework	IBC®	
A118.1—16 <u>A118.1—18</u>	American National Standard Specifications for Dry-set Portland Cement Mortar	IBC®	IRC®
A118.3—13 <u>A118.3—20</u>	American National Standard Specifications for Chemical-resistant, Water-cleanable Tile-setting and -grouting Epoxy and Water Cleanable Tile-setting Epoxy Adhesive	IBC®	IRC®
A118.4—16 <u>A118.4—18</u>	American National Standard Specifications for Modified Dry-set Cement Mortar	IBC®	IRC®
A118.6—10 <u>A118.6—19</u>	American National Standard Specifications for Cement Grouts for Tile Installation	IBC®	
A136.1—08 <u>A136.1—19</u>	American National Standard Specifications for the Installation of Ceramic Tile	IBC®	IRC®
A137.1—17 <u>A137.1—19</u>	American National Standard Specifications for Ceramic Tile	IBC®	IRC®

APA	APA - Engineered Wood Association		
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Standard Reference Number	Title	Referenced in Code(s):	
ANSI 447—15 <u>117—2020</u>	Standard Specification for Structural Glued Laminated Timber of Softwood Species	IBC®	
ANSI/APA A190.1—17 <u>A190.1—2017</u>	Structural Glued Laminated Timber	IBC®	
ANSI/APA PRP 210—14 <u>210—2019</u>	Standard for Performance-Rated Engineered Wood Siding	IBC®	
APA PDS—12 <u>PDS—20</u>	Panel Design Specification	IBC®	
ANSI/APA PRG 320—17 <u>320—2019</u>	Standard for Performance-rated Cross-laminated Timber	IBC®	
APA R540—13 <u>R540—19</u>	Builders <u>Builder</u> Tips: Proper Storage and Handling of Glulam Beams	IBC®	
APA S475—16 <u>S475—20</u>	Glued Laminated Beam Design Tables	IBC®	
APA S560—14 <u>S560—20</u>	Field Notching and Drilling of Glued Laminated Timber Beams	IBC®	
APA X450—01 <u>X450—18</u>	Glulam in Residential Construction—Western Edition <u>Building—Construction Guide</u>	IBC®	

ASABE	American Society of Agricultural and Biological Engineers		
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Standard Reference Number	Title	Referenced in Code(s):	
EP 484.3 MON2016 <u>DEC2017</u>	Diaphragm Design of Metal-clad, Wood-frame Rectangular Buildings	IBC®	
EP 486.2 OCT 2012 ED <u>486.3 SEP2017</u>	Shallow-post and Pier Foundation Design	IBC®	
EP 559.2 MON2016 <u>559.1 W/Corr. AUG2010 (R2014)</u>	Design Requirements and Bending Properties for Mechanically Laminated Wood Assemblies	IBC®	

ASCE/SEI	American Society of Civil Engineers Structural Engineering Institute		
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Standard Reference Number	Title	Referenced in Code(s):	
7—16 <u>with Supplement 1</u>	Minimum Design Loads and Associated Criteria for Buildings and Other Structures	IBC® IRC®	IEBC®

24—14 24—20	Flood Resistant Design and Construction	IBC®	IRC®
29—17 29—19	Standard Calculation Methods for Structural Fire Protection	IBC®	
49—07 49—12	Wind Tunnel Testing for Buildings and Other Structures	IBC®	

ASME	American Society of Mechanical Engineers
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Standard Reference Number	Title	Referenced in Code(s):	
ASME/A17.1—2016 A17.1—2019/CSA B44—16 B44—19	Safety Code for Elevators and Escalators	IBC®	
A17.7—2007/CSA B44—07(R2012 <u>R2019</u>)	Performance-based Safety Code for Elevators and Escalators	IBC®	
A18.1—2014 A18.1—2020	Safety Standard for Platform Lifts and Stairway Chairlifts	IBC® IRC®	IEBC®
A90.1—2015 A90.1—2020	Safety Standard for Belt Manlifts	IBC®	
B16.18—2012 B16.18—2018	Cast Copper Alloy Solder Joint Pressure Fittings	IBC® IMC® IRC®	IFC® IPC®
B16.22—2013 B16.22—2018	Wrought Copper and Copper Alloy Solder Joint Pressure Fittings	IBC® IMC® IRC®	IFC® IPC®
B20.1—2015 B20.1—2021	Safety Standard for Conveyors and Related Equipment	IBC®	
B31.3—2016 B31.3—2020	Process Piping	IBC® IFGC®	IFC®

ASSE	American Society of Safety Engineers
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Standard Reference Number	Title	Referenced in Code(s):	
ANSI/ASSE Z359.1—2016 ASSP Z359.1—2019	Requirements for the ANSI/ASSE Z359—The Fall Protection Code	IBC® IMC®	IFC®

ASTM	ASTM International
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Standard Reference Number	Title	Referenced in Code(s):	
A6/A6M—14 A6M—2017A	Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes and Sheet Piling	IBC®	
A153/A153M—09 A153M—2016A	Specification for Zinc Coating (Hot-dip) on Iron and Steel Hardware	IBC®	IRC®
A240/A240M—15a A240M—17	Standard Specification for Chromium and Chromium-nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications	IBC® ISPSC®	IRC®
A252—10 A252—2010(2018)	Specification for Welded and Seamless Steel Pipe Piles	IBC®	
A283/A283M—13 A283M—2018	Specification for Low and Intermediate Tensile Strength Carbon Steel Plates	IBC®	
A416/A416M—15 A416M—2017A	Specification for Steel Strand, Uncoated Seven-wire for Prestressed Concrete	IBC®	
A572/A572M—15 A572M—2018	Specification for High-strength Low-alloy Columbium-Vanadium Structural Steel	IBC®	
A653/A653M—15 A653M—2017	Specification for Steel Sheet, Zinc-coated Galvanized or Zinc-iron Alloy-coated Galvannealed by the Hot-dip Process	IBC®	IRC®

A690/A690M—13a (2018)	Standard Specification for High-strength Low-alloy Nickel, Copper, Phosphorus Steel H-piles and Sheet Piling with Atmospheric Corrosion Resistance for Use in Marine Environments	IBC®	
A706/A706M—15 <u>A706M—2016</u>	Specification for Low-alloy Steel Deformed and Plain Bars for Concrete Reinforcement	IBC®	IRC®
A722/A722M—15 <u>A722M—2018</u>	Specification for High-strength Steel Bars for Prestressed Concrete	IBC®	
A755/A755M—15 <u>A755M—2016E1</u>	Specification for Steel Sheet, Metallic-coated by the Hot-dip Process and Prepainted by the Coil-coating Process for Exterior Exposed Building Products	IBC®	
A924/A924M—14 <u>A924M—2017A</u>	Standard Specification for General Requirements for Steel Sheet, Metallic-coated by the Hot-dip Process	IBC®	IRC®
B88—14 <u>B88—2016</u>	Specification for Seamless Copper Water Tube	IBC® IFGC® IPC® IRC®	IFC® IMC® IPSDC® ISPSC®
B251—10 <u>B251/B251M—2017</u>	Specification for General Requirements for Wrought Seamless Copper and Copper-alloy Tube	IBC® IMC® IPSDC®	IFC® IPC® IRC®
B280—13 <u>B280—2018</u>	Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service	IBC® IFGC®	IFC® IMC®
B695—04 <u>B695—2004(2009 2016)</u>	Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel Strip for Building Construction	IBC®	IRC®
C5—10 <u>C5—2018</u>	Specification for Quicklime for Structural Purposes	IBC®	IRC®
C27—98 <u>C27—1998(2013 2018)</u>	Specification for Classification of Fireclay and High-alumina Refractory Brick	IBC®	IRC®
C31/C31M—15 <u>C31M—2018B</u>	Practice for Making and Curing Concrete Test Specimens in the Field	IBC®	
C33/C33M—13 <u>C33M—2018</u>	Specification for Concrete Aggregates	IBC®	IRC®
C55—2014a <u>C55—2017</u>	Specification for Concrete Building Brick	IBC®	IRC®
C62—13a <u>C62—2017</u>	Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale)	IBC®	IRC®
C67—14 <u>C67/C67M—2018</u>	Test Methods of Sampling and Testing Brick and Structural Clay Tile	IBC®	
C73—14 <u>C73—2017</u>	Specification for Calcium Silicate Brick (Sand-lime Brick)	IBC®	IRC®
C90—14 <u>C90—2016A</u>	Specification for Loadbearing Concrete Masonry Units	IBC® IRC®	IECC
C91/C91M—12 <u>C91M—2018</u>	Specification for Masonry Cement	IBC®	IRC®
C94/C94M—15a <u>C94M—2017A</u>	Specification for Ready-mixed Concrete	IBC® IRC®	IEBC®
C140/C140M—15 <u>C140M—2018</u>	Test Method Sampling and Testing Concrete Masonry Units and Related Units	IBC®	
C150/C150M—15 <u>C150M—2018</u>	Specification for Portland Cement	IBC®	IRC®
C172/C172M—14a <u>C172M—2017</u>	Practice for Sampling Freshly Mixed Concrete	IBC®	
C199—84 <u>C199—1984(2011 2016)</u>	Test Method for Pier Test for Refractory Mortars	IBC®	IRC®
C208—12 <u>C208—2012(2017)E1</u>	Specification for Cellulosic Fiber Insulating Board	IBC®	IRC®
C216—15 <u>C216—2017A</u>	Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale)	IBC®	IRC®
C315—07 <u>C315—2007(2011 2016)</u>	Specification for Clay Flue Liners and Chimney Pots	IBC® IMC®	IFGC® IRC®

C317/C317M—00 <u>C317M—2000(2015)</u>	Specification for Gypsum Concrete	IBC®	
C330/C330M—14 <u>C330M—2017A</u>	Specification for Lightweight Aggregates for Structural Concrete	IBC®	
C331/C331M—14 <u>C331M—2017</u>	Specification for Lightweight Aggregates for Concrete Masonry Units	IBC®	
C473—15 <u>C473—2017</u>	Test Methods for Physical Testing of Gypsum Panel Products	IBC®	
C475/C475M—15 <u>C475M—2017</u>	Specification for Joint Compound and Joint Tape for Finishing Gypsum Board	IBC®	IRC®
C516—08 <u>C516—2008(2014, 2013)e+ E1</u>	Specifications for Vermiculite Loose Fill Thermal Insulation	IBC®	
C547—15 <u>C547—2017</u>	Specification for Mineral Fiber Pipe Insulation	IBC®	
C549—06(2012)	Specification for Perlite Loose Fill Insulation	IBC®	
C552—15 <u>C552—2017E1</u>	Standard Specification for Cellular Glass Thermal Insulation	IBC®	IRC®
C557—03 <u>C557—2003(2009, 2017)e0+</u>	Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing	IBC®	IRC®
C578—15 <u>C578—2018</u>	Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation	IBC®	IRC®
C587—04 <u>C587—2004(2014, 2018)</u>	Specification for Gypsum Veneer Plaster	IBC®	IRC®
C595/C595M—14e1 <u>C595M—2018</u>	Specification for Blended Hydraulic Cements	IBC®	IRC®
C635/C635M—13a <u>C635M—2017</u>	Specification for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings	IBC®	
C652—15 <u>C652—2017A</u>	Specification for Hollow Brick (Hollow Masonry Units Made from Clay or Shale)	IBC®	IRC®
C726—12 <u>C726—2017</u>	Standard Specification for Mineral Wool Roof Insulation Board	IBC®	IRC®
C728—15 <u>C728—2017A</u>	Standard Specification for Perlite Thermal Insulation Board	IBC®	IRC®
C744—14 <u>C744—2016</u>	Specification for Prefaced Concrete and Calcium Silicate Masonry Units	IBC®	IRC®
C754—15 <u>C754—2018</u>	Specification for Installation of Steel Framing Members to Receive Screw-attached Gypsum Panel Products	IBC®	
C836/C836M—15 <u>C836M—2018</u>	Specification for High-solids Content, Cold Liquid-applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course	IBC®	IRC®
C840—13 <u>C840—2018A</u>	Specification for Application and Finishing of Gypsum Board	IBC®	
C841—03 <u>C841—2003(2013, 2018)</u>	Specification for Installation of Interior Lathing and Furring	IBC®	IRC®
C843—99(2012) <u>C843—2017</u>	Specification for Application of Gypsum Veneer Plaster	IBC®	IRC®
C847—14a <u>C847—2018</u>	Specification for Metal Lath	IBC®	IRC®
C920—14a <u>C920—2018</u>	Standard for Specification for Elastomeric Joint Sealants	IBC®	IRC®
C926—15b <u>C926—2018B</u>	Specification for Application of Portland Cement-based Plaster	IBC®	IRC®
C933—14 <u>C933—2018</u>	Specification for Welded Wire Lath	IBC®	IRC®
C946—10 <u>C946—2018</u>	Specification for Construction of Dry-stacked, Surface-bonded Walls	IBC®	IRC®
C954—15 <u>C954—2018</u>	Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 inch (0.84 mm) to 0.112 inch (2.84 mm) in Thickness	IBC®	IRC®
C957/C957M—15 <u>C957M—2017</u>	Specification for High-solids Content, Cold Liquid-applied Elastomeric Waterproofing Membrane with Integral Wearing Surface	IBC®	IRC®
C1002—14 <u>C1002—2018</u>	Specification for Steel Self-piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs	IBC®	IRC®
C1032—14 <u>C1032—2018</u>	Specification for Woven Wire Plaster Base	IBC®	IRC®
C1047—14a <u>C1047—2018</u>	Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base	IBC®	IRC®
	Specification for Installation of Lathing and Furring to Receive Interior and Exterior		

C1063—15a <u>C1063—2018B</u>	Portland Cement-based Plaster	IBC®	IRC®
C1088—14 <u>C1088—2018</u>	Specification for Thin Veneer Brick Units Made from Clay or Shale	IBC®	IRC®
C1157/C1157M—11 C1157M—2017	Standard Performance Specification for Hydraulic Cement	IBC®	
C1167—11 <u>C1167—2011(2017)</u>	Specification for Clay Roof Tiles	IBC®	IRC®
C1177/C1177M—13 C1177M—2017	Specification for Glass Mat Gypsum Substrate for Use as Sheathing	IBC®	IRC®
C1178/C1178M—13 C1178M—2018	Specification for Coated Mat Water-resistant Gypsum Backing Panel	IBC®	IRC®
C1186—08 <u>C1186—2008(2012, 2016)</u>	Specification for Flat Fiber Cement Sheets	IBC®	IRC®
C1261—13 <u>C1261—2013(2017)E1</u>	Specification for Firebox Brick for Residential Fireplaces	IBC®	IRC®
C1278/C1278M—07a(2011) C1278M—2017	Specification for Fiber-reinforced Gypsum Panel	IBC®	IRC®
C1283—11 <u>C1283—2015</u>	Practice for Installing Clay Flue Lining	IBC®	IRC®
C1288—14 <u>C1288—2017</u>	Standard Specification for Discrete Nonasbestos Fiber-cement Interior Substrate Sheets	IBC®	IRC®
C1289—15 <u>C1289—2018</u>	Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board	IBC®	IRC®
C1325—14 <u>C1325—2018</u>	Standard Specification for Nonasbestos Fiber-mat Reinforced Cement Backer Units	IBC®	IRC®
C1364—10B <u>C1364—2017</u>	Standard Specification for Architectural Cast Stone	IBC®	IRC®
C1396/C1396M—14a C1396M—2017	Specification for Gypsum Board	IBC®	
C1492—03 <u>C1492—2003(2009, 2016)</u>	Standard Specification for Concrete Roof Tile	IBC®	IRC®
C1600/C1600M—11 C1600M—2017	Standard Specification for Rapid Hardening Hydraulic Cement	IBC®	
C1629/C1629M—15 C1629M—2018A	Standard Classification for Abuse-resistant Nondecorated Interior Gypsum Panel Products and Fiber-reinforced Cement Panels	IBC®	
C1658/C1658M—13 C1658M—2018	Standard Specification for Glass Mat Gypsum Panels	IBC®	IRC®
C1670—16 <u>C1670/C1670M—2018</u>	Standard Specification for Adhered Manufactured Stone Masonry Veneer Units	IBC®	
C1766—13 <u>C1766—2015</u>	Standard Specification for Factory-laminated Gypsum Panel Products	IBC®	IRC®
D25—12 <u>D25—2012(2017)</u>	Specification for Round Timber Piles	IBC®	
D41/D41M—11 <u>D41M—2011(2016)</u>	Specification for Asphalt Primer Used in Roofing, Dampproofing and Waterproofing	IBC®	
D43/D43M—00 <u>D43M—2000(2012, 2018)e+</u>	Specification for Coal Tar Primer Used in Roofing, Dampproofing and Waterproofing	IBC®	
D56—05(2010) <u>D56—2016A</u>	Test Method for Flash Point by Tag Closed Cup Tester	IBC® IMC®	IFC®
D86—15 <u>D86—2017</u>	Test Method for Distillation of Petroleum Products and Liquid Fuels at Atmospheric Pressure	IBC®	IFC®
D93—15 <u>D93—2018</u>	Test Methods for Flash Point by Pensky-Martens Closed Cup Tester	IBC® IMC®	IFC®
D226/D226M—09 <u>D226M—2017</u>	Specification for Asphalt-saturated Organic Felt Used in Roofing and Waterproofing	IBC®	IRC®
D227/D227M—03 <u>D227M—2003(2011, 2018)e+</u>	Specification for Coal-tar-saturated Organic Felt Used in Roofing and Waterproofing	IBC®	IRC®
D312/D312M—15 <u>D312M—</u>			

<u>2016M</u>	Specification for Asphalt Used in Roofing	IBC®	
<u>D448—2012(2017)</u>	Standard Classification for Sizes of Aggregate for Road and Bridge Construction	IBC®	
<u>D450/D450M—07 D450M—</u> <u>2017(2013 2018)e+</u>	Specification for Coal-tar Pitch Used in Roofing, Dampproofing and Waterproofing	IBC®	IRC®
<u>D1143/D1143M—07</u> <u>D1143M—2007(2013) E1</u>	Test Methods for Deep Foundations Under Static Axial Compressive Load	IBC®	
<u>D1863/D1863M—05</u> <u>D1863M—2005(2011</u> <u>2018)e+</u>	Specification for Mineral Aggregate Used on Built-up Roofs	IBC®	IRC®
<u>D1970/D1970M—15a</u> <u>D1970M—2017A</u>	Specification for Self-adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roof Underlayment for Ice Dam Protection	IBC®	
<u>D2178/D2178M—15</u> <u>D2178M—15A</u>	Specification for Asphalt Glass Felt Used in Roofing and Waterproofing	IBC®	IRC®
<u>D2487—11 D2487—2017</u>	Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)	IBC®	
<u>D2822/D2822M—05</u> <u>D2822M—2005(2011)e+</u>	Specification for Asphalt Roof Cement, Asbestos Containing	IBC®	IRC®
<u>D2824/D2824M—13</u> <u>D2824M—2018</u>	Standard Specification for Aluminum-pigmented Asphalt Roof Coatings, Nonfibered and Fibered without Asbestos	IBC®	
<u>D2859—16 D2859—2016</u>	Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials	IBC®	IFC®
<u>D2898—10 D2898—</u> <u>2010(2017)</u>	Test Methods for Accelerated Weathering of Fire-retardant-treated Wood for Fire Testing	IBC® IWUIC®	IRC®
<u>D3019—08 D3019/D3019M</u> <u>—2017</u>	Specification for Lap Cement Used with Asphalt Roll Roofing, Nonfibered, Asbestos Fibered and Nonasbestos Fibered	IBC®	IRC®
<u>D3161/D3161M—15</u> <u>D3161M—2016A</u>	Test Method for Wind Resistance of Steep Slope Roofing Products (Fan Induced Method)	IBC®	IRC®
<u>D3200—74 D3200—</u> <u>1974(2012 2017)</u>	Standard Specification and Test Method for Establishing Recommended Design Stresses for Round Timber Construction Poles	IBC®	
<u>D3462/D3462M—10a</u> <u>D3462M—2016</u>	Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules	IBC®	IRC®
<u>D3679—13 D3679—2017</u>	Specification for Rigid Poly (Vinyl Chloride) (PVC) Siding	IBC®	IRC®
<u>D3737—12 D3737—2018E1</u>	Practice for Establishing Allowable Properties for Structural Glued Laminated Timber (Glulam)	IBC®	
<u>D3746—85 D3746/D3746M</u> <u>—1985(2008 2015) E1</u>	Test Method for Impact Resistance of Bituminous Roofing Systems	IBC®	
<u>D3957—09 D3957—</u> <u>2009(2015)</u>	Standard Practices for Establishing Stress Grades for Structural Members Used in Log Buildings	IBC®	
<u>D4318—10e+ D4318—</u> <u>2017E1</u>	Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils	IBC®	IRC®
<u>D4434/D4434M—12</u> <u>D4434M—2015</u>	Specification for Poly (Vinyl Chloride) Sheet Roofing	IBC®	IRC®
<u>D4479/D4479M—07</u> <u>D4479M—2007(2012</u> <u>2018)e+</u>	Specification for Asphalt Roof Coatings—Asbestos-free	IBC®	IRC®
<u>D4586/D4586M—07</u> <u>D4586M—2007(2012</u> <u>2018)e+</u>	Specification for Asphalt Roof Cement—Asbestos-free	IBC®	IRC®
<u>D4637/D4637M—14e+</u> <u>D4637M—2015</u>	Specification for EPDM Sheet Used in Single-ply Roof Membrane	IBC®	IRC®
<u>D4869/D4869M—15</u> <u>D4869M—2016A</u>	Specification for Asphalt-saturated (Organic Felt) Underlayment Used in Steep Slope Roofing	IBC®	IRC®
<u>D4897/D4897M—01(2009)</u>			

D4897M—2016 D4945—12_D4945—2017	Specification for Asphalt-coated Glass Fiber Venting Base Sheet Used in Roofing Test Method for High-strain Dynamic Testing of Deep Foundations	IBC® IBC®	IRC®
D5055—13e1 D5055—2016	Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-joists	IBC®	IRC®
D5456—14b D5456—2018	Specification for Evaluation of Structural Composite Lumber Products	IBC®	IRC®
D5516—09 D5516—2018	Test Method of Evaluating the Flexural Properties of Fire-retardant Treated Softwood Plywood Exposed to Elevated Temperatures	IBC®	IRC®
D5643/D5643M—06 D5643M—2006(2012 2018)e1	Specification for Coal Tar Roof Cement, Asbestos-free	IBC®	IRC®
D5664—10 D5664—2017	Standard Test Method for Evaluating the Effects of Fire-retardant Treatment and Elevated Temperatures on Strength Properties of Fire-retardant Treated Lumber	IBC®	IRC®
D6083—05e01 D6083/D6083M—2018	Specification for Liquid Applied Acrylic Coating Used in Roofing	IBC®	IRC®
D6162/D6162M— 00a(2015)e1 D6162M— 2016	Specification for Styrene-butadiene-styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements	IBC®	
D6163/D6163M— 00(2015)e1 D6163M—2016	Specification for Styrene-butadiene-styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements	IBC®	
D6164/D6164M—11 D6164M—2016	Specification for Styrene-butadiene-styrene (SBS) Modified Bituminous Sheet Metal Materials Using Polyester Reinforcements	IBC®	IRC®
D6222/D6222M—11 D6222M—2016	Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using Polyester Reinforcements	IBC®	IRC®
D6223/D6223M— 02(2009)e1 D6223M—2016	Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements	IBC®	IRC®
D6298—13 D6298/D6298M —2016	Specification for Fiberglass Reinforced Styrene-butadiene-styrene (SBS) Modified Bituminous Sheets with a Factory Applied Metal Surface	IBC®	IRC®
D6380/D6380M—03 D6380M—2003(2013 2018)e1	Standard Specification for Asphalt Roll Roofing (Organic) Felt	IBC®	
D6464—03a D6464— 2003A(2009 2017)e1	Standard Specification for Expandable Foam Adhesives for Fastening Gypsum Wallboard to Wood Framing	IBC®	IRC®
D6509/D6509M—09(2015) D6509M—2016	Standard Specification for Atactic Polypropylene (APP) Modified Bituminous Base Sheet Materials Using Glass Fiber Reinforcements	IBC®	
D6754/D6754M—10 D6754M—2015	Standard Specification for Ketone Ethylene Ester Based Sheet Roofing	IBC®	IRC®
D6757—2013 D6757/D6757M—2018	Specification for Underlayment Felt Containing Inorganic Fibers Used in Steep Slope Roofing	IBC®	IRC®
D6841—08 D6841—2016	Standard Practice for Calculating Design Value Treatment Adjustment Factors for Fire-retardant Treated Lumber	IBC®	IRC®
D6878/D6878M—13 D6878M—2017	Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing	IBC®	IRC®
D6947/D6947M— 07(2013)e1 D6947M—2016	Standard Specification for Liquid Applied Moisture Cured Polyurethane Coating Used in Spray Polyurethane Foam Roofing System	IBC®	IRC®
D7032—14 D7032—2017	Standard Specification for Establishing Performance Ratings for Wood, Plastic Composite Deck Boards and Guardrail Systems (Guards or Rails)	IBC® IWUIC®	IRC®
D7147—11 D7147— 2011(2018)	Specification for Testing and Establishing Allowable Loads of Joist Hangers	IBC®	
D7158/D7158M—16 D7158M—2019	Standard Test Method for Wind Resistance of Asphalt Shingles (Uplift Force/Uplift Resistance Method)	IBC®	
D7254—15 D7254—2017	Standard Specification for Polypropylene (PP) Siding	IBC®	IRC®
D7655/D7655M—12 D7655M—2012(2017)	Standard Classification for Size of Aggregate Used as Ballast for Roof Membrane Systems	IBC®	

D7672-14 <u>D7672-14E1</u>	Standard Specification for Evaluating Structural Capacities of Rim Board Products and Assemblies	IBC®	IRC®
E84-16 <u>E84-2018B</u>	Standard Test Methods for Surface Burning Characteristics of Building Materials	IBC®	
E90-09 <u>E90-2009(2016)</u>	Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements	IBC®	
E96/E96M-15 <u>E96M-2016</u>	Standard Test Methods for Water Vapor Transmission of Materials	IBC®	
E108-16 <u>E108-2017</u>	Standard Test Methods for Fire Tests of Roof Coverings	IBC® IWUIC®	IEBC®
E119-16 <u>E119-2018B</u>	Standard Test Methods for Fire Tests of Building Construction and Materials	IBC®	
E136-16 <u>E136-2016A</u>	Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750° C	IBC® IFGC® IWUIC®	IEBC® IMC®
E283-04 <u>E283-2004(2012)</u>	Standard Test Method for Determining Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences across the Specimen	IBC® IECC	IECC IRC®
E331-00 <u>E331-2000(2009 2016)</u>	Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference	IBC®	IRC®
E492-09 <u>E492-2009(2016)E1</u>	Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-ceiling Assemblies Using the Tapping Machine	IBC®	
E648-15e1 <u>E648-2017A</u>	Standard Test Method for Critical Radiant Flux of Floor-covering Systems Using a Radiant Heat Energy Source	IBC®	IFC®
E736/E736M-00(2015)e1 <u>E736M-2017</u>	Test Method for Cohesion/Adhesion of Sprayed Fire-resistive Materials Applied to Structural Members	IBC®	
E814-2013A(2017)	Test Method for Fire Tests of Penetration Firestop Systems	IBC®	IRC®
E970-14 <u>E970-2017</u>	Standard Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source	IBC®	IRC®
E1300-12ae1 <u>E1300-2016</u>	Practice for Determining Load Resistance of Glass in Buildings	IBC®	
E1354-16 <u>E1354-17</u>	Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter	IBC®	
E1592-05 <u>E1592-2005(2012 2017)</u>	Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference	IBC®	
E1602-09 <u>E1602-2003(2010 2017)e1</u>	Guide for Construction of Solid Fuel-burning Masonry Heaters	IBC®	IRC®
E1886-13A <u>E1886-2013A</u>	Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials	IBC®	IRC®
E1996-14a <u>E1996-2017</u>	Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes	IBC®	
E2174-14b <u>E2174-2018</u>	Standard Practice for On-site Inspection of Installed Fire Stops	IBC®	
E2273-03(2011) <u>E2273-2018</u>	Standard Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish Systems (EIFS) Clad Wall Assemblies	IBC®	IRC®
E2307-15b <u>E2307-15BE1</u>	Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using the Intermediate-scale, Multistory Test Apparatus	IBC®	
E2353-14 <u>E2353-2016</u>	Standard Test Methods for Performance of Glazing in Permanent Railing Systems, Guards and Balustrades	IBC®	
E2404-15a <u>E2404-2017</u>	Practice for Specimen Preparation and Mounting of Textile, Paper or Polymeric (Including Vinyl) and Wood Wall or Ceiling Coverings, Facing and Veneers to Assess Surface Burning Characteristics	IBC®	IFC®
E2556/E2556M-10 <u>E2556M-2010(2016)</u>	Standard Specification for Vapor Permeable Flexible Sheet Water-resistive Barriers Intended for Mechanical Attachment	IBC®	
E2568-09e1 <u>E2568-</u>	Standard Specification for PB Exterior Insulation and Finish Systems	IBC®	IRC®

2017A E2570/E2570M— 07(2014)e1	Standard Test Method for Evaluating Water-resistive Barrier (WRB) Coatings Used under Exterior Insulation and Finish Systems (EIFS) for EIFS with Drainage	IBC®	IRC®
E2573—12 E2573—2017	Standard Practice for Specimen Preparation and Mounting of Site-fabricated Stretch Systems to Assess Surface Burning Characteristics	IBC®	IFC®
E2579—13 E2579—2015	Standard Practice for Specimen Preparation and Mounting of Wood Products to Assess Surface Burning Characteristics	IBC®	IFC®
E2599—15 E2599—2018	Standard Practice for Specimen Preparation and Mounting of Reflective Insulation, Radiant Barrier and Vinyl Stretch Ceiling Materials for Building Applications to Assess Surface Burning Characteristics	IBC®	
E2634—11(2015) E2634— 2018	Standard Specification for Flat Wall Insulating Concrete Form (ICF) Systems	IBC®	IRC®
E2751/E2751M—13 E2751M—2017A	Practice for Design and Performance of Supported Laminated Glass Walkways	IBC®	
F547—06(2012) F547— 2017	Terminology of Nails for Use with Wood and Wood-base Materials	IBC®	
F1667—15 F1667—2018	Specification for Driven Fasteners: Nails, Spikes and Staples	IBC®	IRC®
F2200—14 F2200—2017	Standard Specification for Automated Vehicular Gate Construction	IBC®	IFC®
G154—12a G154—2016A	Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials	IBC®	

AWC		American Wood Council	
Standard Reference Number	Title	Referenced in Code(s):	
AWC STJR—2015 STJR— 2021	Span Tables for Joists and Rafters	IBC®	IRC®
ANSI/AWC PWF—2015 PWF—2021	Permanent Wood Foundation Design Specification	IBC®	IRC®
ANSI/AWC SDPWS—2015 SDPWS—2021	Special Design Provisions for Wind and Seismic	IBC®	

AWPA		American Wood Protection Association	
Standard Reference Number	Title	Referenced in Code(s):	
M4—16 M4—15	Standard for the Care of Preservative-treated Wood Products	IBC®	IRC®
U1—16 U1—20	USE CATEGORY SYSTEM: User Specification for Treated Wood Except Commodity Specification H	IBC®	IRC®

AWS		American Welding Society	
Standard Reference Number	Title	Referenced in Code(s):	
D1.4/D1.4M—2017 D1.4M —2018	Structural Welding Code—Reinforcing Steel Including Metal Inserts and Connections In Reinforced Concrete Construction Code—Steel Reinforcing Bars	IBC®	

BHMA		Builders Hardware Manufacturers' Association	
Standard Reference Number	Title	Referenced in Code(s):	
A 156.10—2011 156.10— 2017	Power Operated Pedestrian Doors	IBC®	

A 156.19—2019 <u>156.19—2020</u>	Standard for Power Assist and Low Energy Power Operated Doors	IBC®
A 156.27—2011 <u>156.27—2019</u>	Power and Manual Operated Revolving Pedestrian Doors	IBC®
A 156.38—2014 <u>156.38—2020</u>	Low Energy Power Operated Sliding and Folding Doors	IBC®

CSA	Canadian Standards Association	
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Standard Reference Number	Title	Referenced in Code(s):
ASME A17.1—2016 <u>A17.1—2019/CSA B44—16</u> B44—16 <u>B44—19</u>	Safety Code for Elevators and Escalators	IBC®
ASME A17.7—2007/CSA B44.7—07(R2017)	Performance-based Safety Code for Elevators and Escalators	IBC®

DASMA	Door & Access Systems Manufacturers Association International	
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Standard Reference Number	Title	Referenced in Code(s):
ANSI/DASMA 115—2016 <u>115—2017</u>	Standard Method for Testing Sectional Garage Doors, Rolling Doors and Flexible Doors: Determination of Structural Performance Under Missile Impact and Cyclic Wind Pressure	IBC®

DOC	U.S. Department of Commerce	
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Standard Reference Number	Title	Referenced in Code(s):
PS 1—09 <u>1—19</u>	Structural Plywood	IBC® IRC®
PS 2—10 <u>2—18</u>	Performance Standard for Wood-based Structural use <u>Wood Structural Panels</u>	IBC® IRC®
PS 20—05	American Softwood Lumber Standard	IBC® IRC®

FM	FM Approvals	
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Standard Reference Number	Title	Referenced in Code(s):
4880—2015 <u>4880—2017</u>	Approval American National Standard for Class 1 Fire Rating of Building Panels or <u>Evaluating the Fire Performance Insulated Building Panel Assemblies and Interior Finish Materials</u>	IBC®

GA	Gypsum Association	
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Standard Reference Number	Title	Referenced in Code(s):
GA 216—2016 <u>216—2018</u>	Application and Finishing of Gypsum Panel Products	IBC®
GA 600—2015 <u>600—2018</u>	Fire-resistance <u>and Sound Control</u> Design Manual, 21st <u>22nd</u> Edition	IBC®

NAAMM	National Association of Architectural Metal Manufacturers	
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Standard Reference Number	Title	Referenced in Code(s):
FP 1001—17 <u>1001—18</u>	Guide Specifications for Design of Metal Flag Poles	IBC®

NCMA**National Concrete Masonry Association**

Standard Reference Number	Title	Referenced in Code(s):
TEK 5—84(1996 2005)	Details for Concrete Masonry Fire Walls	IBC®

NFPA**National Fire Protection Association**

Standard Reference Number	Title	Referenced in Code(s):
10 18 <u>10—21</u>	Standard for Portable Fire Extinguishers	IBC® IFC®
11—16	Standard for Low Low -, Medium, and High Expansion Foam	IBC® IFC®
12A 15 <u>12A—18</u>	Standard on Halon 1301 Fire Extinguishing Systems	IBC® IFC® IPMC®
13 16 <u>13—19</u>	Standard for Installation of Sprinkler Systems	IBC® IFC® IRC®
13D 16 <u>13D—19</u>	Standard for the Installation of Sprinkler Systems in One- and Two-family Dwellings and Manufactured Homes	IBC® IFC® IRC®
13R 16 <u>13R—19</u>	Standard for the Installation of Sprinkler Systems in Low-rise Residential Occupancies	IBC® IFC® IRC®
14 16 <u>14—19</u>	Standard for the Installation of Standpipe and Hose System	IBC® IFC®
16 15 <u>16—19</u>	Standard for the Installation of Foam-water Sprinkler and Foam-water Spray Systems	IBC® IFC®
17 17 <u>17—20</u>	Standard for Dry Chemical Extinguishing Systems	IBC® IFC® IPMC®
17A 17 <u>17A—20</u>	Standard for Wet Chemical Extinguishing Systems	IBC® IFC® IPMC®
20 16 <u>20—19</u>	Standard for the Installation of Stationary Pumps for Fire Protection	IBC® IFC®
30 18 <u>30—21</u>	Flammable and Combustible Liquids Code	IBC® IFC®
30A 18 <u>30A—21</u>	Code for Motor Fuel Dispensing Facilities and Repair Garages	IBC® IFC® IFGC® IMC®
31 16 <u>31—20</u>	Standard for the Installation of Oil-burning Equipment	IBC® IFC® IMC® IRC®
32—16	Standard for Dry Cleaning Plants <u>Drycleaning Facilities</u>	IBC® IFC®
40 16 <u>40—19</u>	Standard for the Storage and Handling of Cellulose Nitrate Film	IBC® IFC®
45 15 <u>45—19</u>	Standard on Fire Protection Laboratories Using Chemicals (2015 Edition)	IBC® IFC®
58 17 <u>58—20</u>	Liquefied Petroleum Gas Code	IBC® IFC® IFGC® IMC® IRC®
61 17 <u>61—20</u>	Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Product Facilities	IBC® IFC®
72 16 <u>72—19</u>	National Fire Alarm and Signaling Code	IBC® IFC® IMC® IPMC® IRC®
80 16 <u>80—19</u>	Standard for Fire Doors and Other Opening Protectives	IBC® IFC® IPMC®
82 14 <u>82—19</u>	Standard on Incinerators and Waste and Linen Handling Systems and Equipment	IBC® IFC® IMC®
85 15 <u>85—19</u>	Boiler and Combustion System Hazards Code	IBC® IFC® IFGC® IMC® IRC®
92 15 <u>92—18</u>	Standard for Smoke Control Systems	IBC® IFC® IMC®

99 — 18 <u>99</u> — 21	Health Care Facilities Code	IBC® IPC®	IFC®
101 — 18 <u>101</u> — 21	Life Safety Code	IBC®	IFC®
105 — 16 <u>105</u> — 19	Standard for Smoke Door Assemblies and Other Opening Protectives	IBC® IPMC®	IFC®
110 — 16 <u>110</u> — 19	Standard for Emergency and Standby Power Systems	IBC®	IFC®
111 — 13 <u>111</u> — 19	Standard on Stored Electrical Energy Emergency and Standby Power Systems	IBC®	IFC®
120 — 15 <u>120</u> — 20	Standard for Fire Prevention and Control in Coal Mines	IBC®	IFC®
211 — 16 <u>211</u> — 19	Standard for Chimneys, Fireplaces, Vents and Solid Fuel-burning Appliances	IBC® IFGC® IRC®	IFC® IMC®
221 — 18 <u>221</u> — 21	Standard for High Challenge Fire Walls, Fire Walls and Fire Barrier Walls	IBC®	
253 — 15 <u>253</u> — 19	Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source	IBC®	IFC®
265 — 15 <u>265</u> — 19	Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile or Expanded Vinyl Wall Coverings on Full Height Panels and Walls	IBC®	IFC®
286 — 15 <u>286</u> — 19	Standard Methods of Fire Test for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth	IBC® IMC®	IFC® IRC®
276 — 15 <u>276</u> — 19	Standard Method of Fire Tests for Determining the Heat Release Rate of Roofing Assemblies with Combustible Above-deck Roofing Components	IBC®	
289 — 18 <u>289</u> — 19	Standard Method of Fire Test for Individual Fuel Packages	IBC®	IFC®
484 — 18 <u>484</u> — 19	Standard for Combustible Metals	IBC®	
652 — 16 <u>652</u> — 19	Standard on the Fundamentals of Combustible Dust	IBC®	IFC®
654 — 17 <u>654</u> — 20	Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing and Handling of Combustible Particulate Solids	IBC®	IFC®
664 — 17 <u>664</u> — 20	Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities	IBC®	IFC®
701 — 15 <u>701</u> — 19	Standard Methods of Fire Tests for Flame Propagation of Textiles and Films	IBC®	IFC®
750 — 15 <u>750</u> — 19	Standard on Water Mist Fire Protection Systems	IBC®	IFC®
2001 — 15 <u>2001</u> — 18	Standard on Clean Agent Fire Extinguishing Systems	IBC® IPMC®	IFC®
2010 — 15 <u>2010</u> — 20	Standard for Fixed Aerosol Fire-extinguishing Systems	IBC®	IFC®

PCI	Precast Prestressed Concrete Institute	
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Standard Reference Number	Title	Referenced in Code(s):
MNL 124 — 11 <u>PCI 124</u> — 18	Design Specification for Fire Resistance of Precast/Prestressed Concrete	IBC®
MNL 128 — 04 <u>PCI 128</u> — 19	Recommended Practice Specification for Glass Fiber Reinforced Concrete Panels	IBC®

PTI	Post-Tensioning Institute	
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Standard Reference Number	Title	Referenced in Code(s):
PTI DC — 10.5-12 <u>DC</u> — 10.5-19	Standard Requirements for Design and Analysis of Shallow <u>Post-Tensioned</u> Concrete Foundations on Expansive and <u>Stable</u> Soils	IBC®

SBCA	Structural Building Components Association	
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Standard Reference Number	Title	Referenced in Code(s):
ANSI/FS 100-12 (<u>R2018</u>)	Standard Requirements for Wind Pressure Resistance of Foam Plastic Insulating	IBC®

Sheathing Used in Exterior Wall Covering Assemblies

SPRI	Single-Ply Roofing Institute	
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Standard Reference Number	Title	Referenced in Code(s):
ANSI/SPRI/FM 4435-ES-1 4435 ES-1-17	Wind Test Design Standard for Edge Systems Used with Low Slope Roofing Systems	IBC®
ANSI/SPRI RP-4-13 RP-4-18	Wind Design Guide for Ballasted Single-ply Roofing Systems	IBC®
ANSI/SPRI VF-1-10 VF-1-17	External Fire Design Standard for Vegetative Roofs	IBC®

TIA	Telecommunications Industry Association	
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Standard Reference Number	Title	Referenced in Code(s):
222-H-2016 ANSI/TIA 222-H-2017	Structural Standards Standard for Antenna Supporting Structures and Antennas <u>Antennas and Small Wind Turbine Support Structures</u>	IBC®

TMS	The Masonry Society	
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Standard Reference Number	Title	Referenced in Code(s):
302-2012 <u>302-2018</u>	Standard Method for Determining the Sound Transmission Class Rating for Masonry Walls	IBC®

UL	UL LLC	
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Standard Reference Number	Title	Referenced in Code(s):
10A—2009	Tin Clad Fire Doors—with Revisions through December 2013 <u>July 2018</u>	IBC®
10C-2009 <u>10C-2016</u>	Positive Pressure Fire Tests of Door Assemblies—with Revisions through February 2015 <u>Assemblies</u>	IBC®
14B—2008	Sliding Hardware for Standard Horizontally Mounted Tin Clad Fire Doors—with Revisions through May 2013 <u>July 2017</u>	IBC®
14C-06 <u>14C-2006</u>	Swinging Hardware for Standard Tin Clad Fire Doors Mounted Singly and in Pairs—with Revisions through May 2013 <u>July 2017</u>	IBC®
55A-04 <u>55A-2004</u>	Materials for Built-up Roof Coverings	IBC® IRC®
103—2010	Factory-built Chimneys, for Residential Type and Building Heating Appliances—with Revisions through July 2012 <u>March 2017</u>	IBC® IFGC® IMC® IRC®
127—2011	Factory-built Fireplaces—with Revisions through May 2015 <u>July 2016</u>	IBC® IFGC® IMC® IRC®
199E-04 <u>199E-2004</u>	Outline of Investigation for Fire Testing of Sprinklers and Water Spray Nozzles for Protection of Deep Fat Fryers	IBC® IFC®
217-06 <u>217-2015</u>	Single and Multiple Station Smoke Alarms—with Revisions through October 2015 <u>November 2016</u>	IBC® IFC® IRC®
263—11	Fire Tests of Building Construction and Materials—with Revisions through June 2015 <u>March 2018</u>	IBC®
268-09 <u>268-2016</u>	Smoke Detectors for Fire Alarm Systems <u>Systems-with revisions through July 2016</u>	IBC® IFC® IPMC®
294-1999 <u>294-2018</u>	Access Control System Units—with Revisions through February 2015 <u>October 2018</u> Fire Testing of Fire Extinguishing Systems for Protection of Commercial Cooking	IBC® IFC®

300 — 05 <u>300</u> — 2005 (R2010)	Equipment—with Revisions through December 2014	IBC®	IFC®
300A — 06 <u>300A</u> — 2006	Outline of Investigation for Extinguishing System Units for Residential Range Top Cooking Surfaces	IBC®	IFC®
305—2012	Panic Hardware—with Revisions through August 2014 <u>March 2017</u>	IBC®	IFC®
325 — 02 <u>325</u> — 2017	Door, Drapery, Gate, Louver and Window Operations and Systems—with Revisions through May 2015 <u>Systems</u>	IBC® IRC®	IFC®
555—2006	Fire Dampers—with Revisions through May 2014 <u>October 2016</u>	IBC®	
555C — 2006 <u>555C</u> — 2014	Ceiling Dampers—with Revisions through December 2014 <u>May 2017</u>	IBC®	
555S — 09 <u>555S</u> — 2014	Smoke Dampers—with Revisions through February 2014 <u>October 2016</u>	IBC®	IMC®
580—2006	Test for Uplift Resistance of Roof Assemblies—with Revisions through October 2013 <u>2018</u>	IBC®	
641—2010	Type L Low-temperature Venting Systems—with Revisions through June 2013 <u>April 2018</u>	IBC® IMC®	IFGC® IRC®
723 — 2008 <u>723</u> — 2018	Test for Surface Burning Characteristics of Building Materials—with Revisions through August 2013 <u>Materials</u>	IBC® IWUIC®	IMC®
790 — 04 <u>790</u> — 2004	Standard Test Methods for Fire Tests of Roof Coverings—with Revisions through July 2014 <u>October 2018</u>	IBC® IFC®	IEBC® IRC®
793 — 08 <u>793</u> — 2008	Automatically Operated Roof Vents for Smoke and Heat—with Revisions through September 2014 <u>March 2017</u>	IBC®	IFC®
864 — 03 <u>864</u> — 2014	Control Units and Accessories for Fire Alarm Systems—with Revisions through December 2014 <u>March 2018</u>	IBC®	IFC®
924 — 06 <u>924</u> — 2016	Safety Emergency Lighting and Power Equipment—with Revisions through April 2014 <u>May 2018</u>	IBC®	IFC®
1040 — 06 <u>1040</u> — 1996	Fire Test of Insulated Wall Construction—with Revisions through October 2012 <u>April 2017</u>	IBC®	IRC®
1256—02	Fire Test of Roof Deck Construction—with Revisions through July 2013 <u>August 2018</u>	IBC®	IRC®
1479 — 03 <u>1479</u> — 2015	Fire Tests of Penetration Firestops—with Revisions through June 2015 <u>Firestops</u>	IBC® IRC®	IMC®
1703 — 02 <u>1703</u> — 2002	Flat-plate Photovoltaic Modules and Panels—with Revisions through October 2015 <u>September 2018</u>	IBC®	IRC®
1715—97	Fire Test of Interior Finish Material—with Revisions through January 2013 <u>April 2017</u>	IBC®	IRC®
1741—2010	Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources—with Revisions through January 2015 <u>February 2018</u>	IBC®	IRC®
1777—2007	Chimney Liners—with Revisions through October 2015 <u>April 2014</u>	IBC® IMC®	IFGC®
1784 — 04 <u>1784</u> — 2015	Air Leakage Tests of Door Assemblies—with Revisions through February 2015 <u>Assemblies</u>	IBC®	IECC
1897 — 12 <u>1897</u> — 2015	Uplift Tests for Roof Covering Systems—with Revisions through September 2015 <u>Systems</u>	IBC®	IRC®
1994 — 04 <u>1994</u> — 2015	Luminous Egress Path Marking Systems—with Revisions through May 2015 <u>Systems</u>	IBC®	IFC®
2034 — 2008 <u>2034</u> — 2017	Single- and Multiple-station Carbon Monoxide Alarms—with Revisions through March 2015 <u>September 2018</u>	IBC®	
2075—2013	Standard for Gas and Vapor Detectors and Sensors <u>Sensors</u> -with revisions through December 2017	IBC® IMC®	IFC® IRC®
2079 — 04 <u>2079</u> — 2015	Tests for Fire Resistance of Building Joint Systems—with Revisions through August 2015 <u>Systems</u>	IBC®	IFC®
2196 — 2004 <u>2196</u> — 2017	Tests Standard for Fire Resistive Cables—with Revisions through March 2012 <u>Test for Circuit Integrity of Fire- Resistive Power, Instrumentation, Control and Data Cables</u>	IBC®	IFC®
2200—2012	Stationary Engine Generator Assemblies—with Revisions through July <u>October 2015</u>	IBC® IFGC®	IFC® IMC®
2202—2009	Electric Vehicle (EV) Charging System Equipment <u>Equipment</u> -with revisions through February 2018	IBC®	

2594—2013 <u>2594—2016</u>	Electric Vehicle Supply Equipment	IBC®
2703—2014	Outline of Investigation for Mounting Systems, Mounting Devices, Clamping/Retention Devices and Ground Lugs for Use with Flat-plate Photovoltaic Modules and Panels <u>Panels-with revisions through December 2019</u>	IBC®

ULC	Underwriters Laboratories of Canada
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Standard Reference Number	Title	Referenced in Code(s):	
CAN/ULC S 102.2—2010 <u>102.2—2018</u>	Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings and Miscellaneous Materials and Assemblies with 2000 Revisions <u>Assemblies</u>	IBC®	IRC®

Reason: THIS IS THE ADMIN STANDARDS UPDATE CODE CHANGE FOR THE IBC.

The CP28 Code Development Policy, Section 4.6 requires the updating of referenced standards to be accomplished administratively, and be processed as a Code Change Proposal for consideration by the Administrative Code Change Committee. In September 2018, a letter was sent to each developer of standards that is referenced in the International Codes, asking them to provide ICC with a list of their standards in order to update to the current edition. Listed are the referenced standards that are to be updated based upon responses received from standard developers.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Not applicable.

Proposal # 5823

ADM47-IBC-19

ADM47-IFC-19

Chapter 80

ANSI		American National Standards Institute	
Standard Reference Number	Title	Referenced in Code(s):	
ANSI Z21.69/CSA 6.16-09 <u>6.16-2015</u>	Connectors for Movable Gas Appliances	IFC®	

API		American Petroleum Institute	
Standard Reference Number	Title	Referenced in Code(s):	
RP 651-3rd-651-4th Edition (2007-2014)	Cathodic Protection of Aboveground Petroleum Storage Tanks	IFC®	
Std 653-4th-653-5th Edition (2009-2018)	Tank Inspection, Repair, Alteration and Reconstruction	IFC®	
Std 2000-6th-2000-7th Edition (2009-2014)	Venting Atmosphere and Low-pressure Storage Tanks: Nonrefrigerated and Refrigerated	IFC®	
RP 2003-7th-2003-8th Edition (2008-2015)	Protection Against Ignitions Arising out of Static, Lightning and Stray Currents	IFC®	
Std 2015-6th-2015-8th Edition 2001 (R2006-2018)	<u>Requirements for Safe Entry and Clearing of Petroleum Storage Tanks</u>	IFC®	
Publ 2028 3rd Edition- (2002, R20+2 R2010)	Flame Arrestors in Piping Systems	IFC®	

ASCE/SEI		American Society of Civil Engineers	
Standard Reference Number	Title	Referenced in Code(s):	
ASCE/SEI 24-14-24-20	Flood Resistant Design and Construction	IFC®	

ASHRAE		ASHRAE	
Standard Reference Number	Title	Referenced in Code(s):	
15-2016-15-2019	Safety Standard for Refrigeration Systems	IFC®	IMC®

ASME		American Society of Mechanical Engineers	
Standard Reference Number	Title	Referenced in Code(s):	
A13.1-2015 <u>A13.1-2020</u>	Scheme for the Identification of Piping Systems	IBC®	IFC®
ASME A17.1-2016 <u>A17.1-2019/CSA B44-16</u> B44-19	Safety Code for Elevators and Escalators	IEBC®	IECC
A17.3-2015 <u>A17.3-2020</u>	Safety Code for Existing Elevators and Escalators	IFC®	IPMC®
B16.18-2012 <u>B16.18-2018</u>	Cast Copper-Alloy Solder Joint Pressure Fittings	IEBC®	IFC®
B16.22-2013 <u>B16.22-2018</u>	Wrought Copper and Copper-alloy Solder-joint Pressure Fittings	IMC®	IPC®
		IFC®	IPC®
		IFC®	IPC®

B31.1—2016 <u>B31.1—2020</u>	Power Piping	IFC®	
B31.3—2016 <u>B31.3—2020</u>	Process Piping	IBC® IFGC®	IFC®
B31.4—2015 <u>B31.4—2019</u>	Pipeline Transportation Systems for Liquids and Slurries	IFC®	
B31.9—2014 <u>B31.9—2020</u>	Building Services Piping	IFC®	IMC®
BPVC—2015 <u>BPVC—2019</u>	ASME Boiler and Pressure Vessel Code (Sections I, II, IV, V & VI, VIII)	IFC® IMC®	IFGC® IRC®

ASSE

American Society of Safety Engineers

Standard Reference Number	Title	Referenced in Code(s):	
ANSI/ASSE Z359.1—2016 ASSP Z359.1—2019	Requirements for the ANSI/ASSE Z359-The Fall Protection Code	IBC® IMC®	IFC®

ASTM

ASTM International

Standard Reference Number	Title	Referenced in Code(s):	
B88—14 <u>B88—2016</u>	Specification for Seamless Copper Water Tube	IBC® IFGC® IPC® IRC®	IFC® IMC® IPSDC® ISPSC®
B251—10 <u>B251/B251M—2017</u>	Specification for General Requirements for Wrought Seamless Copper and Copper-alloy Tube	IBC® IMC® IPSDC®	IFC® IPC® IRC®
B280—13 <u>B280—2018</u>	Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service	IBC® IFGC®	IFC® IMC®
D56—05(2010) <u>D56—2016A</u>	Test Method for Flash Point by Tag Closed Cup Tester	IBC® IMC®	IFC®
D86—15 <u>D86—2017</u>	Test Method for Distillation of Petroleum Products at Atmospheric Pressure	IBC®	IFC®
D92—12b <u>D92—2018</u>	Test Method for Flash and Fire Points by Cleveland Open Cup Tester	IFC®	
D93—15 <u>D93—2018</u>	Test Method for Flash Point by Pensky-Martens Closed Up Tester	IBC® IMC®	IFC®
D2859—16 <u>D2859—2016</u>	Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials	IBC®	IFC®
E84—2016 <u>E84—2018B</u>	Standard Test Method for Surface Burning Characteristics of Building Materials	IEBC® IMC® IWUIC®	IFC® IRC®
E108—2016 <u>E108—2017</u>	Standard Test Methods for Fire Tests of Roof Coverings	IFC®	IRC®
E648—15e1 <u>E648—2017A</u>	Standard Test Method for Critical Radiant Flux of Floor-covering Systems Using a Radiant Heat Energy Source	IBC®	IFC®
E1354—2016 <u>E1354—2017</u>	Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter	IFC®	
E1529—14a <u>E1529—2016E1</u>	Standard Test Method for Determining Effects of Large Hydrocarbon Pool Fires on Structural Members and Assemblies	IFC®	
E1537—2015 <u>E1537—2016</u>	Test Method for Fire Testing of Upholstered Furniture	IFC®	
E1590—13 <u>E1590—2017</u>	Test Method for Fire Testing of Mattresses	IFC®	
E2404—15a <u>E2404—2017</u>	Standard Practice for Specimen Preparation and Mounting of Textile, Paper or Polymeric (Including Vinyl) and Wood Wall or Ceiling Coverings, Facing and Veneers to Assess Surface Burning Characteristics	IBC®	IFC®
E2573—12 <u>E2573—2017</u>	Standard Practice for Specimen Preparation and Mounting of Site-fabricated Stretch Systems to Assess Surface Burning Characteristics	IBC®	IFC®

E2579—13 <u>E2579—2015</u>	Standard Practice for Specimen Preparation and Mounting of Wood Products to Assess Surface Burning Characteristics	IBC®	IFC®
F2200—14 <u>F2200—2017</u>	Standard Specification for Automated Vehicular Gate Construction	IBC®	IFC®

BHMA

Builders Hardware Manufacturers' Association

Standard Reference Number	Title	Referenced in Code(s):	
A156.10—2011 <u>A156.10—2017</u>	American National Standard for Power-operated Pedestrian Doors	IFC®	
A156.19—2013 <u>A156.19—2020</u>	American National Standard for Power Assist and Low-energy Power-operated Doors	IFC®	
A156.27—2011 <u>A156.27—2019</u>	Power- and Manual-operated Revolving Pedestrian Doors	IFC®	
A156.38—2014 <u>A156.38—2020</u>	Low-energy Power-operated Sliding and Folding Doors	IFC®	

CGA

Compressed Gas Association

Standard Reference Number	Title	Referenced in Code(s):	
ANSI/CGA G-13—(2015 2016)	Storage and Handling of Silane and Silane Mixtures (an American National Standard)	IFC®	
S-1.1—(2017 2011)	Pressure Relief Device Standards—Part 1—Cylinders for Compressed Gases	IFC®	IFGC®
S-1.3—(2016 2008)	Pressure Relief Device Standards—Part 3—Stationary Storage Containers for Compressed Gases	IFC®	IFGC®

FM

FM Approvals

Standard Reference Number	Title	Referenced in Code(s):	
ANSI/FM 4996—15 <u>4996—2019</u>	Approval Standard for Classification of Pallets and Other Material Handling Products as Equivalent to Wood Pallets	IFC®	

IIAR

International Institute of Ammonia Refrigeration

Standard Reference Number	Title	Referenced in Code(s):	
ANSI/IIAR-2—2014 <u>Addendum A</u>	Safe Design of Closed-circuit Ammonia Refrigerating Systems	IFC®	
IIAR 7—2013 <u>IIAR-7—2018</u>	Developing Operating Procedures for Closed-circuit Ammonia Mechanical Refrigerating Systems	IFC®	
IIAR 8—2015 <u>IIAR-8—2019</u>	Decommissioning of Closed-circuit Ammonia Refrigerating Systems	IFC®	

IKECA

International Kitchen Exhaust Cleaning Association

Standard Reference Number	Title	Referenced in Code(s):	
ANSI/IKECA C10—2016	IKECA C10 , Standard for the Methodology for Cleaning of Commercial Kitchen Exhaust Systems	IFC®	

NEMA

National Electrical Manufacturer's Association

Standard Reference	Title	Referenced in Code(s):	
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Number		
250 —2014 <u>250</u> —2018	Enclosures for Electrical Equipment (1,000 Volt Maximum)	IFC®

NFPA	National Fire Protection Association	
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Standard Reference Number	Title	Referenced in Code(s):	
02 —16 <u>02</u> —19	Hydrogen Technologies Code	IFC®	
04 —15 <u>04</u> —21	Standard for Integrated Fire Protection and Life Safety System Testing	IFC®	
10 —18 <u>10</u> —21	Standard for Portable Fire Extinguishers	IBC®	IFC®
12 —15 <u>12</u> —18	Standard on Carbon Dioxide Extinguishing Systems	IBC®	IFC®
		IPMC®	
12A —15 <u>12A</u> —18	Standard on Halon 1301 Fire Extinguishing Systems	IBC®	IFC®
		IPMC®	
13 —16 <u>13</u> —19	Standard for the Installation of Sprinkler Systems	IBC®	IFC®
		IRC®	
13D —16 <u>13D</u> —19	Standard for the Installation of Sprinkler Systems in One- and Two-family Dwellings and Manufactured Homes	IBC®	IFC®
		IRC®	
13R —16 <u>13R</u> —19	Standard for the Installation of Sprinkler Systems in Low-rise Residential Occupancies	IBC®	IFC®
		IRC®	
14 —16 <u>14</u> —19	Standard for the Installation of Standpipe and Hose Systems	IBC®	IFC®
16 —15 <u>16</u> —19	Standard for the Installation of Foam-water Sprinkler and Foam-water Spray Systems	IBC®	IFC®
17 —17 <u>17</u> —20	Standard for Dry Chemical Extinguishing Systems	IBC®	IFC®
		IPMC®	
17A —17 <u>17A</u> —20	Standard for Wet Chemical Extinguishing Systems	IBC®	IFC®
		IPMC®	
20 —16 <u>20</u> —19	Standard for the Installation of Stationary Pumps for Fire Protection	IBC®	IFC®
24 —16 <u>24</u> —19	Standard for Installation of Private Fire Service Mains and Their Appurtenances	IFC®	
25 —17 <u>25</u> —20	Standard for the Inspection, Testing and Maintenance of Water-based Fire Protection Systems	IFC®	IPMC®
30 —18 <u>30</u> —21	Flammable and Combustible Liquids Code	IBC®	IFC®
30A —18 <u>30A</u> —21	Code for Motor Fuel-dispensing Facilities and Repair Garages	IBC®	IFC®
		IFGC®	IMC®
30B —15 <u>30B</u> —19	Code for the Manufacture and Storage of Aerosol Products	IFC®	
31 —16 <u>31</u> —20	Standard for the Installation of Oil-burning Equipment	IBC®	IFC®
		IMC®	IRC®
32—16	Standard for Dry Cleaning Plants <u>Drycleaning Facilities</u>	IBC®	IFC®
33 —16 <u>33</u> —18	Standard for Spray Application Using Flammable or Combustible Materials	IFC®	
34 —15 <u>34</u> —18	Standard for Dipping, Coating and Printing Processes Using Flammable or Combustible Liquids	IFC®	
40 —16 <u>40</u> —19	Standard for the Storage and Handling of Cellulose Nitrate Film	IBC®	IFC®
45 —15 <u>45</u> —19	Standard on Fire Protection for Laboratories Using Chemicals (2015 Edition)	IBC®	IFC®
51—18	Standard for the Design and Installation of Oxygen-fuel Gas Systems for Welding, Cutting and Allied Processes	IFC®	IFGC®
		IPC®	
52 —16 <u>52</u> —19	Vehicular Gaseous Fuel System Code	IFC®	
55 —16 <u>55</u> —19	Compressed Gases and Cryogenic Fluids Code	IBC®	IFC®
		IPC®	
56 —17 <u>56</u> —20	Standard for Fire and Explosion Prevention during Cleaning and Purging of Flammable Gas Piping Systems	IFC®	
		IBC®	IFC®
58 —17 <u>58</u> —20	Liquefied Petroleum Gas Code	IFGC®	IMC®

59A — 16 <u>59A</u> —19	Standard for the Production, Storage and Handling of Liquefied Natural Gas (LNG)	IRC®	IFC®
61 — 17 <u>61</u> —20	Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities	IBC®	IFC®
69 — 14 <u>69</u> —19	Standard on Explosion Prevention Systems	IFC®	IMC®
72 — 16 <u>72</u> —19	National Fire Alarm and Signaling Code	IBC® IMC® IRC®	IFC® IPMC®
80 — 16 <u>80</u> —19	Standard for Fire Doors and Other Opening Protectives	IBC® IPMC®	IFC®
85 — 15 <u>85</u> —19	Boiler and Combustion System Hazards Code	IBC® IFGC® IRC®	IFC® IMC®
86 — 15 <u>86</u> —19	Standard for Ovens and Furnaces	IFC®	
92 — 15 <u>92</u> —18	Standard for Smoke Control Systems	IBC® IMC®	IFC®
96 — 17 <u>96</u> —20	Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations	IFC®	IMC®
99 — 18 <u>99</u> —21	Health Care Facilities Code	IBC® IPC®	IFC®
101 — 18 <u>101</u> —21	Life Safety Code	IBC®	IFC®
105 — 16 <u>105</u> —19	Standard for Smoke Door Assemblies and Other Opening Protectives	IBC® IPMC®	IFC®
110 — 16 <u>110</u> —19	Standard for Emergency and Standby Power Systems	IBC®	IFC®
111 — 13 <u>111</u> —19	Standard on Stored Electrical Energy Emergency and Standby Power Systems	IBC®	IFC®
120 — 15 <u>120</u> —20	Standard for Fire Prevention and Control in Coal Mines	IBC®	IFC®
160 — 16 <u>160</u> —21	Standard for the Use of Flame Effects Before an Audience	IFC®	
204 — 15 <u>204</u> —18	Standard for Smoke and Heat Venting	IFC®	IPMC®
211 — 16 <u>211</u> —19	Standard for Chimneys, Fireplaces, Vents and Solid Fuel-burning Appliances	IBC® IFGC® IRC®	IFC® IMC®
241 — 18 <u>241</u> —19	Standard for Safeguarding Construction, Alteration and Demolition Operations	IFC®	
253 — 15 <u>253</u> —19	Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source	IBC®	IFC®
260 — 18 <u>260</u> —19	Methods of Tests and Classification System for Cigarette Ignition Resistance of Components of Upholstered Furniture	IFC®	
265 — 15 <u>265</u> —19	Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile or Expanded Vinyl Wall Coverings in Full Height Panels and Walls	IBC®	IFC®
286 — 15 <u>286</u> —19	Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth	IBC® IMC®	IFC® IRC®
289 — 18 <u>289</u> —19	Standard Method of Fire Test for Individual Fuel Packages	IBC®	IFC®
303 — 16 <u>303</u> —21	Fire Protection Standard for Marinas and Boatyards	IFC®	
326 — 15 <u>326</u> —20	Standard for the Safeguarding of Tanks and Containers for Entry, Cleaning or Repair	IFC®	
400 — 16 <u>400</u> —19	Hazardous Materials Code	IFC®	
410 — 15 <u>410</u> —20	Standard on Aircraft Maintenance	IFC®	
484 — 15 <u>484</u> —19	Standard for Combustible Metals	IFC®	
652 — 16 <u>652</u> —19	The Fundamentals of Combustible Dust	IBC®	IFC®
654 — 17 <u>654</u> —20	Standard for Prevention of Fire and Dust Explosions from the Manufacturing, Processing and Handling of Combustible Particulate Solids	IBC®	IFC®
664 — 17 <u>664</u> —20	Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities	IBC®	IFC®

701—15 701—19 703—18 703—21	Standard Methods of Fire Tests for Flame-propagation of Textiles and Films Standard for Fire Retardant-Wood and Fire-Retardant Coatings for Building Materials	IBC® IFC®	IFC®
750—15 750—19	Standard on Water Mist Fire Protection Systems	IBC®	IFC®
853—15 853—20	Installation of Stationary Fuel Cell Power Systems	IFC® IMC®	IFGC® IRC®
914—15 914—19	Code for Fire Protection of Historic Structures	IFC®	
1126—16 1126—21	Standard for the Use of Pyrotechnics Before a Proximate Audience	IFC®	
1221—16 1221—19	Standard for the Installation, Maintenance and Use of Emergency Services Communications Systems	IFC®	
2001—15 2001—18	Standard on Clean Agent Fire Extinguishing Systems	IBC® IPMC®	IFC®
2010—15 2010—20	Standard for Fixed Aerosol Fire-extinguishing Systems	IBC®	IFC®

UL

Underwriters Laboratories LLC

Standard Reference Number	Title	Referenced in Code(s):	
10C—09 10C—2016	Positive Pressure Fire Tests of Door Assemblies—with revisions through February 2015 <u>Assemblies</u>	IFC®	
30—95 30—1995	Metal Safety Cans—with revisions through June 2014	IFC®	
58—96 58—2018	Steel Underground Tanks for Flammable and Combustible Liquids—with revisions through July 1998 <u>Liquids</u>	IFC®	IRC®
87A—15 87A—2015	Outline of Investigation for Power-operated Dispensing Devices for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations up to 85 Percent <u>Percent—with revisions through June 2017</u>	IFC®	
142—06 142—2006	Steel Aboveground Tanks for Flammable and Combustible Liquids—with revisions through August 2014	IFC®	
199E—04 199E—2004	Outline of Investigation for Fire Testing of Sprinklers and Water Spray Nozzles for Protection of Deep Fat Fryers	IBC®	IFC®
217—06 217—2015	Single and Multiple Station Smoke Alarms—with revisions through October 2015 <u>November 2016</u>	IBC® IRC®	IFC®
268—09 268—2016	Smoke Detectors for Fire Alarm Systems <u>Systems—with revisions through July 2016</u>	IBC® IPMC®	IFC®
294—1999 294—2018	Access Control System Units—with revisions through February 2015 <u>October 2018</u>	IBC®	IFC®
300—05 (R2010) 300—2005	Fire Testing of Fire Extinguishing Systems for Protection of Commercial Cooking Equipment—with revisions through December 2014	IBC®	IFC®
300A—06 300A—2006	Outline of Investigation for Extinguishing System Units for Residential Range Top Cooking Surfaces	IBC®	IFC®
305—2012	Panic Hardware—with revisions through August 2014 <u>March 2017</u>	IBC®	IFC®
325—02 325—2017	Door, Drapery, Gate, Louver and Window Operators and Systems—with revisions through May 2015 <u>Systems</u>	IBC® IRC®	IFC®
499—05 499—2014	Standard for Electrical Heating Appliances—with revisions through November 2014 <u>February 2017</u>	IFC®	IMC®
647—93 647—1993	Standard for Unvented Kerosene-fired Room Heaters and Portable Heaters—with revisions through April 2010	IFC®	
710—2012	Exhaust Hoods for Commercial Cooking Equipment—with revisions through November 2013 <u>June 2018</u>	IFC®	IMC®
723—08 723—18	Standard for Test for Surface Burning Characteristics of Building Materials—with revisions through August 2013 <u>Materials</u>	IEBC® IRC®	IFC®
790—04 790—2004	Standard Test Methods for Fire Tests of Roof Coverings—with revisions through July 2014 <u>October 2018</u>	IBC® IFC®	IEBC® IRC®
793—08 793—2008	Automatically Operated Roof Vents for Smoke and Heat—with revisions through September 2014 <u>March 2017</u>	IBC®	IFC®

817—2015	Standard for Cord Sets and Power-supply Cords—with revisions through March 2015 <u>August 2018</u>	IFC®	
864—03 864—2014	Control Units and Accessories for Fire Alarm Systems—with revisions through December 2014 <u>March 2018</u>	IBC®	IFC®
900—04 900—2015	Air Filter Units—with revisions through April 2015 <u>Units</u>	IFC®	IMC®
924—06 924—2016	Standard for Safety Emergency Lighting and Power Equipment—with revisions through April 2014 <u>May 2018</u>	IBC®	IFC®
1037—99 1037—2016	Antitheft Alarms and Devices—with revisions through December 2009 <u>September 2017</u>	IFC®	
1046—2010	Grease Filters for Exhaust Ducts—with revisions through January 2012 <u>April 2017</u>	IFC®	IMC®
1275—05 1275—2014	Flammable Liquid Storage Cabinets—with revisions through November 2014 <u>February 2018</u>	IFC®	
1313—93 1313—2015	Standard for Nonmetallic Safety Cans for Petroleum Products—with revisions through November 2012 <u>Products</u>	IFC®	
1315—95 1315—2017	Standard for Safety for Metal Waste Paper Containers—with revisions through September 2012 <u>Containers</u>	IFC®	
1363—07 1363—2018	Relocatable Power Taps—with revisions through September 2015 <u>Taps</u>	IFC®	
1564—2015	Industrial Battery Chargers <u>Chargers</u> -with revisions through August 2017	IFC®	
1741—2015 1741—2010	Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources <u>with revisions through February 2018</u>	IFC®	
1805—2002	Standard for Laboratory Hoods and Cabinets <u>Cabinets</u> -with revisions through June <u>2006</u>	IFC®	
1973—13 1973—2018	Standard for Batteries for Use in Stationery, Vehicle Auxiliary Power and Light Electric Rail (LER) Applications and Stationary Applications	IFC®	
1994—04 1994—2015	Standard for Luminous Egress Path Marking Systems—with revisions through May 2015 <u>Systems</u>	IBC®	IFC®
2017—08 2017—2008	General-purpose Signaling Devices and Systems—with revisions through May 2011 <u>January 2016</u>	IFC®	
2034—08 2034—2017	Single and Multiple Station Carbon Monoxide Alarms—with revisions through March 2015 <u>September 2018</u>	IFC®	IRC®
2075—2013	Standard for Gas and Vapor Detectors and Sensors <u>Sensors</u> -with revisions through <u>December 2017</u>	IBC® IMC®	IFC® IRC®
2079—04 2079—2015	Tests for Fire Resistance of Building Joint Systems—with revisions through August 2015 <u>Systems</u>	IBC®	IFC®
2085—97 2085—1997	Protected Above-ground Tanks for Flammable and Combustible Liquids—with revisions through September 2010	IFC®	
2152—15 2152—2016	Outline of Investigation for Special Purpose Nonmetallic Containers and Tanks for Specific Combustible or Noncombustible Liquids	IFC®	
2196—2001 2196—2017	Tests for Fire Resistive Cables—with revisions through March 2012 <u>Standard for Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables</u>	IBC®	IFC®
2200—2012	Stationary Engine Generator Assemblies—with revisions through July <u>October 2015</u>	IBC® IFGC®	IFC® IMC®
2245—06 2245—2006	Below-grade Vaults for Flammable Liquid Storage Tanks	IFC®	
2335—10 2335—2010	Fire Tests of Storage Pallets—with revisions through September 2012 <u>August 2017</u>	IFC®	
2360—00 2360—2000	Test Methods for Determining the Combustibility Characteristics of Plastics Used in Semi-Conductor Tool Construction— with revisions through May 2013 <u>October 2017</u>	IFC®	
9540—14 9540—2016	Outline of Investigation <u>Standard for Energy Storage Systems and Equipment</u>	IFC®	IRC®

Reason: THIS IS THE ADMIN STANDARDS UPDATE CODE CHANGE FOR THE IFC.

The CP28 Code Development Policy, Section 4.6 requires the updating of referenced standards to be accomplished administratively, and be processed as a Code Change Proposal for consideration by the Administrative Code Change Committee. In September 2018, a letter was sent to each developer of standards that is referenced in the International Codes, asking them to provide ICC with a list of their standards in order to update

to the current edition. Listed are the referenced standards that are to be updated based upon responses received from standards developers.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Not applicable.

Proposal # 5816

ADM47-IFC-19

ADM47-IMC-19

Chapter 15

ACCA		Air Conditioning Contractors of America	
Standard Reference Number	Title	Referenced in Code(s):	
<u>ANSI/ACCA 1 Manual D—2016</u>	Residential Duct Systems	IMC®	IRC®
AHRI		Air-Conditioning, Heating & Refrigeration Institute	
Standard Reference Number	Title	Referenced in Code(s):	
700—2015 <u>700—2017</u>	with Addendum 1: Specifications for Refrigerants	IMC®	
AMCA		Air Movement and Control Association International	
Standard Reference Number	Title	Referenced in Code(s):	
ANSI/AMCA 210—ANSI 210—16/ASHRAE 51—07 51—16	Laboratory Methods of Testing Fans for Aerodynamic Performance Rating	IMC®	IMC®
<u>ANSI/AMCA 550—09 (Rev. 09/18)</u>	Test Method for High Velocity Wind Driven Rain Resistant Louvers	IMC®	
ANSI		American National Standards Institute	
Standard Reference Number	Title	Referenced in Code(s):	
Z21.1—2010 <u>Z21.1/CSA 1.1—2016</u>	Household Cooking Gas Appliances	IFGC®	IMC®
Z21.8—1994 (R2002 R2012)	Installation of Domestic Gas Conversion Burners	IMC®	
ASHRAE		ASHRAE	
Standard Reference Number	Title	Referenced in Code(s):	
ANSI/AMCA 210—ANSI/ASHRAE 51—07 51—16	Laboratory Methods of Testing Fans for Aerodynamic Performance Rating	IMC®	IMC®
ASHRAE—2017 <u>ASHRAE—2021</u>	ASHRAE Fundamentals Handbook	IECC	IMC®
15—2016 <u>15—2019</u>	Safety Standard for Refrigeration Systems	IFC®	IMC®
34—2016 <u>34—2019</u>	Designation and Safety Classification of Refrigerants	IMC®	IRC®
62.1—2016 <u>62.1—2019</u>	Ventilation for Acceptable Indoor Air Quality	IEBC®	IMC®
180—2012 <u>180—2018</u>	Standard Practice for Inspection and Maintenance of Commercial Building HVAC Systems	IMC®	IMC®
180—2012 <u>180—2018</u>	Systems	IRC®	
ASME		American Society of Mechanical Engineers	
Standard Reference Number	Title	Referenced in Code(s):	

A112.4.1—2009 <u>(R2019)</u>	Water Heater Relief Valve Drain Tubes	IMC®	IPC®
B1.20.1—2013 <u>B1.20.1—2019</u>	Pipe Threads, General Purpose (Inch)	IFGC® IPC®	IMC® IRC®
B16.3—2016 <u>B16.3—2021</u>	Malleable Iron Threaded Fittings, Classes 150 & 300	IMC® IRC®	IPC®
B16.5—2015 <u>B16.5—2019</u>	Pipe Flanges and Flanged Fittings NPS 1/2 through NPS 24	IFGC®	IMC®
B16.9—2012 <u>B16.9—2018</u>	Factory Made Wrought Steel Buttwelding Fittings	IMC® IRC®	IPC®
B16.11—2016 <u>B16.11—2021</u>	Forged Fittings, Socket-welding and Threaded	IMC® IRC®	IPC®
B16.15—2013 <u>B16.15—2018</u>	Cast Alloy Threaded Fittings: Classes 125 and 250	IMC® IRC®	IPC® ISPSC®
B16.18—2012 <u>B16.18—2018</u>	Cast Copper Alloy Solder Joint Pressure Fittings	IBC® IMC® IRC®	IFC® IPC®
B16.22—2013 <u>B16.22—2018</u>	Wrought Copper and Copper Alloy Solder Joint Pressure Fittings	IBC® IMC® IRC®	IFC® IPC®
B16.24—2016 <u>B16.24—2021</u>	Cast Copper Alloy Pipe Flanges and Flanged Fittings: Class 150, 300, 400, 600, 900, 1500 and 2500	IFGC®	IMC®
B16.26—2016 <u>B16.26—2018</u>	Cast Copper Alloy Fittings for Flared Copper Tubes	IMC® IRC®	IPC®
B16.51—2013 <u>B16.51—2018</u>	Copper and Copper Alloy Press-connect Pressure Fittings	IMC® IRC®	IPC®
B31.5—2016 <u>B31.5—2019</u>	Refrigeration Piping and Heat Transfer Components	IMC®	
B31.9—2014 <u>B31.9—2020</u>	Building Services Piping	IFC®	IMC®
BPVC—2015 <u>BPVC—2019</u>	ASME Boiler & Pressure Vessel Code—07 Edition	IFC® IMC®	IFGC® IRC®
CSD-1—2016 <u>CSD-1—2021</u>	Controls and Safety Devices for Automatically Fired Boilers	IFGC® IRC®	IMC®

ASSE

American Society of Safety Engineers

Standard Reference Number	Title	Referenced in Code(s):	
ANSI/ASSE Z359.1—2016 ASSP Z359.1—2019	Requirements for ANSI/ASSE Z359.1—The Fall Protection Code	IBC® IMC®	IFC®

ASSE

ASSE International

Standard Reference Number	Title	Referenced in Code(s):	
1017—2010 <u>1017—2009</u>	Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems	IMC® IRC®	IPC®

ASTM

ASTM International

Standard Reference Number	Title	Referenced in Code(s):	
A53/A53M—12 <u>A53M—2018</u>	Specification for Pipe, Steel, Black and Hot-dipped, Zinc-coated, Welded and Seamless	IFGC® IPC®	IMC® IRC®
A106/A106M—14 <u>A106M—2018</u>	Specification for Seamless Carbon Steel Pipe for High-temperature Service	IFGC® IRC®	IMC®

A234/A234M—15 <u>A234M—18A</u>	Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service	IMC®	
A254—12 <u>A254—2010(2018)</u>	Specification for Copper Brazed Steel Tubing	IFGC® IRC®	IMC®
A420/A420M—14 <u>A420M—2016</u>	Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Low-temperature Service	IMC®	
B88—14 <u>B88—2016</u>	Specification for Seamless Copper Water Tube	IBC® IFGC® IPC® IRC®	IFC® IMC® IPSDC® ISPSC®
B135—10 <u>B135/B135M—2017</u>	Specification for Seamless Brass Tube	IMC®	IRC®
B251—10 <u>B251/B251M—2017</u>	Specification for General Requirements for Wrought Seamless Copper and Copper-alloy Tube	IBC® IMC® IPSDC®	IFC® IPC® IRC®
B280—13 <u>B280—2018</u>	Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service	IBC® IFGC®	IFC® IMC®
B302—12 <u>B302—2017</u>	Specification for Threadless Copper Pipe, Standard Sizes	IMC® IRC®	IPC®
B813—10 <u>B813—2016</u>	Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube	IMC® IPSDC®	IPC® IRC®
B819—00(R2011) <u>B819—2018</u>	Standard Specification for Seamless Copper Tube for Medical Gas Systems	IMC®	
B828—02(2010) <u>B828—2016</u>	Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings	IMC® IPSDC®	IPC® IRC®
C315—07 <u>C315—2007(2011, 2016)</u>	Specification for Clay Flue Liners and Chimney Pots	IBC® IMC®	IFGC® IRC®
C411—11 <u>C411—2017</u>	Test Method for Hot-surface Performance of High-temperature Thermal Insulation	IMC®	IRC®
D56—05(2010) <u>D56—2016A</u>	Test Method for Flash Point by Tag Closed Cup Tester	IBC® IMC®	IFC®
D93—15 <u>D93—18</u>	Test Method for Flash Point of Pensky-Martens Closed Cup Tester	IBC® IMC®	IFC®
D1785—15 <u>D1785—15E1</u>	Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120	IMC® IRC®	IPC® ISPSC®
D2235—04 <u>D2235—2004(2011, 2016)</u>	Specifications for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings	IMC® IPSDC®	IPC® IRC®
D2412—11 <u>D2412—2011(2018)</u>	Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-plate Loading	IMC®	IRC®
D2466—15 <u>D2466—2017</u>	Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40	IMC® IRC®	IPC® ISPSC®
D2564—12 <u>D2564—2012(2018)</u>	Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems	IMC® IPSDC®	IPC® IRC®
D2657—07 <u>D2657—2007(2015)</u>	Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings	IMC® IPSDC®	IPC® IRC®
D2846/D2846M—14 <u>D2846M—2017BE1</u>	Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Hot- and Cold-water Distribution Systems	IMC® IRC®	IPC® ISPSC®
D2996—01(2007)e01 <u>D2996—2017</u>	Specification for Filament-wound Fiberglass (Glass Fiber Reinforced Thermosetting Resin) Pipe	IMC®	
D3261—12e1 <u>D3261—2016</u>	Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing	IMC® IRC®	IPC®
E84—2016 <u>E84—2018B</u>	Standard Test Method for Surface Burning Characteristics of Building Materials	IEBC® IMC® IWUIC®	IFC® IRC®

E119—2016 <u>E119—2018B</u>	Test Method for Fire Tests of Building Construction and Materials	IMC® IWUIC®	IRC®
E136—16 <u>E136—2016A</u>	Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C	IBC® IFGC® IWUIC®	IEBC® IMC®
E814—13a <u>E814—2013A(2017)</u>	Standard Test Method for Fire Tests of Penetration Firestop Systems	IMC®	
E1509—12 <u>E1509—2012(2017)</u>	Specification for Room Heaters, Pellet Fuel-burning Type	IMC®	IRC®
E2231—15 <u>E2231—2018</u>	Standard Practice for Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics	IMC®	IRC®
F438—15 <u>F438—2017</u>	Specification for Socket Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40	IMC® IRC®	IPC® ISPSC®
F876—15A <u>F876—2018A</u>	Specification for Cross-linked Polyethylene (PEX) Tubing	IMC® IRC®	IPC®
F877—11a <u>F877—2018A</u>	Specification for Cross-linked Polyethylene (PEX) Plastic Hot- and Cold-water Distribution Systems	IMC®	IPC®
F1055—13 <u>F1055—2016A</u>	Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Cross linked Polyethylene (PEX) Pipe and Tubing	IMC® IRC®	IPC®
F1281—11 <u>F1281—2017</u>	Specification for Cross-linked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe	IMC® IRC®	IPC®
F1282—10 <u>F1282—2017</u>	Standard Specification for Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe	IMC® IRC®	IPC®
F1548—01 <u>F1548—2001(2012, 2018)</u>	Standard Specification for the Performance of Fittings for Use with Gasketed Mechanical Couplings Used in Piping Applications	IMC®	IPC®
F1807—15 <u>F1807—2018</u>	Standard Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing	IMC® IRC®	IPC®
F1960—15 <u>F1960—2018</u>	Specification for Cold-expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) Tubing	IMC® IRC®	IPC®
F2080—15 <u>F2080—16</u>	Specification for Cold-expansion Fittings with Metal Compression-sleeves for Cross-linked Polyethylene (PEX) Pipe	IMC® IRC®	IPC®
F2098—08 <u>F2098—2015</u>	Standard Specification for Stainless Steel Clamps for Securing SDR9 Cross-linked Polyethylene (PEX) Tubing to Metal Insert and Plastic Insert Fittings	IMC® IRC®	IPC®
F2159—14 <u>F2159—2018</u>	Standard Specification for Plastic Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing	IMC® IRC®	IPC®
F2389—15 <u>F2389—2017A</u>	Specification for Pressure-rated Polypropylene Piping Systems	IMC® IRC®	IPC®
F2735—09 <u>F2735—2009(2016)</u>	Standard Specification for Plastic Insert Fittings for SDR9 Cross-linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing	IMC® IRC®	IPC®
F2769—14 <u>F2769—2018</u>	Polyethylene of Raised Temperature (PE-RT) Plastic Hot- and Cold-water Tubing and Distribution Systems	IMC® IRC®	IPC®

AWS

American Welding Society

Standard Reference Number	Title	Referenced in Code(s):	
A5.8M <u>A5.8/A5.8—2011</u> <u>A5.8: 2011-AMD1</u>	Specifications for Filler Metals for Brazing and Braze Welding	IMC® IRC®	IPC®

AWWA

American Water Work Association

Standard Reference

Number	Title	Referenced in Code(s):
C151/A21.51—09 A21.51—17	Standard for Ductile-iron Pipe, Centrifugally Cast for Water	IMC® IPC® IRC®

CSA	CSA Group	
Standard Reference Number	Title	Referenced in Code(s):
B137.2—16 B137.2—17	Polyvinylchloride (PVC) Injection-moulded Gasketed Fittings for Pressure Applications	IMC® IPC® IRC® ISPSC®
B137.3—16 B137.3—17	Rigid Poly (Vinyl Chloride) (PVC) Pipe for Pressure Applications	IMC® IPC® IPSDC® IRC® ISPSC®
B137.6—16 B137.6—17	Chlorinated Polyvinylchloride (CPVC) Pipe, Tubing and Fittings for Hot- and Cold-water Distribution Systems	IMC® IPC® IRC® ISPSC®
B137.9—16 B137.9—17	Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure-pipe Systems	IMC® IPC® IRC®
B137.10—16 B137.10—17	Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene (PEX-AL-PEX) Composite Pressure-pipe Systems	IMC® IPC®
<u>ANSI/CSA /IGSHPA C448 Series—16</u>	<u>Design and Installation of Earth Energy Systems installation of ground source heat pump systems for commercial and residential buildings</u>	IMC® IRC®
CSA C22.2 No. 218.1—M89 218.1—13 (R2011 R2017)	Spas, Hot Tubs and Associated Equipment	IMC®
CSA C22.2 No. 236—11 236—15	Heating and Cooling Equipment	IMC®
CSA B137.1—16 B137.1—17	Polyethylene (PE) Pipe, Tubing and Fittings for Cold-water Pressure Services	IMC®
CSA B137.5—16 B137.5—17	Cross-linked Polyethylene (PEX) Tubing Systems for Pressure Applications	IMC®
CSA B137.11—16 B137.11—17	Polypropylene (PP-R) Pipe and Fittings for Pressure Applications	IMC®
CSA B137.18—13 B137.18—17	Polyethylene of Raised Temperature Resistance (PE-RT) Tubing Systems for Pressure Applications	IMC®
<u>America FC1—2012 ANSI/CSA FC1—2014</u>	<u>Stationary Fuel Cell Power Systems Fuel cell technologies - Part 3-100: Stationary fuel cell power systems-Safety</u>	IMC®

IIAR	International Institute of Ammonia Refrigeration	
Standard Reference Number	Title	Referenced in Code(s):
<u>ANSI/IIAR 2—2014 Addendum A</u>	Safe Design of Closed-circuit Ammonia Refrigerating Systems	IMC®
ANSI/IIAR 3—2012 3—2017	Ammonia Refrigeration Valves	IMC®
ANSI/IIAR 5—2013 5—2019	Start-up and Commissioning of Closed-circuit Ammonia Refrigeration Systems	IMC®

MSS	Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.	
Standard Reference Number	Title	Referenced in Code(s):
SP 58—2009 58—2018	Pipe Hangers and Supports—Materials Design and Manufacture, Selection, Application and Installation	IMC®

NBBI	National Board of Boiler and Pressure Vessel Inspectors	
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Standard Reference Number	Title	Referenced in Code(s):
NBIC—2011 <u>NBIC—2017</u>	National Board Inspection Code, Part 3	IMC®

NFPA	National Fire Protection Association	
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Standard Reference Number	Title	Referenced in Code(s):
2—16 <u>2—19</u>	Hydrogen Technologies Code	IFGC® IMC®
30A—18 <u>30A—21</u>	Code for Motor Fuel-dispensing Facilities and Repair Garages	IBC® IFC® IFGC® IMC®
31—16 <u>31—20</u>	Standard for the Installation of Oil-burning Equipment	IBC® IFC® IMC® IRC®
58—17 <u>58—20</u>	Liquefied Petroleum Gas Code	IBC® IFC® IFGC® IMC® IRC®
69—14 <u>69—19</u>	Standard on Explosion Prevention Systems	IFC® IMC®
72—16 <u>72—19</u>	National Fire Alarm and Signaling Code	IBC® IFC® IMC® IPMC® IRC®
82—14 <u>82—19</u>	Standard on Incinerators and Waste and Linen Handling Systems and Equipment	IBC® IFGC® IMC®
85—15 <u>85—19</u>	Boiler and Combustion Systems Hazards Code	IBC® IFC® IFGC® IMC® IRC®
91—15 <u>91—20</u>	Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists and Noncombustible Particulate Solids	IMC®
92—15 <u>92—18</u>	Standard for Smoke Control Systems	IBC® IFC® IMC®
96—17 <u>96—20</u>	Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations	IFC® IMC®
211—16 <u>211—19</u>	Standard for Chimneys, Fireplaces, Vents and Solid Fuel-burning Appliances	IBC® IFC® IFGC® IMC® IRC®
262—15 <u>262—19</u>	Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-handling Spaces	IMC®
286—15 <u>286—19</u>	Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth	IBC® IFC® IMC® IRC®
853—15 <u>853—20</u>	Standard on Installation of Stationary Fuel Cell Power Plants Systems	IFC® IFGC® IMC® IRC®

NSF	NSF International	
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Standard Reference Number	Title	Referenced in Code(s):
NSF 358-1—2014 <u>NSF 358-1—2017</u>	Polyethylene Pipe and Fittings for Water-based Ground-source “Geothermal” Heat Pump Systems	IMC®
NSF 358-2—2012 <u>NSF 358-2—2017</u>	Polypropylene Pipe and Fittings for Water-based Ground-source “Geothermal” Heat Pump Systems	IMC®

SMACNA	Sheet Metal and Air Conditioning Contractors’ National	
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Standard Reference Number	Association, Inc. Title	Referenced in Code(s):	
SMACNA—10	Fibrous Glass Duct Construction Standards <u>7th Edition</u>	IMC®	IRC®
SMACNA/ANSI—2016	HVAC Duct Construction Standards-Metal and Flexible 4th Edition (ANSI)- 2016	IMC®	IRC®
SMACNA 2015	<u>SMACNA Phenolic Duct Construction Standard - 1st Edition (ANSI)</u>	IMC®	

UL	UL LLC		
Standard Reference Number	Title	Referenced in Code(s):	
103—2010	Factory-built Chimneys, Residential Type and Building Heating Appliance—with Appliances—with revisions through July 2012 <u>March 2017</u>	IBC® IMC®	IFGC® IRC®
127—2011	Factory-built Fireplaces—with revisions through May 2015 <u>July 2016</u>	IBC® IMC®	IFGC® IRC®
174—04	Household Electric Storage Tank Water Heaters—with revisions through April 2015 <u>December 2016</u>	IMC®	IRC®
180—2012	Liquid-level Indicating Gauges for Oil Burner Fuels and Other Combustible Liquids <u>Liquids-with revisions through May 2017</u>	IMC® IRC®	IMC®
181—05	Factory-made Air Ducts and Air Connectors—with revisions through October 2008 <u>April 2017</u>	IMC®	IRC®
181A—2013	Closure Systems for Use with Rigid Air Ducts and Air Connectors - <u>with revisions through March 2017</u>	IMC®	IRC®
181B—2013	Closure Systems for Use with Flexible Air Ducts and Air Connectors - <u>with revisions through March 2017</u>	IMC®	IRC®
197—10	Commercial Electric Cooking Appliances—with revisions through September 2014 <u>January 2018</u>	IMC®	
263—2011	Standard for Fire Test of Building Construction and Materials—with revisions through June 2015 <u>March 2018</u>	IMC® IWUIC®	IRC®
268—2009 <u>268—2016</u>	Smoke Detectors for Fire Alarm Systems <u>Systems-with revisions through July 2016</u>	IMC®	IRC®
268A—2008	Smoke Detectors for Duct Application—with revisions through October 2014 <u>August 2016</u>	IMC®	
343—2008 <u>343—2017</u>	Pumps for Oil-burning Appliances—with revisions through June 2013 <u>Appliances</u>	IMC®	IRC®
378—06 <u>378—2006</u>	Draft Equipment—with revisions through June 12, 2014 <u>September 2013</u>	IMC®	IRC®
412—2011	Refrigeration Unit Coolers—with revisions through September 2013 <u>August 2018</u>	IMC®	
471—2010	Commercial Refrigerators and Freezers—with revisions through December 2012 <u>November 2018</u>	IMC®	
499—05 <u>499—2014</u>	Electric Heating Appliances—with revisions through November 2014 <u>February 2017</u>	IFC®	IMC®
507—2014 <u>507—2017</u>	Standard for Electric Fans <u>Electric Fans-with revisions through August 2018</u>	IMC®	
508—99 <u>508—2018</u>	Industrial Control Equipment—with revisions through October 2013 <u>Equipment</u>	IMC® IRC®	IPC®
536—97 <u>536—2014</u>	Flexible Metallic Hose—with revisions through December 2014 <u>Hose</u>	IMC®	IRC®
555—06	Fire Dampers—with revisions through May 2014 <u>October 2016</u>	IMC®	
555C—06 <u>555C—2014</u>	Ceiling Dampers—with revisions through December 2014 <u>May 2017</u>	IMC®	
555S—99 <u>555S—2014</u>	Smoke Dampers—with revisions through February 2014 <u>October 2018</u>	IBC®	IMC®
586—2009	High-efficiency, Particulate, Air Filter Units—with revisions through September 2014 <u>December 2017</u>	IMC®	
641—2010	Type L Low-temperature Venting Systems—with revisions through June 2013 <u>April 2018</u>	IBC® IMC®	IFGC® IRC®
705—2004 <u>705—2017</u>	Standard for Power Ventilators—with revisions through December 2013 <u>October 2018</u>	IMC®	
710—2012	Exhaust Hoods for Commercial Cooking Equipment—with revisions through November 2013 <u>June 2018</u>	IFC®	IMC®

723—2009 <u>723—2018</u>	Standard for Test for Surface Burning Characteristics of Building Materials— with revisions through August 2013 <u>Materials</u>	IBC® IWUIC®	IMC®
727—06 <u>727—2018</u>	Oil-fired Central Furnace— with revisions through October 2013 <u>Furnace</u>	IECC IRC®	IMC®
729—03 <u>729—2003</u>	Oil-fired Floor Furnaces— with revisions through October 2013 <u>November 2016</u>	IMC®	IRC®
730—03 <u>730—2003</u>	Oil-fired Wall Furnaces— with revisions through October 2013 <u>November 2016</u>	IMC®	IRC®
731—95 <u>731—2018</u>	Oil-fired Unit Heaters— with revisions through October 2013 <u>Heaters</u>	IECC	IMC®
732—95 <u>732—2018</u>	Oil-fired Storage Tank Water Heaters— with revisions through October 2013 <u>Heaters</u>	IMC®	IRC®
737—2011	Fireplace Stoves— with revisions through August 2015 <u>Stoves</u>	IMC®	IRC®
762—2010 <u>762—2013</u>	Outline of Investigation for Power Ventilators for Restaurant Exhaust Appliances— with revisions through October 2013 <u>Appliances</u>	IMC®	
791—06 <u>791—2006</u>	Residential Incinerators— with revisions through November 2014	IMC®	
834—04	Heating, Water Supply and Power Boilers Electric— with revisions through December 2013 <u>September 2018</u>	IMC®	IRC®
842—07 <u>842—2015</u>	Valves for Flammable Fluids— with revisions through May 2015	IMC®	IRC®
858—05 <u>858—2014</u>	Household Electric Ranges— with revisions through June 2015 <u>2018</u>	IMC®	IRC®
867—2011	Electrostatic Air Cleaners— with revisions through August 2013 <u>2018</u>	IMC®	
875—09 <u>875—2009</u>	Electric Dry Bath Heater— with revisions through December 2013 <u>September 2017</u>	IMC®	IRC®
896—93 <u>896—1993</u>	Oil-burning Stoves— with revisions through November 2013 <u>2016</u>	IMC®	IRC®
900—04 <u>900—2015</u>	Air Filter Units— with revisions through April 2015 <u>Units</u>	IFC®	IMC®
907—94 <u>907—2016</u>	Fireplace Accessories— with revisions through June 2014 <u>Accessories</u>	IMC®	
923—2013	Microwave Cooking Appliances— with revisions through June 2015 <u>July 2017</u>	IMC®	IRC®
1046—2010	Grease Filters for Exhaust Ducts— with revisions through January 2012 <u>April 2017</u>	IFC®	IMC®
1240—2012 <u>1240—2005</u>	Electric Commercial Clothes—Drying Equipment— with revisions through October 2012 <u>March 2018</u>	IMC®	
1261—01	Electric Water Heaters for Pools and Tubs— with revisions through July 2012 <u>September 2017</u>	IMC®	IRC®
1453—04 <u>1453—2016</u>	Electric Booster and Commercial Storage Tank Water Heaters— with revisions through July 2014 <u>May 2018</u>	IMC®	
1479—03 <u>1479—2015</u>	Fire Tests of Through penetration Firestops— with revisions through June 2015 <u>Penetration Firestops</u>	IBC® IRC®	IMC®
1482—2011	Solid-fuel Type Room Heaters— with revisions through August 2015	IBC® IRC®	IMC®
1563—2009	Standard for Electric Spas, Hot Tubs and Associated Equipment— with revisions through March 2015 <u>October 2017</u>	IMC® ISPSC®	IRC®
1618—09 <u>1618—2015</u>	Wall Protectors, Floor Protectors and Hearth Extensions— with revisions through October 2015 <u>January 2018</u>	IFGC® IRC®	IMC®
1777—2007	Chimney Liners— with revisions through October 2015 <u>April 2014</u>	IBC® IMC®	IFGC®
1812—2013	Standard for Ducted Heat Recovery Ventilators— with revisions through April 2014 <u>July 2018</u>	IMC®	
1815—2012	Standard for Nonducted Heat Recovery— with revisions through April 2014 <u>July 2018</u>	IMC®	
1820—04 <u>1820—2004</u>	Fire Test of Pneumatic Tubing for Flame and Smoke Characteristics— with revisions through May 2013 <u>July 2017</u>	IMC®	
1887—04 <u>1887—2004</u>	Fire Tests of Plastic Sprinkler Pipe for Visible Flame and Smoke Characteristics— with revisions through May 2013 <u>July 2017</u>	IMC®	
1978—2010	Grease Ducts— with revisions through September 2013 <u>April 2017</u>	IMC®	
1995—2011 <u>1995—2015</u>	Heating and Cooling Equipment— with revisions through July 2015 <u>August 2018</u>	IMC® ISPSC®	IRC®
1996—2009	Electric Duct Heaters— with revisions through June 2014 <u>July 2016</u>	IMC®	IRC®

2024 — 2011 <u>2024</u> — <u>2014</u>	Standard for Safety Optical-fiber and Communications Cable Raceway —with revisions through August 2015	IMC®	
2043 — 2008 <u>2043</u> — <u>2013</u>	Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-handling Spaces— with revisions through October 2013 <u>July 2018</u>	IMC®	
2075—2013	Standard for Gas and Vapor Detectors and Sensors <u>Sensors</u> -with revisions through December 2017	IBC® IMC®	IFC® IRC®
2158 — 97 <u>2158</u> — <u>2018</u>	Electric Clothes Dryers —with revisions through March 2009 <u>Dryers</u>	IMC®	
2158A — 2010 <u>2158A</u> — <u>2013</u>	Outline of Investigation for Clothes Dryer Transition Duct <u>Duct</u> -with revisions through April 2017	IMC®	IRC®
2162 — 01 <u>2162</u> — <u>2014</u>	Outline of Investigation for Commercial Wood-fired Baking Ovens-Refractory Type	IMC®	
2200—2012	Stationary Engine Generator Assemblies—with revisions through July <u>October</u> 2015	IBC® IFGC®	IFC® IMC®
2518 — 05 <u>2518</u> — <u>2016</u>	Air Dispersion System Materials <u>Systems</u>	IMC®	
2523 — 09 <u>2523</u> — <u>2009</u>	Solid Fuel-fired Hydronic Heating Appliances —with <u>Appliances, Water Heaters, and Boilers</u> -with revisions through February 2013 <u>March 2018</u>	IMC®	IRC®
2846 — 14 <u>2846</u> — <u>2014</u>	Fire Test of Plastic Water Distribution Plumbing Pipe for Visible Flame and Smoke Characteristics <u>Characteristics</u> -with revisions through December 2016	IMC®	

Reason: THIS IS THE ADMIN STANDARDS UPDATE CODE CHANGE-IMC.

The CP28 Code Development Policy, Section 4.6 requires the updating of referenced standards to be accomplished administratively, and be processed as a Code Change Proposal for consideration by the Administrative Code Change Committee. In September 2018, a letter was sent to each developer of standards that is referenced in the International Codes, asking them to provide ICC with a list of their standards in order to update to the current edition. Listed are the referenced standards that are to be updated based upon responses received from standards developers.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Not applicable.

Proposal # 5811

ADM47-IMC-19

ADM47-IPC-19

Chapter 15

ASME	American Society of Mechanical Engineers	
Standard Reference Number	Title	Referenced in Code(s):
A112.1.2—2012 <u>A112.1.2—2022</u>	Air Gaps in Plumbing Systems (For Plumbing Fixtures and Water Connection Receptors)	IPC® ISPSC® IRC®
A112.1.3—2000 (R2015 <u>R2020</u>)	Air Gap Fittings for Use with Plumbing Fixtures, Appliances and Appurtenances	IPC®
A112.3.1—2007 (R2012 <u>R2022</u>)	Stainless Steel Drainage Systems for Sanitary, DWV, Storm and Vacuum Applications Above and Below Ground	IPC®
ASME A112.3.4—2013 A112.3.4—2020/CSA B45.9—2013 <u>B45.9—2020</u>	Macerating Toilet Systems and Related Components	IPC®
A112.4.1—2009 (R2019)	Water Heater Relief Valve Drain Tubes	IMC® IRC®
A112.4.2—2015 <u>A112.4.2—2020/CSA B45.16—15</u> B45.16—20	Water Closet Personal Hygiene Devices	IPC®
A112.4.3—1999 (R2010 <u>R2020</u>)	Plastic Fittings for Connecting Water Closets to the Sanitary Drainage System	IPC® IRC®
A112.4.14—2004 (R2016 <u>R2019</u>)	Manually Operated, Quarter-turn Shutoff Valves for Use in Plumbing Systems	IPC® IRC®
A112.6.2—2000 (R2016) A112.6.2—2022	Framing-affixed Supports for Off-the-floor Water Closets with Concealed Tanks	IPC® IRC®
A112.6.3—2001 (R2016) A112.6.3—2019	Floor and Trench Drains	IPC® IRC®
A112.6.4—2003 (R2012 <u>R2020</u>)	Roof, Deck, and Balcony Drains	IPC®
A112.6.7—2010 (R2015 <u>R2020</u>)	Sanitary Floor Sinks	IPC®
A112.6.9—2005 (R2015 <u>R2020</u>)	Siphonic Roof Drains	IPC®
A112.14.1—2003 (R2012 <u>R2022</u>)	Backwater Valves	IPC®
A112.14.3—2016 <u>A112.14.3—2021</u>	Grease Interceptors	IPC®
A112.14.4—2001 (R2012 <u>R2022</u>)	Grease Removal Devices	IPC®
A112.14.6—2010 (R2015 <u>R2020</u>)	FOG (Fats, Oils and Greases) Disposal Systems	IPC®
A112.18.1—2017 <u>A112.18.1—2020/CSA B125.1—2017</u> B125.1—2020	Plumbing Supply Fittings	IPC® IRC®
A112.18.2—2015 <u>A112.18.2—2019/CSA B125.2—15</u> B125.2—19	Plumbing Waste Fittings	IPC®
A112.18.3—2002 A112.18.3M—2002 (R2012 <u>R2020</u>)	Performance Requirements for Backflow Protection Devices and Systems in Plumbing Fixture Fittings	IPC®
A112.18.6—2017 <u>A112.18.6</u>		

—2021/CSA B125.6—17	Flexible Water Connectors	IPC®	IRC®
B125.6—21			
A112.16.9—2011 (R2022)	Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures	IPC®	
A112.19.1—2013 A112.19.1—2020/CSA B45.2—2013			
B45.2—2020	Enameled Cast Iron and Enameled Steel Plumbing Fixtures	IPC®	IRC®
A112.19.2—2013 A112.19.2—2020/CSA B45.1—13			
B45.1—20	Ceramic Plumbing Fixtures	IPC®	
A112.19.3—2008 A112.19.3—2021/CSA B45.4—08 (R2013) B45.4—2021			
	Stainless Steel Plumbing Fixtures	IPC®	
A112.19.5—2017 A112.19.5—2021/CSA B45.15—2017			
B45.15—2021	Flush Valves and Spuds for Water-closets, Urinals, and Tanks	IPC®	IRC®
A112.19.7M—2017			
A112.19.7—2012/CSA B45.10—17 B45.10—2012 (2021)			
	Hydromassage Bathtub Systems	IPC®	
A112.19.12—2014			
A112.19.12—2019	Wall Mounted and Pedestal Mounted, Adjustable, Elevating, Tilting and Pivoting Lavatory, Sink and Shampoo Bowl Carrier Systems and Drain Waste Systems	IPC®	IRC®
A112.19.14—2013 (R2018)	Six-liter Water Closets Equipped with a Dual Flushing Device	IPC®	IRC®
A112.19.15—2012 (R2017)	Bathtub/Whirlpool Bathtubs with Pressure Sealed Doors	IPC®	IRC®
A112.19.19—2006 (R2011)			
A112.19.19—2021	Vitreous China Nonwater Urinals	IPC®	
A112.21.3—1985 (R2007 R2017)	Hydrants for Utility and Maintenance Use	IPC®	
A112.36.2M—1991 (R2012 R2017)	Cleanouts	IPC®	
ASSE 1002—2015 1002—2020/ASME A112.1002—2015 A112.1002—2020/CSA B125.12—15			
B125.12—20	Anti-Siphon Fill Valves	IPC® IRC® IRC®	IPC® IRC®
ASSE 1016—2017 1016—2020/ASME A112.1016—2017 A112.1016—2020/CSA B125.16—2017			
B125.16—2020	Performance Requirements for Individual Thermostatic, Pressure Balancing and Combination Control Valves for Individual Fixture Fittings	IPC®	IPC®
ASSE 1070—2015 1070—2020/ASME A112.1070—2015 A112.1070—2020/CSA B125.1070—15			
B125.1070—20	Water Temperature Limiting Devices	IPC®	
B1.20.1—2013 B1.20.1—2019			
	Pipe Threads, General Purpose (inch)	IFGC® IPC®	IMC® IRC®
B16.3—2016 B16.3—2021	Malleable Iron Threaded Fittings Classes 150 and 300	IMC® IRC®	IPC®
B16.4—2016 B16.4—2021	Gray Iron Threaded Fittings Classes 125 and 250	IPC®	IRC®
B16.9—2012 B16.9—2018	Factory-made Wrought Steel Buttwelding Fittings	IMC® IRC®	IPC®
B16.11—2016 B16.11—2021	Forged Fittings, Socket-welding and Threaded	IMC® IRC®	IPC®
B16.12—2009 (R2014 R2019)	Cast-iron Threaded Drainage Fittings	IPC®	IRC®

B16.15—2013 <u>B16.15—2018</u>	Cast Alloy Threaded Fittings: Class 125 and 250	IMC® IRC®	IPC® ISPSC®
B16.18—2012 <u>B16.18—2018</u>	Cast Copper Alloy Solder Joint Pressure Fittings	IBC® IMC® IRC®	IFC® IPC®
B16.22—2013 <u>B16.22—2018</u>	Wrought Copper and Copper Alloy Solder Joint Pressure Fittings	IBC® IMC® IRC®	IFC® IPC®
B16.23—2016 <u>B16.23—2021</u>	Cast Copper Alloy Solder Joint Drainage Fittings DWV	IPC®	IRC®
B16.26—2016 <u>B16.26—2018</u>	Cast Copper Alloy Fittings for Flared Copper Tubes	IMC® IRC®	IPC®
B16.29—2012 <u>B16.29—2017</u>	Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings (DWV)	IPC®	IRC®
B16.34—2015 <u>B16.34—2020</u>	Valves Flanged, Threaded and Welding End	IPC®	IRC®
B16.51—2013 <u>B16.51—2018</u>	Copper and Copper Alloy Press-connect Pressure Fittings	IMC® IRC®	IPC®

ASSE	ASSE International		
Standard Reference Number	Title	Referenced in Code(s):	
1001—2016 <u>1001—2017</u>	Performance Requirements for Atmospheric Type Vacuum Breakers	IPC®	IRC®
ASSE 1002—2015/ASME A112.1002—2015/CSA B125.12—15	Antisiphon <u>Anti-siphon</u> Fill Valves	IPC® IRC® IRC®	IPC® IRC®
1013—2017 <u>1013—2011</u>	Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers	IPC®	IRC®
1017—2010 <u>1017—2009</u>	Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems	IMC® IRC®	IPC®
1018—2017 <u>1018—2001</u>	Performance Requirements for Trap Seal Primer Valves; Potable Water Supplied	IPC®	IRC®
1019—2016 <u>1019—2011</u> (R2016)	Performance Requirements for Vacuum Breaker Wall Hydrants, Freeze Resistant, Automatic Draining Type	IPC®	IRC®
1022—2016 <u>1022—2017</u>	Performance Requirements for Backflow Preventer for Beverage Dispensing Equipment	IPC®	
1024—2016 <u>1024—2017</u>	Performance Requirements for Dual Check Valve Type Backflow Preventers, Anti-siphon-type, Residential Applications	IPC®	IRC®
1044—2010 <u>1044—2015</u>	Performance Requirements for Trap Seal Primer Devices _Drainage Types and Electronic Design Types	IPC®	IRC®
1047—2017 <u>1047—2011</u>	Performance Requirements for Reduced Pressure Detector Fire Protection Backflow Prevention Assemblies	IPC®	IRC®
1048—2017 <u>1048—2011</u>	Performance Requirements for Double Check Detector Fire Protection Backflow Prevention Assemblies	IPC®	IRC®
1055—2016 <u>1055—2018</u>	Performance Requirements for Chemical Dispensing Systems <u>with Integral Backflow Protection</u>	IPC®	
1060—2016 <u>1060—2017</u>	Performance Requirements for Outdoor Enclosures for Fluid Conveying Components	IPC®	IRC®
1062—2016 <u>1062—2017</u>	Performance Requirements for Temperature Actuated, Flow Reduction (TAFR) Valves to Individual Supply Fittings	IPC®	IRC®
1066—2016 <u>1066—1997</u>	Performance Requirements for Individual Pressure Balancing In-line Valves for Individual Fixture Fittings	IPC®	IRC®

ASTM

ASTM International

Standard Reference Number	Title	Referenced in Code(s):	
A53/A53M—12 <u>A53M—2018</u>	Specification for Pipe, Steel, Black and Hot-dipped, Zinc-coated Welded and Seamless	IFGC® IPC®	IMC® IRC®
A74—15 <u>A74—17</u>	Specification for Cast-iron Soil Pipe and Fittings	IPC® IRC®	IPSDC®
A312/A312M—15a <u>A312M—2018</u>	Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes	IPC® ISPSC®	IRC®
A733—15 <u>A733—16</u>	Specification for Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples	IPC®	
A778/A778M—15 <u>A778M—16</u>	Specification for Welded Unannealed Austenitic Stainless Steel Tubular Products	IPC®	IRC®
A888—15 <u>A888—2018</u>	Specification for Hubless Cast-iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Application	IPC® IRC®	IPSDC®
B88—14 <u>B88—2016</u>	Specification for Seamless Copper Water Tube	IFGC® IPC® IRC®	IMC® IPSDC® ISPSC®
B251—10 <u>B251/B251M—2017</u>	Specification for General Requirements for Wrought Seamless Copper and Copper-alloy Tube	IBC® IMC® IPSDC®	IFC® IPC® IRC®
B302—12 <u>B302—17</u>	Specification for Threadless Copper Pipe, Standard Sizes	IMC® IRC®	IPC®
B687—99 <u>B687—1999(2014, 2016)</u>	Specification for Brass, Copper and Chromium-plated Pipe Nipples	IPC®	
B813—10 <u>B813—16</u>	Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube	IMC® IPSDC®	IPC® IRC®
B828—02(2010) <u>B828—2016</u>	Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings	IMC® IPSDC®	IPC® IRC®
C4—04(2014) <u>2018</u>	Specification for Clay Drain Tile and Perforated Clay Drain Tile	IPC® IRC®	IPSDC®
C76—15a <u>C76—2018A</u>	Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe	IPC® IRC®	IPSDC®
C425—04 <u>C425—2004(2013, 2018)</u>	Specification for Compression Joints for Vitrified Clay Pipe and Fittings	IPC® IRC®	IPSDC®
C443—12 <u>C443—2012(2017)</u>	Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets	IPC® IRC®	IPSDC®
C700—13 <u>C700—2018</u>	Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated	IPC® IRC®	IPSDC®
C1053—00 <u>C1053—2000(2010, 2015)</u>	Specification for Borosilicate Glass Pipe and Fittings for Drain, Waste, and Vent (DWV) Applications	IPC®	
C1173—10(2014) <u>C1173—2018</u>	Specification for Flexible Transition Couplings for Underground Piping System	IPC® IRC®	IPSDC®
C1277—15 <u>C1277—2018</u>	Specification for Shielded Coupling Joining Hubless Cast-iron Soil Pipe and Fittings	IPC® IRC®	IPSDC®
C1440—08(2013) <u>C1440—2017</u>	Specification for Thermoplastic Elastomeric (TPE) Gasket Materials for Drain, Waste, and Vent (DWV), Sewer, Sanitary and Storm Plumbing Systems	IPC® IRC®	IPSDC®
C1460—2012 <u>C1460—2017</u>	Specification for Shielded Transition Couplings for Use with Dissimilar DWV Pipe and Fittings Above Ground	IPC® IRC®	IPSDC®
C1461—08 <u>C1461—208(2013, 2017)</u>	Specification for Mechanical Couplings Using Thermoplastic Elastomeric (TPE) Gaskets for Joining Drain, Waste and Vent (DWV) Sewer, Sanitary and Storm Plumbing Systems for Above and Below Ground Use	IPC® IRC®	IPSDC®

C1540 15 <u>C1540</u> —2018	Specification for Heavy Duty Shielded Couplings Joining Hubless Cast-iron Soil Pipe and Fittings	IPC®	IRC®
C1563 08 <u>C1563</u> — <u>2008</u> (2013 <u>2017</u>)	Standard Test Method for Gaskets for Use in Connection with Hub and Spigot Cast Iron Soil Pipe and Fittings for Sanitary Drain, Waste, Vent and Storm Piping Applications	IPC®	
D1785 15 <u>D1785</u> —2015E1	Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120	IMC® IRC®	IPC® ISPSC®
D2235 04 <u>D2235</u> — <u>2004</u> (2011 <u>2016</u>)	Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings	IMC® IPSDC®	IPC® IRC®
D2466 15 <u>D2466</u> —2017	Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40	IMC® IRC®	IPC® ISPSC®
D2564 12 <u>D2564</u> —2012 (<u>2018</u>)	Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems	IMC® IPSDC®	IPC® IRC®
D2657 07 <u>D2657</u> —2007 (<u>2015</u>)	Practice for Heat Fusion-joining of Polyolefin Pipe and Fitting Waste, and Vent Pipe and Fittings	IMC® IPSDC®	IPC® IRC®
D2661 14 <u>D2661</u> —14E1	Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings	IPC® IRC®	IPSDC®
D2665 14 <u>D2665</u> —2014	Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings	IPC® IRC®	IPSDC®
D2729 11 <u>D2729</u> —17	Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings	IPC® IRC®	IPSDC®
D2846 / D2846M 14 <u>D2846M</u> —2017BE1	Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems	IMC® IRC®	IPC® ISPSC®
D2855 96 (2010) <u>D2855</u> — <u>2015</u>	Standard Practice for Making Solvent-cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings	IPC® IRC®	IPSDC®
D3034 14a <u>D3034</u> —2016	Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings	IPC® IRC®	IPSDC®
D3138 04 <u>D3138</u> — <u>2004</u> (2011 <u>2016</u>)	Standard Specification for Solvent Cements for Transition Joints Between Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Non-pressure Piping Components	IPC®	IRC®
D3261 12e1 <u>D3261</u> —2016	Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing	IMC® IRC®	IPC®
D3311 11 <u>D3311</u> —2017	Specification for Drain, Waste and Vent (DWV) Plastic Fittings Patterns	IPC®	IRC®
D4068 15 <u>D4068</u> —2017	Specification for Chlorinated Polyethylene (CPE) Sheeting for Concealed Water-containment Membrane	IPC®	IRC®
D4551 12 <u>D4551</u> —2017	Specification for Poly (Vinyl Chloride) (PVC) Plastic Flexible Concealed Water-containment Membrane	IPC®	IRC®
E2727 10e1 <u>E2727</u> —2018	Standard Practice for the Assessment of Rainwater Quality	IPC®	
F409 12 <u>F409</u> —2017	Specification for Thermoplastic Accessible and Replaceable Plastic Tube and Tubular Fittings	IPC®	IRC®
F438 15 <u>F438</u> —2017	Specification for Socket-type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40	IMC® IRC®	IPC® ISPSC®
F628 12e1 <u>F628</u> —2012E2	Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core	IPC® IRC®	IPSDC®
F656 15 <u>F656</u> —2015	Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings	IPC® IRC®	IPSDC®
F667 12 <u>F667</u> / <u>F667M</u> — <u>2016</u>	Standard Specification for 3 through 24 in. Corrugated Polyethylene Pipe and Fittings	IPC®	
F876 15a <u>F876</u> —2017	Specification for Cross-linked Polyethylene (PEX) Tubing	IMC® IRC®	IPC®
F877 11a <u>F877</u> —2018A	Specification for Cross-linked Polyethylene (PEX) Hot- and Cold-water Distribution Systems	IMC®	IPC®
F891 10 <u>F891</u> —2016	Specification for Coextruded Poly (Vinyl Chloride) (PVC) Plastic Pipe with a Cellular	IPC®	IPSDC®

F1055-13 <u>F1055-2016A</u>	Core Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Cross-linked Polyethylene Pipe and Tubing	IRC® IMC® IRC®	IPC®
F1281-11 <u>F1281-2017</u>	Specification for Cross-linked Polyethylene/Aluminum/ Cross-linked Polyethylene (PEX-AL-PEX) Pressure Pipe	IMC® IRC®	IPC®
F1282-10 <u>F1282-2017</u>	Specification for Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe	IMC® IRC®	IPC®
F1412-09 <u>F1412-2016</u>	Specification for Polyolefin Pipe and Fittings for Corrosive Waste Drainage	IPC®	IRC®
F1488-14 <u>F1488-2014E1</u>	Specification for Coextruded Composite Pipe	IPC® IRC®	IPSDC®
F1548-01 <u>F1548-2001(2012 2018)</u>	Standard Specification for the Performance of Fittings for Use with Gasketed Mechanical Couplings Used in Piping Applications	IMC®	IPC®
F1673-10 <u>F1673-2010 (2016)</u>	Standard Specification for Polyvinylidene Fluoride (PVDF) Corrosive Waste Drainage Systems	IPC®	
F1807-15 <u>F1807-2018</u>	Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing	IMC® IRC®	IPC®
F1866-13 <u>F1866-2018</u>	Specification for Poly (Vinyl Chloride) (PVC) Plastic Schedule 40 Drainage and DWV Fabricated Fittings	IPC®	IRC®
F1960-15 <u>F1960-2018</u>	Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) Tubing	IMC® IRC®	IPC®
F1986-01 <u>F1986-2001(2011)</u>	Specification for Multilayer Pipe, Type 2, Compression Fittings and Compression Joints for Hot and Cold Drinking Water Systems	IPC®	IRC®
F2080-15 <u>F2080-16</u>	Specifications for Cold-expansion Fittings with Metal Compression-sleeves for Cross-linked Polyethylene (PEX) Pipe	IMC® IRC®	IPC®
F2098-08 <u>F2098-2015</u>	Standard Specification for Stainless Steel Clamps for Securing SDR9 Cross-linked Polyethylene (PEX) Tubing to Metal Insert and Plastic Fittings	IMC® IRC®	IPC®
F2159-14 <u>F2159-2018</u>	Specification for Plastic Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing	IMC® IRC®	IPC®
F2306/F2306M-14e1 <u>F2306M-2018</u>	12" to 60" Annular Corrugated Profile-wall Polyethylene (PE) Pipe and Fittings for Gravity Flow Storm Sewer and Subsurface Drainage Applications	IPC®	
F2389-15 <u>F2389-2017A</u>	Specification for Pressure-rated Polypropylene (PP) Piping Systems	IMC® IRC®	IPC®
F2648/F2648M-13 <u>F2648M-2017</u>	Standard Specification for 2 to 60 inch [50 to 1500 mm] Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Land Drainage Applications	IPC®	
F2735-09 <u>F2735-2009(2016)</u>	Standard Specification for Plastic Insert Fittings for SDR9 Cross-linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing	IMC® IRC®	IPC®
F2764/F2764M-11ae2 <u>F2764M-2018</u>	Standard Specification for 30 to 60 in. [750 to 1500 mm] Polypropylene (PP) Triple Wall Pipe and Fittings for Non-pressure Sanitary Sewer Applications	IPC®	
F2769-14 <u>F2769-2018</u>	Polyethylene or Raised Temperature (PE-RT) Plastic Hot- and Cold-water Tubing and Distribution Systems	IMC® IRC®	IPC®
F2831-12 <u>F2831-2012 (2017)</u>	Standard Practice for Internal Non Structural Epoxy Barrier Coating Material Used in Rehabilitation of Metallic Pressurized Piping Systems	IPC®	
F2881-11 <u>F2881/F2881M-2018</u>	Standard Specification for 12 to 60 in. [300 to 1500 mm] Polypropylene (PP) Dual Wall Pipe and Fittings for Non-pressure Storm Sewer Applications	IPC®	

AWS

American Welding Society

Standard Reference Number	Title	Referenced in Code(s):	
A5.8M A5.8/A5.8-2011 <u>A5.8: 2011-AMD1</u>	Specifications for Filler Metals for Brazing and Braze Welding	IMC® IRC®	IPC®

AWWA	American Water Works Association	
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Standard Reference Number	Title	Referenced in Code(s):	
C104/A21.4—13 <u>A21.4—16</u>	Cement-mortar Lining for Ductile-iron Pipe and Fittings	IPC®	IRC®
C111/A21.11—12 <u>A21.11—17</u>	Rubber-gasket Joints for Ductile-iron Pressure Pipe and Fittings	IPC®	
C151/A21.51—09 <u>A21.51—17</u>	Ductile-iron Pipe, Centrifugally Cast for Water	IMC®	IPC®
C504—10 <u>C504—15</u>	Standard for Rubber-Seated Butterfly Valves	IPC®	IRC®
C510—07 <u>C510—17</u>	Double Check Valve Backflow Prevention Assembly	IPC®	IRC®
C511—07 <u>C511—17</u>	Reduced-pressure Principle Backflow Prevention Assembly	IPC®	IRC®

CISPI	Cast Iron Soil Pipe Institute	
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Standard Reference Number	Title	Referenced in Code(s):	
301—12 <u>301—18</u>	Specification for Hubless Cast-iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications	IPC®	IPSDC®
310—12 <u>310—18</u>	Specification for Coupling for Use in Connection with Hubless Cast-iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications	IPC®	IPSDC®

CSA	CSA Group	
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Standard Reference Number	Title	Referenced in Code(s):	
A257.1M—14 <u>A257.1—14</u>	Non-reinforced Circular Concrete Culvert, Storm Drain, Sewer Pipe and Fittings	IPC®	
A257.2M—14 <u>A257.2—14</u>	Reinforced Circular Concrete Culvert, Storm Drain, Sewer Pipe and Fittings	IPC®	
A257.3M—14 <u>A257.3—14</u>	Joints for Circular Concrete Sewer and Culvert Pipe, Manhole Sections and Fittings Using Rubber Gaskets	IPC®	
ASME A112.18.1—2017 A112.18.1—2018/CSA B125.1—17 <u>B125.1—18</u>	Plumbing Supply Fittings	IPC®	
ASME A112.19.1—2013 A112.19.1—2018/CSA B45.2—2013 <u>B45.2—2018</u>	Enameled Cast-iron and Enameled Steel Plumbing Fixtures	IPC®	
ASME A112.19.2—2013 A112.19.2—2018/B45.1—2013 <u>B45.1—2018</u>	Ceramic Plumbing Fixtures	IPC®	
ASME A112.19.3—2008 A112.19.3—2017/CSA B45.4—08(R2013) <u>B45.4—17</u>	Stainless-steel Plumbing Fixtures	IPC®	
ASME A112.19.7—2017 A112.19.7—2012/CSA B45.10—17 <u>B45.10—12 (R2017)</u>	Hydromassage Bathtub Systems	IPC®	
ASME A112.3.4—2013 A112.3.4—2018/CSA <u>B45.9—13</u> B45.9—18	Macerating Toilet Systems and Related Components <u>Waste Pumping Systems for Plumbing Fixtures</u>	IPC®	IRC®
B64.1.1—16 <u>B64.1.1—11(R2016)</u>	Vacuum Breakers, Atmospheric Type (AVB)	IPC®	IRC®
B64.1.2—16 <u>B64.1.2—11(R2016)</u>	Pressure Vacuum Breakers, (PVB)	IPC®	IRC®

B64.1.3 16 B64.1.3 11(R2016)	Spill Resistant Pressure Vacuum Breakers (SRPVB)	IPC®	IRC®
B64.2 16 B64.2 11(R2016)	Vacuum Breakers, Hose Connection Type (HCVB)	IPC®	IRC®
B64.2.1 16 B64.2.1 11(R2016)	Vacuum Breakers, Hose Connection (HCVB) with Manual Draining Feature	IPC®	IRC®
B64.2.1.1 16 B64.2.1.1 11(R2016)	Hose Connection Dual Check Vacuum Breakers (HCDVB)	IPC®	IRC®
B64.2.2 16 B64.2.2 11(R2016)	Vacuum Breakers, Hose Connection Type (HCVB) with Automatic Draining Feature	IPC®	IRC®
B64.3 16 B64.3 11(R2016)	Backflow Preventers, Dual Check Valve Type with Atmospheric Port (DCAP)	IPC®	IRC®
B64.4 16 B64.4 11(R2016)	Backflow Preventers, Reduced Pressure Principle Type (RP)	IPC®	IRC®
B64.4.1 16 B64.4.1 11(R2016)	Reduced Pressure Principle for Fire Sprinklers (RPF)	IPC®	IRC®
B64.5 16 B64.5 11(R2016)	Double Check Backflow Preventers (DCVA)	IPC®	IRC®
B64.5.1 16 B64.5.1 11(R2016)	Double Check Valve Backflow Preventer for Fire Systems (DCVAF)	IPC®	IRC®
B64.6 16 B64.6 11(R2016)	Dual Check Valve (DuC) Backflow Preventers	IPC®	IRC®
B64.7 16 B64.7 11 (R2016)	Laboratory Faucet Vacuum Breakers (LFVB)	IPC®	IRC®
B64.10 16 B64.10 17	Manual for the Selection and Installation of Backflow Prevention Devices	IPC®	
B64.10.1 11 B64.10.1 17	Maintenance and Field Testing of Backflow Preventers	IPC®	
B79 08(R2013 R2018)	Commercial and Residential Drains and Cleanouts	IPC®	
B125.3 2012 B125.3 2018	Plumbing Fittings	IPC®	
B137.1 16 B137.1 17	Polyethylene (PE) Pipe, Tubing and Fittings for Cold-water Pressure Services	IPC®	IRC®
B137.2 16 B137.2 17	Polyvinylchloride, PVC, Injection-moulded Gasketed Fittings for Pressure Applications	IMC® IRC®	IPC® ISPSC®
B137.3 16 B137.3 17	Rigid Poly (Vinyl Chloride) (PVC) Pipe for Pressure Applications	IMC® IPSDC® ISPSC®	IPC® IRC®
B137.5 16 B137.5 17	Cross-linked Polyethylene (PEX) Tubing Systems for Pressure Applications	IPC®	IRC®
B137.6 16 B137.6 17	CPVC Pipe, Tubing and Fittings for Hot- and Cold-water Distribution Systems	IMC® IRC®	IPC® ISPSC®
B137.9 16 B137.9 17	Polyethylene Aluminum/Polyethylene (PE-AL-PE) Composite Pressure-pipe Systems	IMC® IRC®	IPC®
B137.10 16 B137.10 17	Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene (PEX-AL-PEX) Composite Pressure-pipe Systems	IMC®	IPC®
B137.11 16 B137.11 17	Polypropylene (PP-R) Pipe and Fittings for Pressure Applications	IPC®	IRC®
B137.18 13 B137.18 17	Polyethylene of Raised Temperature Resistance (PE-RT) Tubing Systems for Pressure Applications	IPC®	IRC®
B181.1 15 B181.1 18	Acrylonitrile-Butadiene-Styrene ABS Drain, Waste and Vent Pipe and Pipe Fittings	IPC® IRC®	IPSDC®
B181.2 15 B181.2 18	Polyvinylchloride PVC and Chlorinated Polyvinylchloride (CPVC) Drain, Waste, and Vent Pipe and Pipe Fittings	IPC® IRC®	IPSDC®
B181.3 15 B181.3 18	Polyolefin and Polyvinylidene Fluoride (PVDF) Laboratory Drainage Systems	IPC®	IRC®
B182.1 11 B182.1 18	Plastic Drain and Sewer Pipe and Pipe Fittings	IPC® IPC®	IPSDC® IPSDC®

B182.2—14 <u>B182.2—18</u>	PSM Type Polyvinylchloride PVC Sewer Pipe and Fittings	IRC®	
B182.4—15 <u>B182.4—18</u>	Profile Polyvinylchloride PVC Sewer Pipe and Fittings	IPC® IRC®	IPSDC®
B182.6—15 <u>B182.6—18</u>	Profile Polyethylene (PE) Sewer Pipe and Fittings for Leak-proof Sewer Applications	IPC®	IRC®
B182.8—15 <u>B182.8—18</u>	Profile Polyethylene (PE) Storm Sewer and Drainage Pipe and Fittings	IPC®	IRC®
B182.13—14 <u>B182.13—18</u>	Profile Polypropylene (PP) Sewer Pipe and Fittings for Leak-proof Sewer Applications	IPC®	
B356—10 (<u>R2015</u>)	Water Pressure Reducing Valves for Domestic Water Systems	IPC®	IRC®
B481.1—12 (<u>R2017</u>)	Testing and Rating of Grease Interceptors Using Lard	IPC®	
B481.3—12 (<u>R2017</u>)	Sizing, Selection, Location and Installation of Grease Interceptors	IPC®	
<u>CAN/CSA B483.1—07</u> (R2012 <u>R2017</u>)	Drinking Water Treatment <u>Units Systems</u>	IPC®	IRC®
B602—15 <u>B602—16</u>	Mechanical Couplings for Drain, Waste and Vent Pipe and Sewer Pipe	IPC® IRC®	IPSDC®

IAPMO		IAPMO Group	
Standard Reference Number	Title	Referenced in Code(s):	
Z1001—2014 <u>Z1001—2016</u>	Prefabricated Gravity Grease Interceptors	IPC®	
CSA B45.5—17/IAPMO <u>Z124—2017 with errata dated August 2017</u>	Plastic Plumbing Fixtures	IPC® IRC®	IPC®
IAPMO/ANSI Z1157—2014 <u>Z1157—2014e1</u>	Ball Valves	IPC®	

MSS		Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.	
Standard Reference Number	Title	Referenced in Code(s):	
SP-71—2013 <u>SP-71—2018</u>	Gray Iron Swing Check Valves, Flanged and Threaded Ends	IPC®	IRC®
SP-78—2013 <u>SP-78—2011</u>	Cast Iron Plug Valves, Flanged and Threaded Ends	IPC®	
SP-110—2010a <u>SP-110—2010</u>	Ball Valves, Threaded, Socket Welding, Solder Joint, Grooved and Flared Ends (<u>incl. a 2010 Errata Sheet</u>)	IPC®	IRC®
SP-122—2012 <u>SP-122—2017</u>	Plastic Industrial Ball Valves	IPC®	IRC®

NFPA		National Fire Protection Association	
Standard Reference Number	Title	Referenced in Code(s):	
55—16 <u>55—19</u>	Compressed Gases and Cryogenic Fluids Code	IBC® IPC®	IFC®
99—18 <u>99—21</u>	Health Care Facilities Code	IBC® IPC®	IFC®

NSF		NSF International	
Standard Reference Number	Title	Referenced in Code(s):	
3—2012 <u>3—2017</u>	Commercial Warewashing Equipment	IPC®	
14—2015 <u>14—2017</u>	Plastic Piping System Components and Related Materials	IPC®	IRC®

18—2012 <u>18—2016</u>	Manual Food and Beverage Dispensing Equipment	IPC®	
42—2015 <u>42—2017</u>	Drinking Water Treatment Units-Aesthetic Effects	IPC®	IRC®
44—2015 <u>44—2017</u>	Residential Cation Exchange Water Softeners	IPC®	IRC®
50—2015 <u>50—2017</u>	Equipment for Swimming Pools, Spas, Hot Tubs and Other Recreational Facilities	IPC®	IRC®
53—2015 <u>53—2017</u>	Drinking Water Treatment Units—Health Effects	IPC®	IRC®
58—2015 <u>58—2017</u>	Reverse Osmosis Drinking Water Treatment Systems	IPC®	IRC®
61—2015 <u>61—2017</u>	Drinking Water System Components—Health Effects	IPC®	IRC®
62—2015 <u>62—2017</u>	Drinking Water Distillation Systems	IPC®	
350—2014 <u>350—2017a</u>	Onsite Residential and Commercial Water Reuse Treatment Systems	IPC®	IRC®
359—2011 <u>(R2016)</u>	Valves for Cross-linked Polyethylene (PEX) Water Distribution Tubing Systems	IPC®	
372—2011 <u>372—2016</u>	Drinking Water Systems Components—Lead Content	IPC®	IRC®

TCNA	Tile Council of North America		
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Standard Reference Number	Title	Referenced in Code(s):	
TCNA/ANSI A118.10—99 <u>A118.10—14</u>	Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin Set Ceramic Tile and Dimension Stone Installation	IPC®	

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Standard Reference Number	Title	Referenced in Code(s):	
399—2008 <u>399—2017</u>	Drinking-Water Coolers—with revisions through October 2013 <u>August 2018</u>	IPC®	
430—2009 <u>430—2015</u>	Waste Disposers—with revisions through September 2015 <u>February 2018</u>	IPC®	
508—99 <u>508—2018</u>	Industrial Control Equipment—with revisions through October 2013 <u>Equipment</u>	IMC® IRC®	IPC®
1795—2009 <u>1795—2016</u>	Hydromassage Bathtubs—with revisions through January 2015 <u>December 2017</u>	IPC®	

Reason: THIS IS THE ADMIN STANDARDS UPDATE CODE CHANGE FOR THE IPC.

The CP28 Code Development Policy, Section 4.6 requires the updating of referenced standards to be accomplished administratively, and be processed as a Code Change Proposal for consideration by the Administrative Code Change Committee. In September 2018, a letter was sent to each developer of standards that is referenced in the International Codes, asking them to provide ICC with a list of their standards in order to update to the current edition. Listed are the referenced standards that are to be updated based upon responses received from standards developers.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Not applicable.

Proposal # 5809

ADM47-IPC-19

ADM47-IRC-19

Chapter 44

AAMA		American Architectural Manufacturers Association	
Standard Reference Number	Title	Referenced in Code(s):	
450—10 <u>450—20</u>	Voluntary Performance Rating Method for Muller Fenestration Assemblies	IRC®	
711—16 <u>711—20</u>	Voluntary Specification for Self-adhering Flashing Used for Installation of Exterior Wall Fenestration Products	IBC®	IRC®
714—15 <u>714—20</u>	Voluntary Specification for Liquid Applied Flashing Used to Create a Water-resistive Seal around Exterior Wall Openings in Buildings	IBC®	IRC®
AAMA/NPEA/NSA 2100—12 <u>2100—20</u>	Specifications for Sunrooms	IRC®	

ACCA		Air Conditioning Contractors of America	
Standard Reference Number	Title	Referenced in Code(s):	
ANSI/ACCA 1 Manual D—2016	Residential Duct Systems	IMC®	IRC®
ANSI/ACCA Manual J—2016	Residential Load Calculation— Eighth Edition <u>Calculation</u>	IRC®	
ANSI/ACCA 3 Manual S—2014	Residential Equipment Selection	IRC®	

ACI		American Concrete Institute	
Standard Reference Number	Title	Referenced in Code(s):	
318—14 <u>318—19</u>	Building Code Requirements for Structural Concrete	IBC®	IRC®
332—14 <u>332—20</u>	Residential Code Requirements for Structural Concrete	IRC®	

AISI		American Iron and Steel Institute	
Standard Reference Number	Title	Referenced in Code(s):	
AISI S100—16 <u>S1-18</u>	North American Specification for the Design of Cold-formed Steel Structural Members, 2016, <u>with Supplement 1, dated 2018</u>	IBC®	IRC®
AISI S220—15 <u>S220—20</u>	North American Standard for Cold-formed Steel Framing—Nonstructural Members, 2015 <u>2020</u>	IBC®	IRC®
AISI S230—15 <u>S230—18</u>	Standard for Cold-formed Steel Framing—Prescriptive Method for One- and Two-family Dwellings, 2015 <u>2018</u>	IBC®	IRC®
AISI S240—15 <u>S240—20</u>	North American Standard for Cold-Formed Steel Structural Framing, <u>2020</u>	IBC®	IRC®

AMCA		Air Movement and Control Association International	
Standard Reference Number	Title	Referenced in Code(s):	
ANSI/AMCA 210-ANSI/ASHRAE 51—07 <u>51—16</u>	Laboratory Methods of Testing Fans for Aerodynamic Performance Rating	IRC®	

ANCE**Association of the Electric Sector**

Standard Reference Number	Title	Referenced in Code(s):
NMX-J-521/2-40-ANCE— 2014 2-40-ANCE— 2019/CAN/CSA-22.2 No. 60335-2-40—12 60335-2-40—19/UL 60335-2-40 60335-2-40-2019	Safety of Household and Similar Electric Appliances, Part 2-40 2-40-Safety: Particular Requirements for <u>Electric Heat Pumps, Air-Conditioners and Dehumidifiers</u>	IRC®

ANSI**American National Standards Institute**

Standard Reference Number	Title	Referenced in Code(s):
A108.1A—16 A108.1A—17	Installation of Ceramic Tile in the Wet-set Method, with Portland Cement Mortar	IBC® IRC®
A108.1B—99 A108.1B—2017	Installation of Ceramic Tile, Quarry Tile on a Cured Portland Cement Mortar Setting Bed with Dry-set or Latex Portland Mortar	IBC® IRC®
A108.4—99 A108.4—09	Installation of Ceramic Tile with Organic Adhesives or Water-Cleanable Tile-setting Epoxy Adhesive	IBC® IRC®
A108.5—99 A108.5—19	Installation of Ceramic Tile with Dry-set Portland Cement Mortar or Latex Portland Cement Mortar	IBC® IRC®
A108.6—99 A108.6—19	Installation of Ceramic Tile with Chemical-resistant, Water-cleanable Tile-setting and -grouting Epoxy	IBC® IRC®
A108.11—99 A108.11—10	Interior Installation of Cementitious Backer Units	IRC®
ANSI 447—2015 117—2020	Standard Specifications for Structural Glued Laminated Timber of Softwood Species	IRC®
A118.1—16 A118.1—18	American National Standard Specifications for Dry-set Portland Cement Mortar	IBC® IRC®
A118.3—13 A118.3—20	American National Standard Specifications for Chemical-resistant, Water-cleanable Tile-setting and -grouting Epoxy, and Water-cleanable Tile-setting Epoxy Adhesive	IBC® IRC®
A118.4—16 A118.4—18	American National Standard Specifications for Modified Dry-Set Cement Mortar	IBC® IRC®
A118.10—99 A118.10—14	Specification for Load-bearing, Bonded, Waterproof Membranes for Thin-set Ceramic Tile and Dimension Stone Installation	IRC®
A136.1—08 A136.1—19	American National Standard Specifications for Organic Adhesives for Installation of Ceramic Tile	IBC® IRC®
A137.1—17 A137.1—19	American National Standard Specifications for Ceramic Tile	IBC® IRC®
LC1/CSA 6.26—13 6.26—2016	Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing (CSST)	IRC®
Z21.1—2010 Z21.1/CSA 1.1—2016	Household Cooking Gas Appliances	IFGC® IMC® IRC®
Z21.5.1/CSA 7.1—14 7.1—2017	Gas Clothes Dryers—Volume I—Type I Clothes Dryers	IRC®
Z21.8—94 (R2002 R2012)	Installation of Domestic Gas Conversion Burners	IFGC® IRC®
Z21.10.1/CSA 4.1—12 4.1—2012	Gas Water Heaters—Volume I—Storage Water Heaters with Input Ratings of 75,000 Btu per hour or Less	IRC®
Z21.10.3/CSA 4.3—11 4.3—2017	Gas Water Heaters—Volume III—Storage Water Heaters with Input Ratings above 75,000 Btu per hour, Circulating and Instantaneous	IECC IRC®
Z21.11.2—11 Z21.11.2—2016	Gas-fired Room Heaters—Volume II—Unvented Room Heaters	IRC®
Z21.13/CSA 4.9—11 4.9—2017	Gas-fired Low-pressure Steam and Hot Water Boilers	IRC®
Z21.15/CSA 9.1—09(R2014)	Manually Operated Gas Valves for Appliances, Appliance Connector Valves and Hose End Valves	IRC®
Z21.24/CSA 6.10—06 6.10	Connectors for Gas Appliances	IRC®

Z21.40.1/CSA 2.91—96 (R2011, R2017)	Gas-fired, Heat-activated Air-conditioning and Heat Pump Appliances	IRC®	
Z21.40.2/CSA 2.92—96 (R2011, R2017)	<u>Gas-fired, Work Activated</u> Air-conditioning and Heat Pump Appliances (Thermal-Internal Combustion)	IRC®	
Z21.42—2014 Z21.42—2013	Gas-fired Illuminating Appliances	IFGC®	IRC®
Z21.47/CSA 2.3—12 2.3—2016	Gas-fired Central Furnaces	IECC	IRC®
Z21.50/CSA 2.22—16 2.22—2016	Vented <u>Decorative</u> Gas Fireplaces	IRC®	
Z21.54—2009 Z21.54—2014	Gas Hose Connectors for Portable Outdoor Gas-fired Appliances	IFGC®	IRC®
Z21.58—95/CSA 1.6—13 1.6—2015	Outdoor Cooking Gas Appliances	IRC®	
Z21.60/CSA 2.26—12 2.26—2017	Decorative Gas Appliances for Installation in Solid Fuel-burning Fireplaces	IRC®	
Z21.69/CSA 6.16—09 6.16—2015	Connectors for Movable Gas Appliances	IRC®	
Z21.75/CSA 6.27—07 6.27—2016	Connectors for Outdoor Gas Appliances and Manufactured Homes	IRC®	
Z21.80/CSA 6.22—11 6.22—2011(R2016)	Line Pressure Regulators	IRC®	
ANSI/CSA FC 1—12 1—2014	Stationary Fuel-Cell Power Systems <u>Fuel cell technologies - Part 3-100: Stationary fuel cell power systems - Safety</u>	IRC®	
Z21.84—12 Z21.84—2017	Manually Listed Lighted , Natural Gas Decorative Gas Appliances for Installation in Solid Fuel-burning Fireplaces <u>Solid-Fuel Burning Appliances</u>	IRC®	
Z21.86/CSA 2.32—08 2.32—2016	<u>Vented</u> Gas-fired Vented Space Heating Appliances	IRC®	
Z21.91—07 Z21.91—2017	Ventless Firebox Enclosures for Gas-fired Unvented Decorative Room Heaters	IRC®	
Z21.93/CSA 6.30—13 6.30—2017	Excess Flow Valves for Natural <u>Gas</u> and LP-Propane Gas with Pressures up to 5 psig	IRC®	
Z21.97—12 Z21.97—2014	Outdoor Decorative <u>Gas</u> Appliances	IRC®	
Z83.8/CSA 2.6—09 2.6—2016	Gas-fired <u>Gas</u> Unit Heaters, Gas Packaged Heaters, Gas Utility Heaters, and Gas-fired Duct Furnaces	IECC	IRC®
Z83.19—01 Z83.19—2009 (R2009, R2014)	Gas-fuel <u>Gas-fired</u> High-intensity Infrared Heaters	IRC®	
Z83.20—08 Z83.20—2016	Gas-fired <u>Tubular and</u> Low-intensity Infrared Heaters Outdoor Decorative Appliances	IRC®	

APA

APA—The Engineered Wood Association

Standard Reference Number	Title	Referenced in Code(s):
ANSI/APA PRP 210—2014 210—2019	Standard for Performance-rated Engineered Wood Siding	IRC®
ANSI/APA PRG 320—2017 320—2019	Standard for Performance-rated Cross Laminated Timber	IRC®
ANSI/APA PRS 610.1—2013 610.1—2018	Standard for Performance-Rated Structural Insulated Panels in Wall Applications	IRC®
APA E30—15 E30—19	Engineered Wood Construction Guide	IRC®

APSP

The Association of Pool & Spa Professionals

Standard Reference Number	Title	Referenced in Code(s):	
ANSI/APSP/ICC 14—2014 <u>14—2019</u>	American National Standard for Portable Electric Spa Energy Efficiency	IECC	IECC
ANSI/APSP/ICC 15a—2014 <u>15—2020</u>	American National Standard for Residential Swimming Pool and Spa Energy Efficiency —includes Appendix A Approved January 9, 2013 Efficiency	IECC	IECC
		IRC®	ISPSC®

ASCE/SEI	American Society of Civil Engineers		
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Standard Reference Number	Title	Referenced in Code(s):	
7—16 <u>with Supplement 1</u>	Minimum Design Loads and Associated Criteria for Buildings and Other Structures	IBC®	IEBC®
24—14 <u>24—20</u>	Flood-resistant Design and Construction	IRC®	IRC®

ASHRAE	ASHRE		
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Standard Reference Number	Title	Referenced in Code(s):	
ASHRAE—2017 <u>ASHRAE—2021</u>	ASHRAE Handbook of Fundamentals	IECC	IMC®
34—2016 <u>34—2019</u>	Designation and Safety Classification of Refrigerants	IRC®	IRC®

ASME	American Society of Mechanical Engineers		
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Standard Reference Number	Title	Referenced in Code(s):	
ASME A17.1—2016 <u>A17.1—2019/CSA B44—16</u> <u>B44—2019</u>	Safety Code for Elevators and Escalators	IEBC®	IECC
A18.1—2014 <u>A18.1—2020</u>	Safety Standard for Platforms and Stairway Chair Lifts	IFC®	IPMC®
A112.1.2—2012 <u>(R2022)</u>	Air Gaps in Plumbing Systems (For Plumbing Fixtures and Water Connected Receptors)	IRC®	IEBC®
A112.1.3—2000 <u>(Reaffirmed 2015 2020)</u>	Air Gap Fittings for Use with Plumbing Fixtures, Appliances and Appurtenances	IBC®	IEBC®
A112.3.1—2007 <u>(R2012 R2022)</u>	Stainless Steel Drainage Systems for Sanitary, DWV, Storm and Vacuum Applications Above and Below Ground	IRC®	IEBC®
A112.3.4—2013 <u>A112.3.4—2020/CSA B45.9—13</u> <u>B45.9—20</u>	Macerating Toilet Systems and Related Components	IPC®	IRC®
A112.4.1—2009 <u>(R2019)</u>	Water Heater Relief Valve Drain Tubes	ISPSC®	IPC®
ASME A112.4.2—2015 <u>A112.4.2—2020/CSA B45.16—15</u> <u>B45.16—20</u>	Water-closet Personal Hygiene Devices	IMC®	IPC®
A112.4.3—1999 <u>(R2010 R2020)</u>	Plastic Fittings for Connecting Water Closets to the Sanitary Drainage System	IRC®	IRC®
A112.4.14—2004 <u>(R2016)</u> <u>A112.4.14/CSA B125.14—2019</u>	Manually Operated, Quarter-turn Shutoff Valves for Use in Plumbing Systems	IPC®	IRC®
A112.6.2—2000 <u>(R2016)</u> <u>A112.6.2—2022</u>	Framing-affixed Supports for Off-the-floor Water Closets with Concealed Tanks	IRC®	IRC®
A112.6.3—2001 <u>(R2016)</u>			

A112.6.3—2019	Floor and Trench Drains	IPC®	IRC®
A112.14.1—03 A112.14.1—2003 (2012 2022)	Backwater Valves	IRC®	
A112.18.1—2017 A112.18.1—2020 CSA B125.1—2017 B125.1—2020	Plumbing Supply Fittings	IPC®	IRC®
A112.18.2—2015 A112.18.2—2019 CSA B125.2—2015 B125.2—2019	Plumbing Waste Fittings	IRC®	
A112.18.3—2002 A112.18.3M—2002 (R2012 R2020)	Performance Requirements for Backflow Protection Devices and Systems in Plumbing Fixture Fittings	IRC®	
A112.18.6—2017 A112.18.6—2021 CSA B125.6—17 B125.6—21	Flexible Water Connectors	IPC®	IRC®
A112.19.1—2013 A112.19.1—2020 CSA B45.2—2013 B45.2—2020	Enameled Cast-iron and Enameled Steel Plumbing Fixtures	IPC®	IRC®
A112.19.2—2013 A112.19.2—2020 CSA B45.1—2013 B45.1—2020	Ceramic Plumbing Fixtures	IRC®	
A112.19.3—2008 A112.19.3—2021 CSA B45.4—08 (R2013) B45.4—2021	Stainless Steel Plumbing Fixtures	IRC®	
A112.19.5—2017 A112.19.5—2021 CSA B45.15—2017 B45.15—2021	Flush Valves and Spuds for Water-closets, Urinals and Tanks	IPC®	IRC®
A112.19.7—2017 A112.19.7—2021 CSA B45.10—2017 B45.10—2021	Hydromassage Bathtub Systems	IRC®	IRC®
A112.19.12—2014 A112.19.12—2019	Wall-mounted and Pedestal-mounted, Adjustable, Elevating, Tilting, and Pivoting Lavatory and Sink, and Shampoo Bowl Carrier Systems and Drain Waste Systems	IPC®	IRC®
A112.19.14—2013 (R2018)	Six-Liter Water Closets Equipped with Dual Flushing Device	IPC®	IRC®
A112.19.15—2012 (R2017)	Bathtub/Whirlpool Bathtubs with Pressure-sealed Doors	IPC®	IRC®
A112.36.2m—1991 A112.36.2M—1991 (R2012 R2017)	Cleanouts	IRC®	
ASSE 1002—2015 1002—2020 ASME A112.1002—2015 A112.1002—2020 CSA B125.12—15 B125.12—20	Anti-Siphon Fill Valves	IPC® IRC® IRC®	IPC® IRC®
B1.20.1—2013 B1.20.1—2019	Pipe Threads, General-purpose (Inch)	IFGC® IPC®	IMC® IRC®
B16.3—2016 B16.3—2021	Malleable-iron-threaded Fittings, 150 and 300	IMC® IRC®	IPC®
B16.4—2016 B16.4—2021	Gray-iron-threaded Fittings	IPC®	IRC®
B16.9—2012 B16.9—2018	Factory-made, Wrought-steel Buttwelding Fittings	IMC® IRC®	IPC®
B16.11—2016 B16.11—2021	Forged Fittings, Socket-welding and Threaded	IMC® IRC®	IPC®
B16.12—2009 (R2014 R2019)	Cast-iron-threaded Drainage Fittings	IPC®	IRC®
B16.15—2013 B16.15—		IMC®	IPC®

<u>2018</u>	Cast-Alloy-threaded Fittings: Classes 125 and 250	IRC®	ISPSC®
B16.18—2012 <u>B16.18—2018</u>	Cast-copper-alloy Solder Joint Pressure Fittings	IBC® IMC® IRC®	IFC® IPC®
B16.22—2013 <u>B16.22—2018</u>	Wrought-copper and Copper-alloy Solder Joint Pressure Fittings	IBC® IMC® IRC®	IFC® IPC®
B16.23—2016 <u>B16.23—2021</u>	Cast-copper-alloy Solder Joint Drainage Fittings (DWV)	IPC®	IRC®
B16.26—2016 <u>B16.26—2018</u>	Cast-copper-alloy Fittings for Flared Copper Tubes	IMC® IRC®	IPC®
B16.29—2012 <u>B16.29—2017</u>	Wrought-copper and Wrought-copper-alloy Solder Joint Drainage Fittings (DWV)	IPC®	IRC®
B16.33—2012 (R2017)	Manually Operated Metallic Gas Valves for Use in Gas Piping Systems up to 125 psig (Sizes 1/2 through 2)	IFGC®	IRC®
B16.34—2015 <u>B16.34—2020</u>	Valves—Flanged, Threaded and Welding End	IPC®	IRC®
B16.44—2012 (R2017)	Manually Operated Metallic Gas Valves for Use in Above-ground Piping Systems up to 5 psi	IFGC®	IRC®
B16.51—2013 <u>B16.51—2018</u>	Copper and Copper Alloy Press-Connect Pressure Fittings	IMC® IRC®	IPC®
B36.10M—2004 (R2015) B36.10M—2018	Welded and Seamless Wrought-steel Pipe	IRC®	
BPVC—2015 <u>BPVC—2019</u>	ASME Boiler and Pressure Vessel Code (Sections I, II, IV, V, VI and VIII)	IFC® IMC®	IFGC® IRC®
CSD-1—2016 <u>CSD-1—2021</u>	Controls and Safety Devices for Automatically Fired Boilers	IFGC® IRC®	IMC®
ASSE 1016—2017 <u>1016—2020</u> / ASME 112.1016—2017 <u>112.1016—2020</u> / CSA B125.16—2017 <u>B125.16—2020</u>	Performance Requirements for Automatic Compensating Valves for Individual Showers and Tub/Shower Combinations	IRC® IRC®	IRC®
ASSE 1070—2015 <u>1070—2020</u> / ASME A112.1070—2015 <u>A112.1070—2020</u> / CSA B125.70—15 <u>B125.70—20</u>	Performance Requirements for Water-temperature-limiting Devices	IPC® IRC®	IRC® IRC®

ASSE	ASSE International		
Standard Reference Number	Title	Referenced in Code(s):	
1001—2016 <u>1001—2017</u>	Performance Requirements for Atmospheric-type Vacuum Breakers	IPC®	IRC®
ASSE 1002—2015 <u>1002—2020</u> / ASME A112.1002—2015 <u>A112.1002—2020</u> / CSA B125.12—15 <u>B125.12—20</u>	Anti-Siphon Fill Valves	IPC® IRC® IRC®	IPC® IRC®
1013—2017 <u>1013—2011</u>	Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers	IPC®	IRC®
ASSE 1016—2017 <u>1016—2020</u> / ASME 112.1016—2017 <u>112.1016—2020</u> / CSA B125.16—2017 <u>B125.16—2020</u>	Performance Requirements for Automatic Compensating Valves for Individual Showers and Tub/Shower Combinations	IRC® IRC®	IRC®

1017 2010 <u>1017</u> — 2009	Performance Requirements for Temperature-actuated Mixing Valves for Hot Water Distribution Systems	IMC® IRC®	IPC®
1018 2017 <u>1018</u> — 2001	Performance Requirements for Trap Seal Primer Valves; Potable Water Supplied	IPC®	IRC®
1019 2016 <u>1019</u> — 2011 (R2016)	Performance Requirements for Freeze-resistant, Wall Hydrants, Vacuum Breaker, Draining Types	IPC®	IRC®
1023 2016 <u>1023</u> — 1979	Performance Requirements for Hot Water Dispensers, Household-storage-type— Electrical	IRC®	
1024 2016 <u>1024</u> — 2017	Performance Requirements for Dual Check Backflow Preventers, Anti-siphon-type, Residential Applications	IPC®	IRC®
1044 2010 <u>1044</u> — 2015	Performance Requirements for Trap Seal Primer Devices _Drainage Types and Electronic Design Types	IPC®	IRC®
1047 2017 <u>1047</u> — 2011	Performance Requirements for Reduced Pressure Detector Fire Protection Backflow Prevention Assemblies	IPC®	IRC®
1048 2017 <u>1048</u> — 2011	Performance Requirements for Double Check Detector Fire Protection Backflow Prevention Assemblies	IPC®	IRC®
1062 2016 <u>1062</u> — 2017	Performance Requirements for Temperature-actuated, Flow Reduction (TAFR) Valves for Individual Supply Fittings	IPC®	IRC®
1066 2016 <u>1066</u> — 1997	Performance Requirements for Individual Pressure Balancing In-line Valves for Individual Fixture Fittings	IPC®	IRC®
ASSE 1070 2015 <u>1070</u> — <u>2020</u> /ASME A112- 1070 — 2015 A112.1070— <u>2020</u> /CSA B125.70—15 <u>B125.70</u> —20	Performance Requirements for Water-temperature-limiting Devices	IPC® IRC®	IRC® IRC®

ASTM	ASTM International		
Standard Reference Number	Title	Referenced in Code(s):	
A53/A53M — 12 <u>A53M</u> — <u>2018</u>	Specification for Pipe, Steel, Black and Hot-dipped, Zinc-coated Welded and Seamless	IFGC® IPC®	IMC® IRC®
A74 — 15 <u>A74</u> — 2017	Specification for Cast-iron Soil Pipe and Fittings	IPC® IRC®	IPSDC®
A106/A106M — 14 <u>A106M</u> — <u>2018</u>	Specification for Seamless Carbon Steel Pipe for High-temperature Service	IFGC® IRC®	IMC®
A123/A123M — 15 <u>A123M</u> — <u>2017</u>	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products	IRC®	
A153/A153M — 09 <u>A153M</u> — <u>2016A</u>	Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware	IBC®	IRC®
A240/A240M — 15A <u>A240M</u> — <u>17</u>	Standard Specification for Chromium and Chromium-nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications	IBC® ISPSC®	IRC®
A254 — 12 <u>A254</u> — <u>2010</u> (2018)	Specification for Copper Brazed Steel Tubing	IFGC® IRC®	IMC®
A268 — 2010 <u>A268/A268M</u> — <u>2010</u> (16)	Standard Specification for Seamless and Welded Ferritic and Martensitic Stainless Steel Tubing for General Service	IRC®	
A269 — 2015 <u>A269/A269M</u> — <u>2015A</u>	Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service	IRC®	
A307 — 14 <u>A307</u> — 2014E1	Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength	IRC®	
A312/A312M — 15A <u>A312M</u> — <u>2018</u>	Specification for Seamless, Welded and Heavily Cold Worked Austenitic Stainless Steel Pipes	IPC® ISPSC®	IRC®
A653/A653M — 15 <u>A653M</u> — <u>2017</u>	Specification for Steel Sheet, Zinc-coated (Galvanized) or Zinc-iron Alloy-coated (Galvannealed) by the Hot-dip Process	IBC®	IRC®
A706/A706M — 15 <u>A706M</u> —			

<u>2016</u>	Specification for Low-alloy Steel Deformed and Plain Bars for Concrete Reinforcement	IBC®	IRC®
<u>A755/A755M—2015 A755M—2016E1</u>	Specification for Steel Sheet, Metallic Coated by the Hot-dip Process and Preprimed by the Coil-coating Process for Exterior Exposed Building Products	IRC®	
<u>A778/A778M—15 A778M—2016</u>	Specification for Welded Unannealed Austenitic Stainless Steel Tubular Products	IPC®	IRC®
<u>A888—15 A888—2018</u>	Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Application	IPC® IRC®	IPSDC®
<u>A924/A924M—14 A924M—2017A</u>	Standard Specification for General Requirements for Steel Sheet, Metallic-coated by the Hot-dip Process	IBC®	IRC®
<u>A996/A996M—15 A996M—2016</u>	Specifications for Rail-steel and Axle-steel Deformed Bars for Concrete Reinforcement	IRC®	
<u>B88—14 B88—2016</u>	Specification for Seamless Copper Water Tube	IBC® IFGC® IPC® IRC®	IFC® IMC® IPSDC® ISPSC®
<u>B135—10 B135/B135M—2017</u>	Specification for Seamless Brass Tube	IMC®	IRC®
<u>B251—10 B251/B251M—2017</u>	Specification for General Requirements for Wrought Seamless Copper and Copper-alloy Tube	IBC® IMC® IPSDC®	IFC® IPC® IRC®
<u>B302—12 B302—2017</u>	Specification for Threadless Copper Pipe, Standard Sizes	IMC® IRC®	IPC®
<u>B695—04 B695—2004(2009 2016)</u>	Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel	IBC®	IRC®
<u>B813—10 B813—2016</u>	Specification for Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube	IMC® IPSDC®	IPC® IRC®
<u>B828—02(2010) B828—2016</u>	Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings	IMC® IPSDC®	IPC® IRC®
<u>C4—04 C4—2004(2014 2018)</u>	Specification for Clay Drain Tile and Perforated Clay Drain Tile	IPC® IRC®	IPSDC®
<u>C5—10 C5—2018</u>	Specification for Quicklime for Structural Purposes	IBC®	IRC®
<u>C27—98 C27—1998(2013 2018)</u>	Specification for Standard Classification of Fireclay and High-alumina Refractory Brick	IBC®	IRC®
<u>C33/C33M—13 C33M—2018</u>	Specification for Concrete Aggregates	IBC®	IRC®
<u>C34—13 C34—2017</u>	Specification for Structural Clay Load-bearing Wall Tile	IRC®	
<u>C55—2014A C55—2017</u>	Specification for Concrete Building Brick	IBC®	IRC®
<u>C56—13 C56—2013(2017)</u>	Standard Specification for Structural Clay Nonloadbearing Tile	IRC®	
<u>C62—13A C62—2017</u>	Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale)	IBC®	IRC®
<u>C73—14 C73—2017</u>	Specification for Calcium Silicate Face Brick (Sand Lime Brick)	IBC®	IRC®
<u>C76—15A C76—2018A</u>	Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe	IPC® IRC®	IPSDC®
<u>C90—14 C90—2016A</u>	Specification for Load-bearing Concrete Masonry Units	IBC® IRC®	IECC
<u>C91/C91M—12 C91M—2018A</u>	Specification for Masonry Cement	IBC®	IRC®
<u>C94/C94M—15A C94M—2017A</u>	Standard Specification for Ready-mixed Concrete	IBC® IRC®	IEBC®
<u>C126—15 C126—2017</u>	Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units	IRC®	
<u>C129—14A C129—2017</u>	Specification for Nonload-bearing Concrete Masonry Units	IRC®	
<u>C143/C143M—15 C143M—</u>	Test Method for Slump of Hydraulic Cement Concrete	IRC®	

C150/C150M—15 C150M—2018	Specification for Portland Cement	IBC®	IRC®
C199—84 C199—1984(2011, 2016)	Test Method for Pier Test for Refractory Mortar	IBC®	IRC®
C203—05a C203—2005A(2012, 2017)	Standard Test Methods for Breaking Load and Flexural Properties of Block-type Thermal Insulation	IRC®	
C207—06(2011) C207—2018	Specification for Hydrated Lime for Masonry Purposes	IRC®	
C208—12 C208—2012(2017)E1	Specification for Cellulosic Fiber Insulating Board	IBC®	IRC®
C212—14 C212—2017	Standard Specification for Structural Clay Facing Tile	IRC®	
C216—15 C216—2017A	Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale)	IBC®	IRC®
C315—07 C315—2007(2011, 2016)	Specification for Clay Flue Liners and Chimney Pots	IBC® IMC®	IFGC® IRC®
C411—11 C411—2017	Test Method for Hot-surface Performance of High-temperature Thermal Insulation	IMC®	IRC®
C425—04 C425—2004(2013, 2018)	Specification for Compression Joints for Vitriified Clay Pipe and Fittings	IPC® IRC®	IPSDC®
C443—12 C443—2012(2017)	Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets	IPC® IRC®	IPSDC®
C475/C475M—15 C475M—2017	Specification for Joint Compound and Joint Tape for Finishing Gypsum Wallboard	IBC®	IRC®
C476—10 C476—2018	Specification for Grout for Masonry	IRC®	
C503/C503M—2010 C503M—2015	Standard Specification for Marble Dimension Stone	IRC®	
C552—15 C552—2017E1	Standard Specification for Cellular Glass Thermal Insulation	IBC®	IRC®
C557—03 C557—2003(2009, 2017)e0+	Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing	IBC®	IRC®
C568/C568M—2010 C568M—2015	Standard Specification for Limestone Dimension Stone	IRC®	
C578—15 C578—2018	Specification for Rigid, Cellular Polystyrene Thermal Insulation	IBC®	IRC®
C587—04 C587—2004(2014, 2018)	Specification for Gypsum Veneer Plaster	IBC®	IRC®
C595/C595M—14E1 C595M—2018	Specification for Blended Hydraulic Cements	IBC®	IRC®
C615/C615M—11 C615M—2018E1	Standard Specification for Granite Dimension Stone	IRC®	
C616/C616M—10 C616M—2015	Standard Specification for Quartz-based Dimension Stone	IRC®	
C629/C629M—10 C629M—2015	Standard Specification for Slate Dimension Stone	IRC®	
C645—14 C645—2018	Specification for Nonstructural Steel Framing Members	IRC®	
C652—15 C652—2017A	Specification for Hollow Brick (Hollow Masonry Units Made from Clay or Shale)	IBC®	IRC®
C685/C685M—14 C685M—2017	Specification for Concrete Made by Volumetric Batching and Continuous Mixing	IRC®	
C700—13 C700—2018	Specification for Vitriified Clay Pipe, Extra Strength, Standard Strength and Perforated	IPC® IRC®	IPSDC®
C726—12 C726—2017	Standard Specification for Mineral Wool Roof Insulation Board	IBC®	IRC®
C728—15 C728—2017A	Standard Specification for Perlite Thermal Insulation Board	IBC®	IRC®
C744—14 C744—2016	Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units	IBC®	IRC®
C836/C836M—15 C836M—2018	Specification for High Solids Content, Cold Liquid-applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course	IBC®	IRC®

C841—03 C841—2003(2013) <u>2018</u>	Standard Specification for Installation of Interior Lathing and Furring	IBC®	IRC®
C843—99(2012) C843—2017	Specification for Application of Gypsum Veneer Plaster	IBC®	IRC®
C847—14A C847—2018	Specification for Metal Lath	IBC®	IRC®
C920—14A C920—2018	Standard Specification for Elastomeric Joint Sealants	IBC®	IRC®
C926—15B C926—2018B	Specification for Application of Portland Cement-based Plaster	IBC®	IRC®
C933—14 C933—2018	Specification for Welded Wire Lath	IBC®	IRC®
C946—10 C946—2018	Standard Practice for Construction of Dry-Stacked, Surface-Bonded Walls	IBC®	IRC®
C954—15 C954—2018	Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) or to 0.112 in. (2.84 mm) in Thickness	IBC®	IRC®
C957/C957M—15 C957M—2017	Specification for High-solids Content, Cold Liquid-applied Elastomeric Waterproofing Membrane for Use with Integral Wearing Surface	IBC®	IRC®
C1002—14 C1002—2018	Specification for Steel Self-piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs	IBC®	IRC®
C1032—14 C1032—2018	Specification for Woven Wire Plaster Base	IBC®	IRC®
C1063—15A C1063—2018B	Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-based Plaster	IBC®	IRC®
C1088—14 C1088—2018	Standard Specification for Thin Veneer Brick Units Made from Clay or Shale	IBC®	IRC®
C1107/C1107M—14A C1107M—2017	Standard Specification for Packaged Dry, Hydraulic-cement Grout (Nonshrink)	IRC®	
C1157—11/C1157M—11 C1157M—2017	Standard Performance Specification for Hydraulic Cement	IRC®	
C1167—11 C1167—2011(2017)	Specification for Clay Roof Tiles	IBC®	IRC®
C1173—10(2014) C1173—2018	Specification for Flexible Transition Couplings for Underground Piping Systems	IPC® IRC®	IPSDC®
C1177/C1177M—13 C1177M—2017	Specification for Glass Mat Gypsum Substrate for Use as Sheathing	IBC®	IRC®
C1178/C1178M—13 C1178M—2018	Specification for Glass Mat Water-resistant Gypsum Backing Panel	IBC®	IRC®
C1186—08 C1186—2008(2012) 2016	Specification for Flat Fiber Cement Sheets	IBC®	IRC®
C1261—13 C1261—2013(2017) <u>E1</u>	Specification for Firebox Brick for Residential Fireplaces	IBC®	IRC®
C1277—15 C1277—2018	Specification for Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings	IPC® IRC®	IPSDC®
C1278/C1278M—07a(2011) C1278M—2017	Specification for Fiber-reinforced Gypsum Panels	IBC®	IRC®
C1283—11 C1283—2015	Practice for Installing Clay Flue Lining	IBC®	IRC®
C1288—14 C1288—2017	Standard Specification for Discrete Nonasbestos Fiber-cement Interior Substrate Sheets	IBC®	IRC®
C1289—15 C1289—2018	Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board	IBC®	IRC®
C1325—14 C1325—2018	Standard Specification for Nonasbestos Fiber-mat Reinforced Cement Interior Substrate Sheets Backer Units	IBC®	IRC®
C1364—10B C1364—2017	Standard Specification for Architectural Cast Stone	IBC®	IRC®
C1396/C1396M—2014A C1396M—2017	Specification for Gypsum Board	IRC®	
C1405—15 C1405—2016	Standard Specification for Glazed Brick (Single Fired, Brick Units)	IRC®	

C1440-08(2013) <u>C1440-2017</u>	Specification for Thermoplastic Elastomeric (TPE) Gasket Materials for Drain, Waste and Vent (DWV), Sewer, Sanitary and Storm Plumbing Systems	IPC® IRC®	IPSDC®
C1460-2012 <u>C1460-2017</u>	Specification for Shielded Transition Couplings for Use with Dissimilar DWV Pipe and Fittings Above Ground	IPC® IRC®	IPSDC®
C1461-08(2013) <u>C1461-2017</u>	Specification for Mechanical Couplings Using Thermoplastic Elastomeric (TPE) Gaskets for Joining Drain, Waste and Vent (DWV) Sewer, Sanitary and Storm Plumbing Systems for Above and Below Ground Use	IPC® IRC®	IPSDC®
C1492-03(2009) <u>C1492-2016</u>	Specification for Concrete Roof Tile	IBC®	IRC®
C1513-2013 <u>C1513-2018</u>	Standard Specification for Steel Tapping Screws for Cold-formed Steel Framing Connections	IRC®	
C1540-15 <u>C1540-2018</u>	Specification for Heavy Duty Shielded Couplings Joining Hubless Cast-iron Soil Pipe and Fittings	IPC®	IRC®
C1634-15 <u>C1634-2017</u>	Standard Specification for Concrete Facing Brick	IRC®	
C1658/C1658M-13 <u>C1658M-2018</u>	Standard Specification for Glass Mat Gypsum Panels	IBC®	IRC®
C1670/1670M-16 <u>1670M-2018</u>	Standard Specification for Adhered Manufactured Stone Masonry Veneer Units	IRC®	
C1691-11(2011) <u>C1691-2017</u>	Standard Specification for Unreinforced Autoclaved Aerated Concrete (AAC) Masonry Units	IRC®	
C1693-11(2011) <u>C1693-2017</u>	Standard Specification for Autoclaved Aerated Concrete (AAC)	IRC®	
C1766-13 <u>C1766-2015</u>	Standard Specification for Factory-Laminated Gypsum Panel Products	IBC®	IRC®
D41/D41M-2011(2016) <u>D41/D41M-2017</u>	Specification for Asphalt Primer Used in Roofing, Dampproofing and Waterproofing	IRC®	
D43/D43M-2000(2012) <u>2018)E+</u>	Specification for Coal Tar Primer Used in Roofing, Dampproofing and Waterproofing	IRC®	
D226/D226M-09 <u>D226M-2017</u>	Specification for Asphalt-saturated (Organic Felt) Used in Roofing and Waterproofing	IBC®	IRC®
D227/D227M-03(2003) <u>D227M-2018)E+</u>	Specification for Coal Tar Saturated (Organic Felt) Used in Roofing and Waterproofing	IBC®	IRC®
D312/D321M-15 <u>D321M-2016M</u>	Specification for Asphalt Used in Roofing	IRC®	
D449/D449M-03(2003) <u>D449M-2014)E1</u>	Specification for Asphalt Used in Dampproofing and Waterproofing	IRC®	
D450/D450M-07(2017) <u>D450M-2018)E+</u>	Specification for Coal-tar Pitch Used in Roofing, Dampproofing and Waterproofing	IBC®	IRC®
D1248-12 <u>D1248-2016</u>	Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable	IRC®	
D1785-15 <u>D1785-15E1</u>	Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120	IMC® IRC®	IPC® ISPSC®
D1863/D1863M-05 <u>D1863M-2005(2011)</u> <u>2018)E+</u>	Specification for Mineral Aggregate Used in Built-up Roofs	IBC®	IRC®
D1970/D1970M-2015A <u>D1970M-2017A</u>	Specification for Self-adhering Polymer Modified Bitumen Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection	IRC®	
D2178/D2178M-15 <u>D2178M-15A</u>	Specification for Asphalt Glass Felt Used in Roofing and Waterproofing	IBC®	IRC®
D2235-04(2004) <u>D2235-2016</u>	Specification for Solvent Cement for Acrylonitrile-butadiene-styrene (ABS) Plastic Pipe and Fittings	IMC® IPSDC®	IPC® IRC®
D2412-11(2011) <u>D2412-2018</u>	Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-plate Loading	IMC®	IRC®
D2466-15 <u>D2466-2017</u>	Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40	IMC® IRC®	IPC® ISPSC®

D2513 2014e+ <u>D2513</u>	Specification for Gas Pressure Pipe, Tubing and Fittings	IRC®	
2018A D2564 12 <u>D2564</u>	Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems	IMC® IPSDC®	IPC® IRC®
D2657 07 <u>D2657</u>	Standard Practice for Heat Fusion-joining of Polyolefin Pipe Fittings	IMC® IPSDC®	IPC® IRC®
D2661 14 <u>D2661</u> — <u>2014E1</u>	Specification for Acrylonitrile-butadiene-styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings	IPC® IRC®	IPSDC®
D2729 11 <u>D2729</u> — <u>2017</u>	Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings	IPC® IRC®	IPSDC®
D2822 / D2822M — 05 <u>D2822M</u> — <u>2005</u> (<u>2011</u>)e+	Specification for Asphalt Roof Cement, Asbestos Containing	IBC®	IRC®
D2824 / D2824M — 2013 <u>D2824M</u> — <u>2018</u>	Specification for Aluminum-pigmented Asphalt Roof Coatings, Nonfibered, Asbestos Fibered and Fibered without Asbestos	IRC®	
D2846 / D2846M — 14 <u>D2846M</u> — <u>2017BE1</u>	Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Hot- and Cold-water Distribution Systems	IMC® IRC®	IPC® ISPSC®
D2855 96 (2010) <u>D2855</u> — <u>2015</u>	Standard Practice for Making Solvent-cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings	IPC® IRC®	IPSDC®
D2898 10 <u>D2898</u> — <u>2010</u> (<u>2017</u>)	Test Methods for Accelerated Weathering of Fire-retardant-treated Wood for Fire Testing	IBC® IWUIC®	IRC®
D3019 08 <u>D3019</u> / <u>D3019</u> — <u>2017</u>	Specification for Lap Cement Used with Asphalt Roll Roofing, Nonfibered, Asbestos Fibered and Nonasbestos Fibered	IBC®	IRC®
D3034 14a <u>D3034</u> — <u>2016</u>	Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings	IPC® IRC®	IPSDC®
D3138 04 <u>D3138</u> — <u>2004</u> (2011 <u>2016</u>)	Standard Specification for Solvent Cements for Transition Joints Between Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Non-Pressure Piping Components	IPC®	IRC®
D3161 / D3161M — 15 <u>D3161M</u> — <u>2016A</u>	Test Method for Wind-Resistance of Steep Slope Roofing Products (Fan Induced Method)	IBC®	IRC®
D3261 12E+ <u>D3261</u> — <u>2016</u>	Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing	IMC® IRC®	IPC®
D3311 11 <u>D3311</u> — <u>2017</u>	Specification for Drain, Waste and Vent (DWV) Plastic Fittings Patterns	IPC®	IRC®
D3462 / D3462M — 10A <u>D3462M</u> — <u>2016</u>	Specification for Asphalt Shingles Made From Glass Felt and Surfaced with Mineral Granules	IBC®	IRC®
D3679 13 <u>D3679</u> — <u>2017</u>	Specification for Rigid Poly (Vinyl Chloride) (PVC) Siding	IBC®	IRC®
D3737 2012 <u>D3737</u> — <u>2018E1</u>	Practice for Establishing Allowable Properties for Structural Glued Laminated Timber (Glulam)	IRC®	
D4068 15 <u>D4068</u> — <u>2017</u>	Specification for Chlorinated Polyethylene (CPE) Sheeting for Concealed Water Containment Membrane	IPC®	IRC®
D4318 10E+ <u>D4318</u> — <u>2017E1</u>	Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils	IBC®	IRC®
D4434 / D4434M — 12 <u>D4434M</u> — <u>2015</u>	Specification for Poly (Vinyl Chloride) Sheet Roofing	IBC®	IRC®
D4479 / D4479M — 07 <u>D4479M</u> — <u>2007</u> (2012 <u>2018</u>)e+	Specification for Asphalt Roof Coatings—asbestos-free	IBC®	IRC®
D4551 12 <u>D4551</u> — <u>2017</u>	Specification for Poly (Vinyl Chloride) (PVC) Plastic Flexible Concealed Water-containment Membrane	IPC®	IRC®
D4586 / D4586M — 07 <u>D4586M</u> — <u>2007</u> (2012 <u>2018</u>)e+	Specification for Asphalt Roof Cemen—asbestos-free	IBC®	IRC®
D4637 / D4637M — 14E+ <u>D4637M</u> — <u>2015</u>	Specification for EPDM Sheet Used in Single-ply Roof Membrane	IBC®	IRC®
D4869 / D4869M — 15	Specification for Asphalt-saturated (Organic Felt) Underlayment Used in Steep Slope		

D4869M—2016A	Roofing	IBC®	IRC®
D4897/D4897M—01(2009) D4897M—2016	Specification for Asphalt Coated Glass-fiber Venting Base Sheet Used in Roofing	IBC®	IRC®
D5055—13E+ D5055—2016	Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-joists	IBC®	IRC®
D5456—14B D5456—2018	Standard Specification for Evaluation of Structural Composite Lumber Products	IBC®	IRC®
D5516—09 D5516—2018	Test Method for Evaluating the Flexural Properties of Fire-retardant-treated Softwood Plywood Exposed to the Elevated Temperatures	IBC®	IRC®
D5643/D5643M—06 D5643M—2006(2012 2018)e+	Specification for Coal Tar Roof Cement Asbestos-free	IBC®	IRC®
D5664—10 D5664—2017	Test Methods For Evaluating the Effects of Fire-retardant Treatments and Elevated Temperatures on Strength Properties of Fire-retardant-treated Lumber	IBC®	IRC®
D6083—05e0+ D6083/D6083M—2018	Specification for Liquid-applied Acrylic Coating Used in Roofing	IBC®	IRC®
D6162/D6162M— 2000a(2015)E+ D6162M— 2016	Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements	IRC®	
D6163/D6163M— 2000(2015)E+ D6163M— 2016	Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements	IRC®	
D6164/D6164M—11 D6164M—2016	Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements	IBC®	IRC®
D6222/D6222M—11 D6222M—2016	Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using Polyester Reinforcements	IBC®	IRC®
D6223/D6223M— 02(2009)E+ D6223M—2016	Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcement	IBC®	IRC®
D6298—13 D6298/D6298M —2016	Specification for Fiberglass-reinforced Styrene Butadiene Styrene (SBS) Modified Bituminous Sheets with a Factory Applied Metal Surface	IBC®	IRC®
D6380/D6380—03 D6380M —2003(2013 2018)E+	Standard Specification for Asphalt Roll Roofing (Organic Felt)	IRC®	
D6464—03a D6464— 2003A(2009 2017)e+	Standard Specification for Expandable Foam Adhesives for Fastening Gypsum Wallboard to Wood Framing	IBC®	IRC®
D6694/D6694M— 08(2013)E+ D6694M—2015	Standard Specification for Liquid-applied Silicone Coating Used in Spray Polyurethane Foam Roofing Systems	IBC®	IRC®
D6754/D6754M—10 D6754M—2015	Standard Specification for Ketone-ethylene-ester-based Sheet Roofing	IBC®	IRC®
D6757—2013 D6757/D6757M—2018	Specification for Underlayment Felt Containing Inorganic Fibers Used with Steep Slope Roofing	IBC®	IRC®
D6841—08 D6841—2016	Standard Practice for Calculating Design Value Treatment Adjustment Factors for Fire-retardant-treated Lumber	IBC®	IRC®
D6878/D6878M—13 D6878M—2017	Standard Specification for Thermoplastic-polyolefin-based Sheet Roofing	IBC®	IRC®
D6947/D6947M— 07(2013)E+ D6947M—2016	Standard Specification for Liquid Applied Moisture Cured Polyurethane Coating Used in Spray Polyurethane Foam Roofing System	IBC®	IRC®
D7032—14 D7032—2017	Standard Specification for Establishing Performance Ratings for Wood-plastic Composite Deck Boards and Guardrail Systems (Guards or Handrails)	IBC® IWUIC®	IRC®
D7158—D7158M—2016 D7158/D7158M—2019	Standard Test Method for Wind Resistance of Asphalt Shingles (Uplift Force/Uplift Resistance Method)	IRC®	
D7254—15 D7254—2017	Standard Specification for Polypropylene (PP) siding	IBC®	IRC®
D7672—14 D7672—2014E1	Standard Specification for Evaluating Structural Capacities of Rim Board Products and Assemblies	IBC®	IRC®
D7793—13 D7793—2017	Standard Specification for Insulated Vinyl Siding	IRC®	

E84—2016 <u>E84—2018B</u>	Standard Test Method for Surface Burning Characteristics of Building Materials	IEBC® IMC® IWUIC®	IFC® IRC®
E96/E96M—2015 <u>E96M—2016</u>	Test Method for Water Vapor Transmission of Materials	IRC®	
E108—2016 <u>E108—2017</u>	Test Methods for Fire Tests of Roof Coverings	IFC®	IRC®
E119—2016 <u>E119—2018B</u>	Test Methods for Fire Tests of Building Construction and Materials	IMC® IWUIC®	IRC®
E136—2016 <u>E136—2016A</u>	Test Method for Behavior of Materials in a Vertical Tube Furnace at 750° C	IRC®	
E283—04 <u>E283—2004(2012)</u>	Test Method for Determining the Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences across the Specimen	IBC® IECC	IECC IRC®
E331—00 <u>E331—2000(2009 2016)</u>	Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference	IBC®	IRC®
E779—10 <u>E779—2010(2018)</u>	Standard Test Method for Determining Air Leakage Rate by Fan Pressurization	IECC IRC®	IECC
E814—2013A <u>(2017)</u>	Standard Test Method for Fire Tests of Penetration Firestop Systems	IBC®	IRC®
E970—14 <u>E970—2017</u>	Standard Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source	IBC®	IRC®
E1509—12 <u>E1509—2012(2017)</u>	Standard Specification for Room Heaters, Pellet Fuel-burning Type	IMC®	IRC®
E1602—09 <u>E1602—2003(2010 2017)e+</u>	Guide for Construction of Solid Fuel Burning Masonry Heaters	IBC®	IRC®
E1827—11 <u>E1827—2011(2017)</u>	Standard Test Methods for Determining Airtightness of Building Using an Orifice Blower Door	IECC IRC®	IECC
E1886—13A <u>E1886—2013A</u>	Test Method for Performance Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials	IBC®	IRC®
E1996—2014a <u>E1996—2017</u>	Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes	IRC®	
E2231—15 <u>E2231—2018</u>	Standard Practice for Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics	IMC®	IRC®
E2273—03(2011) <u>E2273—2018</u>	Standard Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish Systems (EIFS) Clad Wall Assemblies	IBC®	IRC®
E2568—09e+ <u>E2568—2017A</u>	Standard Specification for PB Exterior Insulation and Finish Systems	IBC®	IRC®
E2634—11(2015) <u>E2634—2018</u>	Standard Specification for Flat Wall Insulating Concrete Form (ICF) Systems	IBC®	IRC®
F409—12 <u>F409—2017</u>	Specification for Thermoplastic Accessible and Replaceable Plastic Tube and Tubular Fittings	IPC®	IRC®
F438—15 <u>F438—2017</u>	Specification for Socket-type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40	IMC® IRC®	IPC® ISPSC®
F628—12E+ <u>F628—2012E2</u>	Specification for Acrylonitrile-butadiene-styrene (ABS) Schedule 40 Plastic Drain, Waste and Vent Pipe with a Cellular Core	IPC® IRC®	IPSDC®
F656—15 <u>F656—2015</u>	Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride)(PVC) Plastic Pipe and Fittings	IPC® IRC®	IPSDC®
F876—15A <u>F876—2017</u>	Specification for Cross-linked Polyethylene (PEX) Tubing	IMC® IRC®	IPC®
F877—2011A <u>F877—2018A</u>	Specification for Cross-linked Polyethylene (PEX) Plastic Hot- and Cold-water Distribution Systems	IRC®	
F891—10 <u>F891—2016</u>	Specification for Coextruded Poly (Vinyl Chloride) (PVC) Plastic Pipe with a Cellular Core	IPC® IRC®	IPSDC®
F1055—13 <u>F1055—2016A</u>	Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene Pipe and Tubing	IMC® IRC®	IPC®

F1281 11 <u>F1281—2017</u>	Specification for Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene (PEX-AL-PEX) Pressure Pipe	IMC® IRC®	IPC®
F1282 10 <u>F1282—2017</u>	Specification for Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe	IMC® IRC®	IPC®
F1412 09 <u>F1412—2016</u>	Specification for Polyolefin Pipe and Fittings for Corrosive Waste Drainage	IPC®	IRC®
F1488 14 <u>F1488—14E1</u>	Specification for Coextruded Composite Pipe	IPC® IRC®	IPSDC®
F1554 15 <u>F1554—2018</u>	Specification for Anchor Bolts, Steel, 36, 55 and 105-ksi Yield Strength	IRC®	
F1667 15 <u>F1667—2018</u>	Specification for Driven Fasteners, Nails, Spikes and Staples	IBC®	IRC®
F1807 15 <u>F1807—2018</u>	Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing	IMC® IRC®	IPC®
F1866 13 <u>F1866—2018</u>	Specification for Poly (Vinyl Chloride) (PVC) Plastic Schedule 40 Drainage and DWV Fabricated Fittings	IPC®	IRC®
F1960 15 <u>F1960—2018</u>	Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) Tubing	IMC® IRC®	IPC®
F1973 13E1 <u>F1973—2013(2018)</u>	Standard Specification for Factory Assembled Anodeless Risers and Transition Fittings in Polyethylene (PE) and Polyamide 11 (PA 11) Fuel Gas Distribution Systems	IFGC®	IRC®
F1986 01 <u>F1986—2001(2011)</u>	Multilayer Pipe Type 2, Compression Joints for Hot and Cold Drinking Water Systems	IPC®	IRC®
F2080 15 <u>F2080—2016</u>	Specification for Cold-expansion Fittings with Metal Compression-sleeves for Cross-linked Polyethylene (PEX) Pipe	IMC® IRC®	IPC®
F2098 08 <u>F2098—2015</u>	Standard Specification for Stainless Steel Clamps for Securing SDR9 Cross-linked Polyethylene (PEX) Tubing to Metal Insert and Plastic Insert Fittings	IMC® IRC®	IPC®
F2159 14 <u>F2159—2018</u>	Standard Specification for Plastic Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing	IMC® IRC®	IPC®
F2389 15 <u>F2389—2017A</u>	Standard for Pressure-rated Polypropylene (PP) Piping Systems	IMC® IRC®	IPC®
F2735 09 <u>F2735—2009(2016)</u>	Standard Specification for Plastic Insert Fittings for SDR9 Cross-linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing	IMC® IRC®	IPC®
F2769 14 <u>F2769—2018</u>	Polyethylene or Raised Temperature (PE-RT) Plastic Hot and Cold-Water Tubing and Distribution Systems	IMC® IRC®	IPC®
F2945 2015 <u>F2945—2018</u>	Standard Specification for Polyamide 11 Gas Pressure Pipe, Tubing and Fittings	IRC®	

AWC

American Wood Council

Standard Reference Number	Title	Referenced in Code(s):	
AWC STJR 2015 <u>STJR—2021</u>	Span Tables for Joists and Rafters	IBC®	IRC®
ANSI/AWC PWF 2015 <u>PWF—2021</u>	Permanent Wood Foundation Design Specification	IBC®	IRC®

AWPA

American Wood Protection Association

Standard Reference Number	Title	Referenced in Code(s):	
M4 16 <u>M4—15</u>	Standard for the Care of Preservative-treated Wood Products	IBC®	IRC®
U1 16 <u>U1—20</u>	USE CATEGORY SYSTEM: User Specification for Treated Wood Except Commodity Specification H	IBC®	IRC®

AWS

American Welding Society

Standard Reference Number	Title	Referenced in Code(s):	
A5.8M/A5.8—2011 <u>A5.8: 2011—AMD1</u>	Specifications for Filler Metals for Brazing and Braze Welding	IMC® IRC®	IPC®

AWWA	American Water Works Association		
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Standard Reference Number	Title	Referenced in Code(s):	
C104/A21.4—13 <u>A21.4—16</u>	Cement-mortar Lining for Ductile-iron Pipe and Fittings	IPC®	IRC®
C151/A21.51—09 <u>A21.51—17</u>	Ductile-iron Pipe, Centrifugally Cast, for Water	IMC® IRC®	IPC®
C504—10 <u>C504—15</u>	Standard for Rubber-seated Butterfly Valves	IPC®	IRC®
C511—07 <u>C511—17</u>	Reduced-pressure Principle Backflow Prevention Assembly	IPC®	IRC®

CISPI	Cast Iron Soil Pipe Institute		
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Standard Reference Number	Title	Referenced in Code(s):	
301—12 <u>301—18</u>	Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications	IPC® IRC®	IPSDC®
310—12 <u>310—18</u>	Standard Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications	IPC® IRC®	IPSDC®

CSA	CSA Group		
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Standard Reference Number	Title	Referenced in Code(s):	
ASME A112.3.4—2013/CSA B45.9—13 <u>B45.9—18</u>	Macerating Toilet Systems and Related Components	IPC®	IRC®
ASME A112.18.1—2017 <u>A112.18.1—2018/CSA B125.1—2017</u> <u>B125.1—2018</u>	Plumbing Supply Fittings	IRC®	
ASME A112.18.2—2015 <u>A112.18.2—2019/CSA B125.2—2015</u> <u>B125.2—2019</u>	Plumbing Waste Fittings	IPC®	IRC®
A112.18.6—2017 <u>A112.18.6—2021/CSA B125.6—2017</u> <u>B125.6—2021</u>	Flexible Water Connectors	IRC®	
ASME A112.19.1—2013 <u>A112.19.1—2018/CSA B45.2—13</u> <u>B45.2—18</u>	Enameled Cast-iron and Enameled Steel Plumbing Fixtures	IRC®	
ASME A112.19.2—2013 <u>A112.19.2—2018/CSA B45.1—13</u> <u>B45.1—18</u>	Ceramic Plumbing Fixtures	IRC®	
ASME A112.19.3—2008 <u>A112.19.3—2017/CSA B45.4—08 (R2013)</u> <u>B45.4—2017</u>	Stainless Steel Plumbing Fixtures	IRC®	
ASSE 1002—2015 <u>1002—2020/ASME A112.1002—2015</u> <u>A112.1002—2020/CSA B125.12—15</u>	Anti-Siphon Fill Valves <u>for water closet tanks</u>	IPC® IRC® IRC®	IPC® IRC®

<u>B125.12—20</u>				
A112.19.5—2011	<u>A112.19.5</u>	Flush Valves and Spuds for Water-closets, Urinals and Tanks	IRC®	
—2017/CSA B45.15—2011	<u>B45.15—2017</u>			
A112.19.7—2017	<u>A112.19.7</u>	Hydromassage Bathtub Systems	IRC®	IRC®
—2021/CSA B45.10—2017	<u>B45.10—2021</u>			
ASME A17.1/CSA B44—2016	<u>B44—2019</u>	Safety Code for Elevators and Escalators	IRC®	
B64.1.1—16	<u>B64.1.1—11(R2016)</u>	Vacuum Breakers, Atmospheric Type (AVB)	IPC®	IRC®
B64.1.2—16	<u>B64.1.2—11(R2016)</u>	Pressure Vacuum Breakers (PVB)	IPC®	IRC®
B64.1.3—16	<u>B64.1.3—11(R2016)</u>	Spill Resistant Pressure Vacuum Breakers (SRPVB)	IPC®	IRC®
B64.2—16	<u>B64.2—11(R2016)</u>	Vacuum Breakers, Hose Connection Type (HCVB)	IPC®	IRC®
B64.2.1—16	<u>B64.2.1—11(R2016)</u>	Hose Connection Vacuum Breakers (HCVB) with Manual Draining Feature	IPC®	IRC®
B64.2.1.1—16	<u>B64.2.1.1—11(R2016)</u>	Hose Connection Dual Check Vacuum Breakers (HCDVB)	IPC®	IRC®
B64.2.2—16	<u>B64.2.2—11(R2016)</u>	Vacuum Breakers, Hose Connection Type (HCVB) with Automatic Draining Feature	IPC®	IRC®
B64.3—16	<u>B64.3—11(R2016)</u>	Dual Check Backflow Preventers with Atmospheric Port (DCAP)	IPC®	IRC®
B64.4—16	<u>B64.4—11(R2016)</u>	Backflow Preventers, Reduced Pressure Principle Type (RP)	IPC®	IRC®
B64.4.1—16	<u>B64.4.1—11(R2016)</u>	Reduced Pressure Principle for Fire Sprinklers (RPF)	IPC®	IRC®
B64.5—16	<u>B64.5—11(R2016)</u>	Double Check Backflow Preventers (DCVA)	IPC®	IRC®
B64.5.1—16	<u>B64.5.1—11(2016)</u>	Double Check Valve Backflow Preventers, Type for Fire Systems (DCVAF)	IPC®	IRC®
B64.6—16	<u>B64.6—11(R2016)</u>	Dual Check Valve Backflow Preventers (DuC)	IPC®	IRC®
B64.7—16	<u>B64.7—11(R2016)</u>	Laboratory Faucet Vacuum Breakers (LFVB)	IPC®	IRC®
B125.3—12	<u>B125.3—18</u>	Plumbing Fittings	IRC®	
B137.1—16	<u>B137.1—17</u>	Polyethylene (PE) Pipe, Tubing and Fittings for Cold Water Pressure Services	IPC®	IRC®
B137.2—16	<u>B137.2—17</u>	Polyvinylchloride PVC Injection-moulded Gasketed Fittings for Pressure Applications	IMC® IRC®	IPC® ISPSC®
B137.3—16	<u>B137.3—17</u>	Rigid Poly (Vinyl Chloride) (PVC) Pipe for Pressure Applications	IMC® IPSDC® ISPSC®	IPC® IRC®
B137.5—16	<u>B137.5—17</u>	Cross-linked Polyethylene (PEX) Tubing Systems for Pressure Applications	IPC®	IRC®
B137.6—16	<u>B137.6—17</u>	Chlorinated polyvinylchloride CPVC Pipe, Tubing and Fittings For Hot- and Cold-water Distribution Systems	IMC® IRC®	IPC® ISPSC®
B137.9—16	<u>B137.9—17</u>	Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe Systems	IMC® IRC®	IPC®
B137.10—13	<u>B137.10—17</u>	Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene (PE-AL-PE) Composite Pressure Pipe Systems	IRC®	
B137.11—16	<u>B137.11—17</u>	Polypropylene (PP-R) Pipe and Fittings for Pressure Applications	IPC®	IRC®

B137.18—13 <u>B137.18—17</u>	Polyethylene of Raised Temperature (PE-RT) Tubing Systems for Pressure Applications	IPC®	IRC®
B181.1—15 <u>B181.1—18</u>	Acrylonitrile-butadiene-styrene (ABS) Drain, Waste and Vent Pipe and Pipe Fittings	IPC® IRC®	IPSDC®
B181.2—15 <u>B181.2—18</u>	Polyvinylchloride (PVC) and chlorinated polyvinylchloride (CPVC) Drain, Waste and Vent Pipe and Pipe Fittings	IPC® IRC®	IPSDC®
B181.3—15 <u>B181.3—18</u>	Polyolefin and polyvinylidene (PVDF) Laboratory Drainage Systems	IPC®	IRC®
B182.2—11 <u>B182.2—18</u>	PSM Type polyvinylchloride (PVC) Sewer Pipe and Fittings	IPC® IRC®	IPSDC®
B182.4—15 <u>B182.4—18</u>	Profile polyvinylchloride (PVC) Sewer Pipe & Fittings	IPC® IRC®	IPSDC®
B182.6—15 <u>B182.6—18</u>	Profile Polyethylene (PE) Sewer Pipe and Fittings for leak-proof Sewer Applications	IPC®	IRC®
B182.8—15 <u>B182.8—18</u>	Profile Polyethylene (PE) Storm Sewer and Drainage Pipe and Fittings	IPC®	IRC®
B356—10 <u>CAN/CSA-B356—10(R2015)</u>	Water Pressure Reducing Valves for Domestic Water Supply Systems	IPC®	IRC®
B483.1—07 <u>(R2012 R2017)</u>	Drinking Water Treatment Systems	IPC®	IRC®
B602—15 <u>B602—16</u>	Mechanical Couplings for Drain, Waste and Vent Pipe and Sewer Pipe	IPC® IRC®	IPSDC®
C22.2 No. 218.1—M89 <u>218.1—13(R2011 R2017)</u>	Spas, Hot Tubs and Associated Equipment	IRC®	
<u>ANSI/CSA /IGSHPA C448 Series—16</u>	Design and Installation of Earth Energy Systems <u>ground source heat pump systems for commercial and residential buildings</u>	IMC®	IRC®
CSA O325—07 <u>O325—16</u>	Construction Sheathing	IRC®	
O437-Series—93 <u>(R2011)</u>	Standards on OSB and Waferboard (Reaffirmed 2006)	IRC®	
CAN/CSA/C22.2 No. 60335-2-40—2012 <u>60335-2-40—2017</u>	Safety of Household and Similar Electrical Appliances <u>— Safety- Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers</u>	IRC®	

DASMA

Door & Access Systems Manufacturers Association International

Standard Reference Number	Title	Referenced in Code(s):	
105—2016 <u>105—2017</u>	Test Method for Thermal Transmittance and Air Infiltration of Garage Doors and Rolling Doors	IECC IRC®	IECC
115—2016 <u>115—2017</u>	Standard Method for Testing Sectional Garage Doors, Rolling Doors and Flexible Doors: Determination of Structural Performance Under Missile Impact and Cyclic Wind Pressure	IRC®	

DOC

United States Department of Commerce

Standard Reference Number	Title	Referenced in Code(s):	
PS 1—09 <u>1—19</u>	Structural Plywood	IBC®	IRC®
PS 2—10 <u>2—18</u>	Performance Standard for Wood-based Structural use <u>Wood Structural Panels</u>	IBC®	IRC®

FM

FM Approvals

Standard Reference Number	Title	Referenced in Code(s):	
4880—(2015) <u>ANSI/FM 4880—2017</u>	Approval American National Standard for Class 1 Rating of Evaluating the Fire Performance of Insulated Building Panels or Assemblies and Interior Finish Materials	IRC®	

GA

Gypsum Association

Standard Reference Number	Title	Referenced in Code(s):
GA-253 2016_GA-253 <u>2018</u>	Application of Gypsum Sheathing	IRC®

HVI	Home Ventilating Institute	
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Standard Reference Number	Title	Referenced in Code(s):
916 09_916 <u>18</u>	Airflow Test Procedure	IECC IRC®

IAPMO	IAPMO Group	
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Standard Reference Number	Title	Referenced in Code(s):
CSA B45.5—17/IAPMO Z124—2017 <u>with Errata dated August 2017</u>	Plastic Plumbing Fixtures	IPC® IPC® IRC®

ICC	International Code Council, Inc.	
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Standard Reference Number	Title	Referenced in Code(s):
ANSI/RESNET/ICC 901 2014_301 <u>2019</u>	Standard for the Calculation and Labeling of the Energy Performance of Low-Rise Residential Buildings <u>Low-rise Dwelling and Sleeping Units</u> using the Energy Rating Index, March 7, 2014, republished 2016	IECC IECC IRC®
ANSI/RESNET/ICC 900 2016_380 <u>2019</u>	Standard for Testing Airtightness of Building Enclosures , <u>Dwelling Unit and Sleeping Unit Enclosures</u> ; Airtightness of Heating and Cooling Air Distribution <u>Systems</u> ; and Airflow of Mechanical Ventilation Systems	IECC IECC IRC®

MSS	Manufacturers Standardization Society of the Valve and Fittings Industry	
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Standard Reference Number	Title	Referenced in Code(s):
SP-58 09_SP-58 <u>2018</u>	Pipe Hangers and Supports—Materials, Design, Manufacture, Selection, Application and Installation	IRC®
SP-67 11_SP-67 <u>2017</u>	Butterfly Valves	IRC®
SP-71 2013_SP-71 <u>2018</u>	Gray Iron Swing Check Valves, Flanged and Threaded Ends	IPC® IRC®
SP-110 2010a_SP-110 <u>2010</u>	Ball Valves, Threaded, Socket Welded, Solder Joint, Grooved and Flared Ends	IPC® IRC®
SP-122 2012_SP-122 <u>2017</u>	Plastic Industrial Ball Valves	IPC® IRC®

NFPA	National Fire Protection Association	
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Standard Reference Number	Title	Referenced in Code(s):
13 16_13 <u>19</u>	Standard for Installation of Sprinkler Systems	IBC® IFC® IRC®
13D 16_13D <u>19</u>	Standard for the Installation of Sprinkler Systems in One- and Two-family Dwellings and Manufactured Homes	IBC® IFC® IRC®
13R 16_13R <u>19</u>	Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies	IBC® IFC®

31 — 16.31 — 20	Standard for the Installation of Oil-burning Equipment	IBC® IMC®	IFC® IRC®
58 — 17.58 — 20	Liquefied Petroleum Gas Code	IBC® IFGC® IRC®	IFC® IMC®
72 — 16.72 — 19	National Fire Alarm and Signaling Code	IBC® IMC® IRC®	IFC® IPMC®
85 — 15.85 — 19	Boiler and Combustion Systems Hazards Code	IBC® IFGC® IRC®	IFC® IMC®
211 — 16.211 — 19	Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances	IBC® IFGC® IRC®	IFC® IMC®
286 — 15.286 — 19	Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth	IBC® IMC®	IFC® IRC®
853 — 15.853 — 20	Standard on the Installation of Stationary Fuel Cell Power Systems	IFC® IMC®	IFGC® IRC®

NFRC

National Fenestration Rating Council, Inc.

Standard Reference Number	Title	Referenced in Code(s):	
100 — 2017.100 — 2020	Procedure for Determining Fenestration Products U-Factors	IECC IRC®	IECC
200 — 2017.200 — 2020	Procedure for Determining Fenestration Product Solar Heat Gain Coefficients and Visible Transmittance at Normal Incidence	IECC IRC®	IECC
400 — 2017.400 — 2020	Procedure for Determining Fenestration Product Air Leakage	IECC IRC®	IECC

NSF

NSF International

Standard Reference Number	Title	Referenced in Code(s):	
14 — 2015.14 — 2017	Plastics Piping System Components and Related Materials	IPC®	IRC®
41 — 2011.41 — 2016	Nonliquid Saturated Treatment Systems (Composting Toilets)	IPSDC®	IRC®
42 — 2015.42 — 2017	Drinking Water Treatment Units—Anesthetic Effects	IPC®	IRC®
44 — 2015.44 — 2017	Residential Cation Exchange Water Softeners	IPC®	IRC®
50 — 2015.50 — 2017	Equipment for Swimming Pools, Hot Tubs and Other Recreational Water Facilities	IPC®	IRC®
53 — 2015.53 — 2017	Drinking Water Treatment Units—Health Effects	IPC®	IRC®
58 — 2015.58 — 2017	Reverse Osmosis Drinking Water Treatment Systems	IPC®	IRC®
61 — 2015.61 — 2017	Drinking Water System Components—Health Effects	IPC®	IRC®
350 — 2014.350 — 2017a	Onsite Residential and Commercial Water Reuse Treatment Systems	IPC®	IRC®
358-1 — 2014.358-1 — 2017	Polyethylene Pipe and Fittings for Water-based Ground Source “Geothermal” Heat Pump Systems	IRC®	
358-2 — 2012.358-2 — 2017	Polypropylene Pipe and Fittings for Water-based Ground Source “Geothermal” Heat Pump Systems	IRC®	
359 — 2012.359 — 2011(R2016)	Valves for Crosslinked Polyethylene (PEX) Water Distribution Tubing Systems	IRC®	
372 — 2011.372 — 2016	Drinking Water Systems Components—Lead Content	IPC®	IRC®

PCA

Portland Cement Association

Standard Reference Number	Title	Referenced in Code(s):
100—12.100—2017	Prescriptive Design of Exterior Concrete Walls for One- and Two-family Dwellings (Pub. No. EB244-PCA 100.3)	IRC®

SBCA	Structural Building Components Association
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Standard Reference Number	Title	Referenced in Code(s):
BCSI—2013 (Updated March 2015) BCSI—2018	Building Component Safety Information Guide to Good Practice for Handling, Installing, Restraining & Bracing of Metal Plate Connected Wood Trusses	IRC®
CFS-BCSI—2008 (<u>updated June 2016</u>)	Cold-formed Steel Building Component Safety Information (CFSBCSI) Guide to Good Practice for Handling, Installing & Bracing of Cold-formed Steel Trusses	IRC®
<u>ANSI/FS100—12 (R2018)</u>	Standard Requirements for Wind Pressure Resistance of Foam Plastic Insulating Sheathing Used in Exterior Wall Covering Assemblies	IRC®

SMACNA	Sheet Metal & Air Conditioning Contractors National Assoc. Inc.
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Standard Reference Number	Title	Referenced in Code(s):
SMACNA—10	Fibrous Glass Duct Construction Standards (2003) <u>7th edition</u>	IMC® IRC®
SMACNA/ANSI—2016	HVAC Duct Construction Standards—Metal and Flexible 4th Edition (ANSI)- 2016	IMC® IRC®

TPI	Truss Plate Institute
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Standard Reference Number	Title	Referenced in Code(s):
TPI 1—2014	National Design Standard for Metal plate-connected <u>Metal Plate Connected</u> Wood Truss Construction	IBC® IRC®

UL	UL LLC
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Standard Reference Number	Title	Referenced in Code(s):
55A—04.55A—2004	Materials for Built-up Roof Coverings	IBC® IRC®
58—96.58—2018	Steel Underground Tanks for Flammable and Combustible Liquids— with Revisions through July 1998 <u>Liquids</u>	IFC® IRC®
103—2010	Factory-built Chimneys for Residential Type and Building Heating Appliances— with revisions through July 2012 <u>March 2017</u>	IBC® IFGC® IMC® IRC®
127—2011	Factory-built Fireplaces— with revisions through May 2015 <u>July 2016</u>	IBC® IFGC® IMC® IRC®
174—04.174—2004	Household Electric Storage Tank Water Heaters— with revisions through April 2015 <u>December 2016</u>	IMC® IRC®
180—2012	Liquid-level Indicating Gauges for Oil Burner Fuels and Other Combustible Liquids— with revisions through May 2017	IMC® IMC® IRC®
181—05.181—2005	Factory-made Air Ducts and Air Connectors— with revisions through May 2009 <u>April 2017</u>	IMC® IRC®
181A—2013	Closure Systems for Use with Rigid Air Ducts and Air Connectors— with revisions through December 1998 <u>March 2017</u>	IMC® IRC®
181B—2013	Closure Systems for Use with Flexible Air Ducts and Air Connectors— with revisions through August 2009 <u>March 2017</u>	IMC® IRC®
217—06.217—2015	Single- and Multiple-station Smoke Alarms— with revisions through October 2015 <u>November 2016</u>	IBC® IFC® IRC®

263—2011	Standards for Fire Test of Building Construction and Materials—with revisions through June 2015 <u>March 2018</u>	IMC® IWUIC®	IRC®
268—2009 <u>268—2016</u>	Smoke Detectors for Fire Alarm Systems—with revisions through July 2016	IMC®	IRC®
325—02 <u>325—2017</u>	Door, Drapery, Gate, Louver and Window Operations and Systems—with revisions through May 2015 <u>Systems</u>	IBC® IRC®	IFC®
343—2008 <u>343—2017</u>	Pumps for Oil-burning Appliances—with revisions through June 2013 <u>Appliances</u>	IMC®	IRC®
378—06	Draft Equipment—with revisions through June 12, 2014 <u>September 2013</u>	IMC®	IRC®
441—10 <u>441—16</u>	Gas Vents—with revisions through June 12, 2014 <u>July 2016</u>	IRC®	
507—99 <u>507—2017</u>	Standard for Electric Fans—with revisions through August 2018	IRC®	
508—99 <u>508—2018</u>	Industrial Control Equipment—with revisions through October 2013 <u>Equipment</u>	IMC® IRC®	IPC®
536—97 <u>536—2014</u>	Flexible Metallic Hose—with revisions through December 2014 <u>Hose</u>	IMC®	IRC®
641—2010	Type L, Low-temperature Venting Systems—with revisions through June 2013 <u>April 2018</u>	IBC® IMC®	IFGC® IRC®
651—2011	Schedule 40, <u>Type EB and Schedule 80-A Rigid PVC Conduit and Fittings—with revisions through May 2014</u> <u>June 2016</u>	IFGC®	IRC®
705—04 <u>705—2017</u>	Standard for Power Ventilators—with revisions through December 2013 <u>October 2018</u>	IRC®	
723—08 <u>723—2018</u>	Standard for Test for Surface Burning Characteristics of Building Materials—with revisions through August 2013 <u>Materials</u>	IEBC® IRC®	IFC®
727—06 <u>727—2018</u>	Oil-fired Central Furnaces—with revisions through October 2013 <u>Furnaces</u>	IECC IRC®	IMC®
729—03 <u>729—2003</u>	Oil-fired Floor Furnaces—with revisions through October 2013 <u>November 2016</u>	IMC®	IRC®
730—03	Oil-fired Wall Furnaces—with revisions through October 2013 <u>November 2016</u>	IMC®	IRC®
732—95 <u>732—2018</u>	Oil-fired Storage Tank Water Heaters—with revisions through October 2013 <u>August 2018</u>	IMC®	IRC®
737—2011	Fireplaces Stoves—with revisions through August 2015 <u>Stoves</u>	IMC®	IRC®
790—04	Standard Test Methods for Fire Tests of Roof Coverings—with revisions through July 2014 <u>October 2018</u>	IBC® IFC®	IEBC® IRC®
795—2011 <u>795—2016</u>	Commercial-industrial Gas Heating Equipment—with revisions through November 2013 <u>Equipment</u>	IFGC®	IRC®
834—04 <u>834—2004</u>	Heating, Water Supply and Power Boilers—Electric—with revisions through December 2013 <u>September 2018</u>	IMC®	IRC®
842—07 <u>842—2015</u>	Valves for Flammable Fluids—with revisions through May 2015	IMC®	IRC®
858—05 <u>858—2014</u>	Household Electric Ranges—with revisions through June 2015 <u>2018</u>	IMC®	IRC®
875—09	Electric Dry-bath Heaters—with revisions through December 2013 <u>September 2017</u>	IMC®	IRC®
896—93 <u>896—1993</u>	Oil-burning Stoves—with revisions through November 2013 <u>2016</u>	IMC®	IRC®
923—2013	Microwave Cooking Appliances—with revisions through June 2015 <u>July 2017</u>	IMC®	IRC®
1026—2012	Electric Household Cooking and Food Serving Appliances—with revisions through August 2015 <u>July 2018</u>	IRC®	
1040—96 <u>1040—1996</u>	Fire Test of Insulated Wall Construction—with revisions through October 2012 <u>April 2017</u>	IBC®	IRC®
1042—2009	Electric Baseboard Heating Equipment—with revisions through September 2014 <u>December 2016</u>	IRC®	
1256—02	Fire Test of Roof Deck Construction—with revisions through July 2013 <u>August 2018</u>	IBC®	IRC®
1261—01 <u>1261—2016</u>	Electric Water Heaters for Pools and Tubs—with revisions through July 2012 <u>September 2017</u>	IMC®	IRC®
1479—03 <u>1479—2015</u>	Fire Tests of Through-Penetration Firestops—with revisions through June 2015 <u>Firestops</u>	IBC® IRC®	IMC®
1563—2009	Standard for Electric Spas, Hot Tubs—Equipment Assemblies, and Associated Equipment—with revisions through March 2015 <u>October 2017</u>	IMC® ISPSC®	IRC®

1618—09 <u>1618—2015</u>	Wall Protectors, Floor Protectors, and Hearth Extensions—with revisions through October 2015 <u>January 2018</u>	IFGC®	IMC®
1703—02 <u>1703—2002</u>	Flat-plate Photovoltaic Modules and Panels—with revisions through October 2015 <u>September 2018</u>	IBC®	IRC®
1715—97	Fire Test of Interior Finish Material—with revisions through January 2013 <u>April 2017</u>	IBC®	IRC®
1738—2010	Venting Systems for Gas-burning Appliances, Categories II, III and IV—with revisions through November 2014 <u>IV</u>	IFGC®	IRC®
1741—2010	Inverters, Converters, Controllers and Interconnection System Equipment with Distributed Energy Resources—with revisions through January 2015 <u>February 2018</u>	IBC®	IRC®
1777—07	Chimney Liners—with revisions through October 2015 <u>April 2014</u>	IRC®	
1897—12 <u>1897—2015</u>	Uplift Tests for Roof Covering Systems —with revisions through September 2015 <u>Systems</u>	IBC®	IRC®
1995—2011 <u>1995—2015</u>	Heating and Cooling Equipment—with revisions through July 2015 <u>August 2018</u>	IMC® ISPS®	IRC®
1996—2009	Electric Duct Heaters—with revisions through June 2014 <u>July 2016</u>	IMC®	IRC®
2034—08 <u>2034—2017</u>	Standard for Single- and Multiple-station Carbon Monoxide Alarms—with revisions through March 2015 <u>September 2018</u>	IFC®	IRC®
2075—2013	Standard for Gas and Vapor Detectors and Sensors <u>Sensors</u> -with revisions through December 2017	IBC® IMC®	IFC® IRC®
2158A—2010 <u>2158A—2013</u>	Outline of Investigation for Clothes Dryer Transition Duct <u>Duct</u> -with revisions through April 2017	IMC®	IRC®
2523—09 <u>2523—2009</u>	Standard for Solid Fuel-fired Hydronic Heating Appliances, Water Heaters and Boilers—with revisions through February 2013 <u>March 2018</u>	IMC®	IRC®
2703—14 <u>2703—2014</u>	Mounting Systems, Mounting Devices, Clamping/Retention Devices and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels <u>Panels</u> -with revisions through December 2019	IRC®	
9540—14 <u>9540—2016</u>	Outline of Investigation <u>Standard</u> for Energy Storage Systems and Equipment	IFC®	IRC®
UL/CSA/ANCE 60335-2-40—2012 <u>60335-2-40—2019</u>	Standard for Household and Similar Electrical Appliances, Part 2 <u>Appliances- Safety - Part 2-40</u> : Particular Requirements for Motor-compressors <u>Electrical Heat Pumps, Air Conditioners and Dehumidifiers</u>	IRC®	

ULC		ULC	
Standard Reference Number	Title	Referenced in Code(s):	
CAN/ULC S 102.2—2010 <u>102.2—2018</u>	Standard Methods for <u>Method of</u> Test for Surface Burning Characteristics of Building Materials and Assemblies	IBC®	IRC®

WDMA		Window and Door Manufacturers Association	
Standard Reference Number	Title	Referenced in Code(s):	
I.S. 11—13 <u>11—16</u>	Industry Standard Analytical Method for Design Pressure (DP) Ratings of Fenestration Products	IRC®	

WMA		World Millwork Alliance (formerly Association of Millwork Distributors Standards AMD)	
Standard Reference Number	Title	Referenced in Code(s):	
ANSI/WMA 100—2016 <u>100—2018</u>	Standard Method of Determining Structural Performance Ratings of Side Hinged Exterior Door Systems and Procedures for Component Substitution	IRC®	

Reason: THIS IS THE ADMIN STANDARDS UPDATE CODE CHANGE FOR THE IRC.

The CP28 Code Development Policy, Section 4.6 requires the updating of referenced standards to be accomplished administratively, and be processed as a Code Change Proposal for consideration by the Administrative Code Change Committee. In September 2018, a letter was sent to each developer of standards that is referenced in the International Codes, asking them to provide ICC with a list of their standards in order to update to the current edition. Listed are the referenced standards that are to be updated based upon responses received from standards developers.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Not applicable.

Proposal # 5812

ADM47-IRC-19

ADM47-IEBC-19

Chapter 16

ASCE/SEI		American Society of Civil Engineers	
Standard Reference Number	Title	Referenced in Code(s):	
7—16	Minimum Design Loads and Associated Criteria for Buildings and Other Structures <u>with Supplement 1</u>	IBC® IRC®	IEBC®

ASHRAE		ASHRAE	
Standard Reference Number	Title	Referenced in Code(s):	
62.1 —2016 <u>62.1</u> —2019	Ventilation for Acceptable Indoor Air Quality	IEBC®	IMC®

ASME		American Society of Mechanical Engineers	
Standard Reference Number	Title	Referenced in Code(s):	
ASME A17.1 —2016 <u>A17.1</u> — 2019/CSA B44 —16 <u>B44</u> — <u>19</u>	Safety Code for Elevators and Escalators	IEBC® IFC® IRC®	IECC IPMC®
A17.3 —2015 <u>A17.3</u> —2020	Safety Code for Existing Elevators and Escalators	IEBC®	IFC®
A18.1 —2014 <u>A18.1</u> —2020	Safety Standard for Platform Lifts and Stairway Chair Lifts	IBC® IRC®	IEBC®

ASTM		ASTM International	
Standard Reference Number	Title	Referenced in Code(s):	
C94/C94M —15A <u>C94M</u> — <u>2017A</u>	Specification for Ready-mixed Concrete	IBC® IRC®	IEBC®
E84 —2016 <u>E84</u> —2018B	Standard Test Method for Surface Burning Characteristics of Building Materials	IEBC® IMC® IWUIC®	IFC® IRC®
E108 —16 <u>E108</u> —2017	Standard Test Methods for Fire Tests of Roof Coverings	IBC® IWUIC®	IEBC®
E136 —16 <u>E136</u> —2016A	Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 °C	IBC® IFGC® IWUIC®	IEBC® IMC®

NFPA		National Fire Protection Agency	
Standard Reference Number	Title	Referenced in Code(s):	
NFPA 13R —16 <u>13R</u> —19	Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height	IEBC®	
NFPA 72 —16 <u>72</u> —19	National Fire Alarm and Signaling Code	IEBC®	
NFPA 99 —18 <u>99</u> —21	Health Care Facilities Code	IEBC®	
NFPA 101 —18 <u>101</u> —21	Life Safety Code	IEBC®	

UL		UL LLC	
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Standard Reference Number	Title	Referenced in Code(s):	
723-08 <u>723-2018</u>	Standard for Test for Surface Burning Characteristics of Building Materials— with Revisions through August 2013 <u>Materials</u>	IEBC® IRC®	IFC®
790-04 <u>790-2004</u>	Standard Test Methods for Fire Tests of Roof Coverings— with Revisions through July 2014 <u>October 2018</u>	IBC® IFC®	IEBC® IRC®

Reason: THIS IS THE ADMIN STANDARDS UPDATE CHANGE-IEBC.

The CP28 Code Development Policy, Section 4.6 requires the updating of referenced standards to be accomplished administratively, and be processed as a Code Change Proposal for consideration by the Administrative Code Change Committee. In September 2018, a letter was sent to each developer of standards that is referenced in the International Codes, asking them to provide ICC with a list of their standards in order to update to the current edition. Listed are the referenced standards that are to be updated based upon responses received from standards developers.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Not applicable.

Proposal # 5793

ADM47-IEBC-19

ADM47-IFGC-19

Chapter 8

ANSI	American National Standards Institute	
Standard Reference Number	Title	Referenced in Code(s):
ANSI NGV 5.1—2015 <u>5.1—2016</u>	Residential Fueling Appliances	IFGC®
ANSI FC 1—2012 <u>1—2014</u>	Stationary Fuel Cell Power Systems <u>Fuel cell technologies - Part 3-100: Stationary fuel cell power systems-Safety</u>	IFGC®
LC 1/CSA 6.26—2013 <u>6.26—2016</u>	Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing (CSST)	IFGC®
Z21.1—2010 <u>Z21.1/CSA 1.1—2016</u>	Household Cooking Gas Appliances	IFGC® IRC®
Z21.5.1/CSA 7.1—2014 <u>7.1—2017</u>	Gas Clothes Dryers—Volume I—Type 1 Clothes Dryers	IFGC®
Z21.5.2/CSA 7.2—2014 <u>7.2—2016</u>	Gas Clothes Dryers—Volume II—Type 2 Clothes Dryers	IFGC®
Z21.8—94 (R2002) <u>R2012)</u>	Installation of Domestic Gas Conversion Burners	IFGC® IRC®
Z21.10.1/CSA 4.1—2012 <u>4.1—2017</u>	Gas Water Heaters—Volume I—Storage, Water Heaters with Input Ratings of 75,000 Btu per Hour or Less	IFGC®
Z21.10.3/CSA 4.3—2011 <u>4.3—2017</u>	Gas Water Heaters—Volume III—Storage, Water Heaters with Input Ratings above 75,000 Btu per Hour, Circulating and Instantaneous	IFGC®
Z21.11.2—2011 <u>Z21.11.2—2016</u>	Gas-fired Room Heaters—Volume II—Unvented Room Heaters	IFGC®
Z21.13/CSA 4.9—2011 <u>4.9—2017</u>	Gas-fired Low-pressure Steam and Hot Water Boilers	IFGC®
Z21.15/CSA 9.1—2009 <u>(R2014)</u>	Manually Operated Gas Valves for Appliances, Appliance Connector Valves and Hose End Valves	IFGC®
Z21.19/CSA 1.4—02(R2007) <u>1.4—2014</u>	Refrigerators Using Gas (R1999) -Fuel	IFGC®
Z21.24/CSA 6.10—2006 <u>6.10—2015</u>	Connectors for Gas Appliances	IFGC®
Z21.40.1/CGA 2.91—1996 <u>(R2011, R2017)</u>	Gas-fired_Heat Activated Air Conditioning and Heat Pump Appliances	IFGC®
Z21.40.2/CGA 2.92—1996 <u>(R2011, R2017)</u>	Gas-fired_Work Activated Air Conditioning and Heat Pump Appliances (Internal Combustion)	IFGC®
Z21.42—2014 <u>Z21.42—2013</u>	Gas-fired Illuminating Appliances	IFGC® IRC®
Z21.47/CSA 2.3—2012 <u>2.3—2016</u>	Gas-fired Central Furnaces	IFGC®
Z21.50/CSA 2.22—2016	Vented <u>Decorative</u> Gas Fireplaces	IFGC®
Z21.54—2009 <u>Z21.54—2014</u>	Gas Hose Connectors for Portable Outdoor Gas-fired Appliances	IFGC® IRC®
Z21.58/CSA 1.6—2013 <u>1.6—2015</u>	Outdoor Cooking Gas Appliances	IFGC®
Z21.60/CSA 2.26—2012 <u>2.26—2017</u>	Decorative Gas Appliances for Installation in Solid-fuel Burning Fireplaces	IFGC®
Z21.61—1983 (R2004) <u>R2013)</u>	Gas-fired Toilets	IFGC®
Z21.69/CSA 6.16—2009	Connectors for Movable Gas Appliances	IFGC®

6.16—2015 Z21.75/CSA 6.27—2007 6.27—2016	Connectors for Outdoor Gas Appliances and Manufactured Homes	IFGC®
Z21.80/CSA 6.22—2011 6.22—2016	Line Pressure Regulators	IFGC®
Z21.84—2012 <u>Z21.84—</u> <u>2017</u>	Manually Lighted, Natural Gas Decorative Gas Appliances for Installation in Solid-Fuel <u>Solid-Fuel Burning Fireplaces Appliances</u>	IFGC®
Z21.86/CSA 2.32—2008 2.32—2016	Vented Gas-fired Space Heating Appliances	IFGC®
Z21.91—2007 <u>Z21.91—</u> <u>2017</u>	Ventless Firebox Enclosures for Gas-fired Unvented Decorative Room Heaters	IFGC®
Z21.93/CSA 6.30—2013 6.30—2017	Excess Flow Valves for Natural <u>Gas</u> and LP-Propane Gas with Pressures up to 5 psig	IFGC®
Z21.97—2012 <u>Z21.97—</u> <u>2014</u>	Outdoor Decorative <u>Gas</u> Appliances	IFGC®
Z83.4/CSA 3.7—2012 <u>3.7—</u> <u>2017</u>	Nonrecirculating Direct-gas-fired Industrial Air Heaters <u>Heating and Forced Ventilation</u> <u>Appliances for Commercial and Industrial Application</u>	IFGC®
Z83.8/CSA 2.6—2009 <u>2.6—</u> <u>2016</u>	Gas Unit Heater, Gas Packaged Heater Heaters , Gas Utility Heaters, and Gas-fired Duct Furnaces	IFGC®
Z83.11/CSA 1.8—2013 <u>1.8</u> <u>—2016</u>	Gas Food Service Equipment	IFGC®
Z83.18—2012 <u>Z83.18—</u> <u>2017</u>	Recirculating Direct Gas-fired Industrial Air Heaters <u>Heating and Forced Ventilation</u> <u>Appliances for Commercial and Industrial Applications</u>	IFGC®
Z83.19—2001 <u>Z83.19—</u> <u>09(R2009 R2014)</u>	Gas-fired High-intensity Infrared Heaters	IFGC®
Z83.20—2008 <u>Z83.20—</u> <u>2016</u>	Gas-fired <u>Tubular and</u> Low-intensity Infrared Heaters	IFGC®
ANSI A13.1—2015 <u>A13.1—</u> <u>2020</u>	Scheme for the Identification of Piping Systems	IFGC®

ASME

American Society of Mechanical Engineers

Standard Reference Number	Title	Referenced in Code(s):	
B16.1—2010 <u>B16.1—2020</u>	Gray Iron Pipe Flanges and Flanged Fittings, Class 25, 125 and 250	IFGC®	
B1.20.1—2013 <u>B1.20.1—</u> <u>2019</u>	Pipe Threads, General Purpose (inch)	IFGC®	IMC® IPC® IRC®
B16.5—2015 <u>B16.5—2019</u>	Pipe Flanges and Flanged Fittings: NPS 1/2 through NFPS 24 Metric/Inch Standard	IFGC®	IMC®
B16.24—2016 <u>B16.24—</u> <u>2021</u>	Cast Copper Alloy Pipe Flanges and Flanged Fittings: Classes 150, 300, 600, 900, 1500 and 2500	IFGC®	IMC®
B16.42—2016 <u>B16.42—</u> <u>2021</u>	Ductile Iron Pipe Flanges and Flanged Fittings, Classes 150 and 300	IFGC®	
B16.47—2016 <u>B16.47—</u> <u>2020</u>	Large Diameter Steel Flanges: NPS 26 through NPS 60 Metric/Inch Standard	IFGC®	
B16.33—2012(<u>R2017</u>)	Manually Operated Metallic Gas Valves for Use in Gas Piping Systems up to 125 psig (Sizes 1/2 through 2)	IFGC®	IRC®
B16.44—2012(<u>R2017</u>)	Manually Operated Metallic Gas Valves for Use in Aboveground Piping Systems up to 5 psi	IFGC®	IRC®
B31.3—2016 <u>B31.3—2020</u>	Process Piping	IBC® IFGC®	IFC®
B31.12—2014 <u>B31.12—</u> <u>2019</u>	Hydrogen Piping and Pipelines	IFGC®	
B36.10M—(R2015)	Welded and Seamless Wrought-steel Pipe	IFGC®	

B36.10M—2018 BPVC—2015 <u>BPVC—2019</u>	ASME Boiler & Pressure Vessel Code (2007 Edition)	IFC® IMC®	IFGC® IRC®
CSD-1—2016 <u>CSD-1—2021</u>	Controls and Safety Devices for Automatically Fired Boilers	IFGC® IRC®	IMC®

ASTM	ASTM International		
Standard Reference Number	Title	Referenced in Code(s):	
A53/A53M—12 <u>A53M—2018</u>	Specification for Pipe, Steel, Black and Hot Dipped Zinc-coated Welded and Seamless	IFGC® IPC®	IMC® IRC®
A106/A106M—14 <u>A106M—2018</u>	Specification for Seamless Carbon Steel Pipe for High-temperature Service	IFGC® IRC®	IMC®
A254—12 <u>A254—2010(2018)</u>	Specification for Copper Brazed Steel Tubing	IFGC® IRC®	IMC®
A268—10 <u>A268/A268—2010(16)</u>	Standard Specification for Seamless and Welded Ferritic and Martensitic Stainless Steel Tubing for General Service	IFGC®	
A269—15 <u>A269/A269M—2015A</u>	Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service	IFGC®	
A312—15 <u>A312/A312M—2018</u>	Standard Specification for Seamless, Welded and Heavily Cold Worked Austenitic Stainless Steel Pipes	IFGC®	
B88—14 <u>B88—2016</u>	Specification for Seamless Copper Water Tube	IBC® IFGC® IPC® IRC®	IFC® IMC® IPSDC® ISPSC®
B241/B241M—12e1 <u>B241M—2016</u>	Specification for Aluminum and Aluminum-alloy, Seamless Pipe and Seamless Extruded Tube	IFGC®	
B280—13 <u>B280—2018</u>	Standard Specification for Seamless Copper Tube for Air-Conditioning and Refrigeration Field Service	IBC® IFGC®	IFC® IMC®
C315—07 <u>C315—2007(2011, 2016)</u>	Specification for Clay Flue Liners and Chimney Pots	IBC® IMC®	IFGC® IRC®
D2513—14e1 <u>D2513—2018A</u>	Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing and Fittings	IFGC®	
E136—16 <u>E136—2016A</u>	Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 °C	IBC® IFGC® IWUIC®	IEBC® IMC®
F1973—13e1 <u>F1973—2013(2018)</u>	Standard Specification for Factory Assembled Anodeless Risers and Transition Fittings in Polyethylene (PE) and Polyamide 11 (PA11) and Polyamide 12 (PA12) Fuel Gas Distribution Systems	IFGC®	IRC®
F2945—15 <u>F2945—2018</u>	Standard Specification for Polyamide 11 Gas Pressure Pipe, Tubing and Fittings	IFGC®	

CGA	Compressed Gas Association		
Standard Reference Number	Title	Referenced in Code(s):	
S-1.1—(2017) <u>2011</u>	Pressure Relief Device Standards—Part 1—Cylinders for Compressed Gases	IFC®	IFGC®
S-1.3—(2016) <u>2008</u>	Pressure Relief Device Standards—Part 3—Stationary Storage Containers for Compressed Gases	IFC®	IFGC®

CSA	CSA Group		
Standard Reference Number	Title	Referenced in Code(s):	

MSS**Manufacturers Standardization Society of the Valve and Fittings Industry**

Standard Reference Number	Title	Referenced in Code(s):
ANSI SP 58—2009 <u>58—2018</u>	Pipe Hangers and Supports—Materials, Design and Manufacture	IFGC®

NFPA**National Fire Protection Association**

Standard Reference Number	Title	Referenced in Code(s):
2—16.2—19	Hydrogen Technologies Code	IFGC® IMC®
30A—18.30A—21	Code for Motor Fuel Dispensing Facilities and Repair Garages	IBC® IFC® IFGC® IMC®
58—17	Liquefied Petroleum Gas Code	IBC® IFC® IFGC® IMC® IRC®
82—14.82—19	Incinerators, Waste and Linen Handling Systems and Equipment	IBC® IFGC® IMC®
85—15.85—19	Boiler and Combustion Systems Hazards Code	IBC® IFC® IFGC® IMC® IRC®
88A—15.88A—19	<u>Standard for Parking Structures</u>	IFGC®
211—16.211—19	Standard for the Chimneys, Fireplaces, Vents and Solid Fuel-burning Appliances	IBC® IFC® IFGC® IMC® IRC®
853—15.853—20	<u>Standard Installation of Stationary Fuel Cell Power Systems</u>	IFC® IFGC® IMC® IRC®

UL**UL LLC**

Standard Reference Number	Title	Referenced in Code(s):
103—2010	Factory-built Chimneys, Residential Type and Building Heating Appliances— with Revisions through July 2012 <u>March 2017</u>	IBC® IFGC® IMC® IRC®
127—2011	Factory-built Fireplaces—with Revisions through May 2015 <u>July 2016</u>	IBC® IFGC® IMC® IRC®
378—2006	Draft Equipment <u>Equipment with revisions through September 2013</u>	IFGC®
441—2010 <u>441—2016</u>	Gas Vents—with Revisions through June 2014 <u>July 2016</u>	IFGC®
641—2010	Type L Low-temperature Venting Systems—with Revisions through June 2013 <u>April 2018</u>	IBC® IFGC® IMC® IRC®
651—2011	Schedule 40, 80, Type EB and 80-A Rigid PVC Conduit and Fittings—with Revisions through May 2014 <u>June 2016</u>	IFGC® IRC®
795—2011 <u>795—2016</u>	Commercial industrial Commercial-Industrial Gas Heating Equipment—with Revisions through November 2013 <u>Equipment</u>	IFGC® IRC®
1618—09 <u>1618—2015</u>	Wall Protectors, Floor Protectors and Hearth Extensions—with Revisions through October 2015 <u>January 2018</u>	IFGC® IMC® IRC®
1738—2010	Venting Systems for Gas Burning Appliances, Categories II, III and IV—with Revisions through November 2014 <u>IV</u>	IFGC® IRC®

1777—2007	Chimney Liners—with Revisions through October 2015 <u>April 2014</u>	IBC® IMC®	IFGC®
2200—2012	Stationary Engine Generator Assemblies—with Revisions through July <u>October</u> 2015	IBC® IFGC®	IFC® IMC®

Reason: THIS IS THE ADMIN STANDARDS UPDATE CODE CHANGE FOR THE IFGC.

The CP28 Code Development Policy, Section 4.6 requires the updating of referenced standards to be accomplished administratively, and be processed as a Code Change Proposal for consideration by the Administrative Code Change Committee. In September 2018, a letter was sent to each developer of standards that is referenced in the International Codes, asking them to provide ICC with a list of their standards in order to update to the current edition. Listed are the referenced standards that are to be updated based upon responses received from standard developers.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Not applicable.

Proposal # 5804

ADM47-IFGC-19

ADM47-IPMC-19

Chapter 8

Chapter 8

ASME		American Society of Mechanical Engineers	
Standard Reference Number	Title	Referenced in Code(s):	
ASME A17.1—2016 <u>A17.1—2019/CSA B44—16</u> B44—16 <u>19</u>	Safety Code for Elevators and Escalators	IEBC® IFC® IRC®	IECC IPMC®
ASTM		ASTM International	
Standard Reference Number	Title	Referenced in Code(s):	
F1346—91 <u>(2010, 2018)</u>	Performance Specifications for Safety Covers and Labeling Requirements for All Covers for Swimming Pools, Spas and Hot Tubs	IPMC®	
NFPA		National Fire Protection Association	
Standard Reference Number	Title	Referenced in Code(s):	
10—17 <u>10—21</u>	Standard for Portable Fire Extinguishers	IPMC®	
12—15 <u>12—18</u>	Standard on Carbon Dioxide Extinguishing Systems	IBC® IPMC®	IFC®
12A—15 <u>12A—18</u>	Standard on Halon 1301 Fire Extinguishing Systems	IBC® IPMC®	IFC®
17—17 <u>17—20</u>	Standard for Dry Chemical Extinguishing Systems	IBC® IPMC®	IFC®
17A—17 <u>17A—20</u>	Standard for Wet Chemical Extinguishing Systems	IBC® IPMC®	IFC®
25—17 <u>25—20</u>	Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems	IFC®	IPMC®
72—16 <u>72—19</u>	National Fire Alarm and Signaling Code	IBC® IMC® IRC®	IFC® IPMC®
80—16 <u>80—19</u>	Standard for Fire Doors and Other Opening Protectives	IBC® IPMC®	IFC®
105—16 <u>105—19</u>	Standard for Smoke Door Assemblies and Other Opening Protectives	IBC® IPMC®	IFC®
204—15 <u>204—18</u>	Standard for Smoke and Heat Venting	IFC®	IPMC®
750—14 <u>750—19</u>	Standard on Water Mist Fire Protection Systems	IPMC®	
2001—15 <u>2001—18</u>	Standard on Clean Agent Fire Extinguishing Systems	IBC® IPMC®	IFC®
UL		Underwriters Laboratories, LLC	
Standard Reference Number	Title	Referenced in Code(s):	
268—09 <u>268—2016</u>	Smoke Detectors for Fire Alarm Systems <u>Systems with revisions through July 2016</u>	IBC® IPMC®	IFC®

Reason: THIS IS THE ADMIN STANDARDS UPDATE CODE CHANGE FOR THE IPMC.

The CP28 Code Development Policy, Section 4.6 requires the updating of referenced standards to be accomplished administratively, and be processed as a Code Change Proposal for consideration by the Administrative Code Change Committee. In September 2018, a letter was sent to each developer of standards that is referenced in the International Codes, asking them to provide ICC with a list of their standards in order to update to the current edition. Listed are the referenced standards that are to be updated based upon responses received from standard developers.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Not applicable.

Proposal # 5789

ADM47-IPMC-19

ADM47-IPSDC-19

Chapter 14

ASTM	ASTM International		
Standard Reference Number	Title	Referenced in Code(s):	
A74-15 <u>A74-17</u>	Specification for Cast Iron Soil Pipe and Fittings	IPC® IRC®	IPSDC®
A888-15 <u>A888-18</u>	Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Application	IPC® IRC®	IPSDC®
B88-14 <u>B88-16</u>	Specification for Seamless Copper Water Tube	IBC® IFGC® IPC® IRC®	IFC® IMC® IPSDC® ISPSC®
B251-10 <u>B251/B251M-2017</u>	Specification for General Requirements for Wrought Seamless Copper and Copper-alloy Tube	IBC® IMC® IPSDC®	IFC® IPC® IRC®
B813-10 <u>B813-2016</u>	Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper-alloy Tube	IMC® IPSDC®	IPC® IRC®
B828-02(2010) <u>B828-2016</u>	Practice for Making Capillary Joints by Soldering of Copper and Copper-alloy Tube and Fittings	IMC® IPSDC®	IPC® IRC®
C4-04 <u>C4-2004(2014 2018)</u>	Specification for Clay Drain Tile and Perforated Clay Drain Tile	IPC® IRC®	IPSDC®
C76-15A <u>C76-2018A</u>	Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe	IPC® IRC®	IPSDC®
C425-04 <u>C425-2004(2013 2018)</u>	Specification for Compression Joints for Vitrified Clay Pipe and Fittings	IPC® IRC®	IPSDC®
C443-12 <u>C443-2012(2017)</u>	Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets	IPC® IRC®	IPSDC®
C700-13 <u>C700-2018</u>	Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated	IPC® IRC®	IPSDC®
C1173-10(2014) <u>C1173-2018</u>	Specification for Flexible Transition Couplings for Underground Piping Systems	IPC® IRC®	IPSDC®
C1277-15 <u>C1277-2018</u>	Specification for Shielding Coupling Joining Hubless Cast-iron Pipe and Fittings	IPC® IRC®	IPSDC®
C1440-08(2013) <u>C1440-2017</u>	Specification for Thermoplastic Elastomeric (TPE) Gasket Materials for Drain, Waste and Vent (DWV), Sewer, Sanitary and Storm Plumbing Systems	IPC® IRC®	IPSDC®
C1460-2012 <u>C1460-2017</u>	Specification for Shielded Transition Couplings for Use with Dissimilar DWV Pipe and Fittings Above Ground	IPC® IRC®	IPSDC®
C1461-08 <u>C1461-2008(2013 2017)</u>	Specification for Mechanical Couplings Using Thermoplastic Elastomeric (TPE) Gaskets for Joining Drain, Waste and Vent (DWV) Sewer, Sanitary and Storm Plumbing Systems for Above and Below Ground Use	IPC® IRC®	IPSDC®
D2235-04 <u>D2235-2004(2011 2016)</u>	Specification for Solvent Cement for Acrylonitrile-butadiene-styrene (ABS) Plastic Pipe and Fittings	IMC® IPSDC®	IPC® IRC®
D2564-12 <u>D2564-2012(2018)</u>	Specification for Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Piping Systems	IMC® IPSDC®	IPC® IRC®
D2657-07 <u>D2657-2007(2015)</u>	Standard Practice for Heat-fusion Joining of Polyolefin Pipe and Fittings	IMC® IPSDC®	IPC® IRC®
D2661-14 <u>D2661-14E1</u>	Specification for Acrylonitrile-butadiene-styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings	IPC® IRC®	IPSDC®
D2665-14 <u>D2665-2014</u>	Specification for Poly Vinyl Chloride (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings	IPC® IRC®	IPSDC®

D2729 11 <u>D2729</u> —2017	Specification for Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings	IPC® IRC®	IPSDC®
D2855 96(2010) <u>D2855</u> — <u>2015</u>	Standard Practice for Making Solvent-cemented Joints with Poly Vinyl Chloride (PVC) Pipe and Fittings	IPC® IRC®	IPSDC®
D3034 14a <u>D3034</u> —2016	Specification for Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings	IPC® IRC®	IPSDC®
F628 12E+ <u>F628</u> —2012 <u>E2</u>	Specification for Acrylonitrile-butadiene-styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core	IPC® IRC®	IPSDC®
F656 15 <u>F656</u> —2015	Specification for Primers for Use in Solvent Cement Joints of Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings	IPC® IRC®	IPSDC®
F891 10 <u>F891</u> —2016	Specification for Coextruded Poly Vinyl Chloride (PVC) Plastic Pipe with a Cellular Core	IPC® IRC®	IPSDC®
F1488 14 <u>F1488</u> —2014 <u>E1</u>	Specification for Coextruded Composite Pipe	IPC® IRC®	IPSDC®
F1499 12 <u>F1499</u> —2017	Specification for Coextruded Composite Drain Waste and Vent Pipe (DWV)	IPSDC®	

CISPI		Cast Iron Soil Pipe Institute	
Standard Reference Number	Title	Referenced in Code(s):	
301 12 <u>301</u> —18	Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications	IPC® IRC®	IPSDC®
310 12 <u>310</u> —18	Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications	IPC® IRC®	IPSDC®

CSA		CSA Group	
Standard Reference Number	Title	Referenced in Code(s):	
B137.3 16 <u>B137.3</u> —17	Rigid Poly Vinyl Chloride (PVC) Pipe for Pressure Applications	IMC® IPSDC® ISPSC®	IPC® IRC®
B181.1 15 <u>B181.1</u> —18	Acrylonitrile-butadiene-styrene (ABS) Drain, Waste, and Vent Pipe and Pipe Fittings	IPC® IRC®	IPSDC®
B181.2 15 <u>B181.2</u> —18	(PVC) Polyvinylchloride and Chlorinated Polyvinylchloride (CPVC) Drain, Waste, and Vent Pipe and Pipe Fittings	IPC® IRC®	IPSDC®
B182.1 11 <u>B182.1</u> —18	Plastic Drain and Sewer Pipe and Pipe Fittings	IPC®	IPSDC®
B182.2 11 <u>B182.2</u> —18	(PVC) Polyvinylchloride Sewer Pipe and Fittings PSM Type	IPC® IRC®	IPSDC®
B182.4 15 <u>B182.4</u> —18	Profile PVC Sewer Pipe and Fittings	IPC® IRC®	IPSDC®
B602 15 <u>B602</u> —16	Mechanical Couplings for Drain, Waste, and Vent Pipe and Sewer Pipe	IPC® IRC®	IPSDC®

NSF		NSF International	
Standard Reference Number	Title	Referenced in Code(s):	
40 2013 <u>40</u> —2018	Residential Wastewater Treatment Systems	IPSDC®	
41 2011 <u>41</u> —2016	Nonliquid Saturated Treatment Systems (Composing Toilets)	IPSDC®	IRC®

Reason: THIS IS THE ADMIN STANDARDS UPDATE CODE CHANGE-IPSDC.

The CP28 Code Development Policy, Section 4.6 requires the updating of referenced standards to be accomplished administratively, and be processed as a Code Change Proposal for consideration by the Administrative Code Change Committee. In September 2018, a letter was sent to

each developer of standards that is referenced in the International Codes, asking them to provide ICC with a list of their standards in order to update to the current edition. Listed are the referenced standards that are to be updated based upon responses received from standards developers.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Not applicable.

Proposal # 5792

ADM47-IPSDC-19

ADM47-ISPSC-19

Chapter 11

AHRI		Air Conditioning, Heating & Refrigeration Institute	
Standard Reference Number	Title	Referenced in Code(s):	
1160 (I-P)—2014	Performance Rating of Heat Pump Pool Heaters <u>(with Addendum 1)</u>	ISPSC®	
ANSI		American National Standards Institute	
Standard Reference Number	Title	Referenced in Code(s):	
A108/A118/A136.1—2008 <u>A136.1—2019</u>	Specifications for Installation of Ceramic Tile	ISPSC®	
APSP		The Association of Pool & Spa Professionals	
Standard Reference Number	Title	Referenced in Code(s):	
ANSI/APSP/ICC 4— 12.4 — <u>2019</u>	American National Standard for Aboveground/Onground Residential Swimming Pools— Includes Addenda A Approved April 4, 2013	ISPSC®	
ANSI/APSP/ICC 7— 13.7 — <u>2020</u>	American National Standard for Suction Entrapment Avoidance in Swimming Pools, Wading Pools, Spas, Hot Tubs, and Catch Basins	ISPSC®	
ANSI/APSP/ICC 14— 2014 <u>14—2019</u>	American National Standard for Portable Electric Spa Energy Efficiency	IECC IRC®	IECC ISPSC®
ANSI/APSP/ICC 15a—2011	American National Standard for Energy Efficiency Residential Inground Swimming Pool and Spas—Includes Addenda A Approved January 9, 2013 <u>Spa Energy Efficiency</u>	IECC IRC®	IECC ISPSC®
ANSI/APSP/ICC 16— 11.16 <u>—2017</u>	American National Standard for Suction <u>Outlet Fittings (SOFA)</u> for Use in Swimming Pools, Wading Pools, Spas, and Hot Tubs	ISPSC®	
ASCE/SEI		American Society of Civil Engineers Structural Engineering Institute	
Standard Reference Number	Title	Referenced in Code(s):	
ASCE 24—14.24—20	Flood Resistant Design & Construction	ISPSC®	
ASME		American Society of Mechanical Engineers	
Standard Reference Number	Title	Referenced in Code(s):	
A112.1.2—2012(<u>R2022</u>)	Air Gaps in Plumbing Systems (For Plumbing Fixtures and Water-connected Receptors)	IPC® ISPSC®	IRC®
ASTM		ASTM International	
Standard Reference Number	Title	Referenced in Code(s):	
A182—15 <u>A182/A182M— 2018A</u>	Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-temperature Service	ISPSC®	
A240/ A240M—15a <u>A240M —17</u>	Standard Specification for Chromium and Chromium-nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications	IBC® ISPSC®	IRC®

A312/A312M—15a <u>A312M—2018</u>	Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes	IPC® ISPSC®	IRC®
A403—15 <u>A403/A403M—2018A</u>	Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings	ISPSC®	
B88—14 <u>B88—2016</u>	Standard Specification for Seamless Copper Water Tube	IFGC® IPC® IRC®	IFC® IMC® IPSDC® ISPSC®
D1785—15 <u>D1785—15E1</u>	Specification for Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80 and 120	IMC® IRC®	IPC® ISPSC®
D2466—15 <u>D2466—2017</u>	Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40	IMC® IRC®	IPC® ISPSC®
D2846/D2846M—14 <u>D2846M—2017BE1</u>	Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems	IMC® IRC®	IPC® ISPSC®
F438—15 <u>F438—2017</u>	Standard Specification for Socket-type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40	IMC® IRC®	IPC® ISPSC®
F1346—91 <u>F1346—1991(2016, 2018)</u>	Standard Performance Specification for Safety Covers and Labeling Requirements for All Covers for Swimming Pools, Spas and Hot Tubs	ISPSC®	

CSA	CSA Group	
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Standard Reference Number	Title	Referenced in Code(s):	
B137.2—16 <u>B137.2—17</u>	Polyvinylchloride (PVC) Injection-moulded Gasketed Fittings for Pressure Application	IMC® IRC®	IPC® ISPSC®
B137.3—16 <u>B137.3—17</u>	Rigid Polyvinylchloride (PVC) Pipe and Fitting and Pressure Applications	IMC® IPSDC® ISPSC®	IPC® IRC®
B137.6—16 <u>B137.6—17</u>	Chlorinated Polyvinylchloride (CPVC) Pipe, Tubing, and Fitting for Hot- and Cold-water Distribution Systems	IMC® IRC®	IPC® ISPSC®
C22.2 No. 218.1— <u>13(R2017)</u>	Spas, Hot Tubs and Associated Equipment	ISPSC®	

NSF	NSF International	
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Standard Reference Number	Title	Referenced in Code(s):	
NSF 14—2015 <u>14—2017</u>	Plastics Pumping Systems Components and Related Materials	ISPSC®	
NSF 50—2015 <u>50—2017</u>	Equipment <u>and Chemicals</u> for Swimming Pools, Spas, Hot Tubs, and Other Recreational Water Facilities	ISPSC®	

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Standard Reference Number	Title	Referenced in Code(s):	
1004-1—12	Standard for Rotating Electrical Machines General Requirements— with revisions through June 2011 <u>August 2018</u>	ISPSC®	
1081—2008 <u>1081—2016</u>	Standard for Swimming Pool Pumps, Filters and Chlorinators— with revisions through March 2014 <u>October 2017</u>	ISPSC®	
1261—2001 <u>1261—2016</u>	Standard for Electric Water Heaters for Pools and Tubs—with revisions through July 2012 <u>September 2017</u>	ISPSC®	
1563—2009	Standard for Electric Hot Tubs, Spas Electric Spas Equipment Assemblies, and Associated Equipment— with revisions through March 2015 <u>October 2017</u>	IMC® ISPSC®	IRC®
1995—2011 <u>1995—2015</u>	Heating and Cooling Equipment—with revisions through July 2015 <u>August 2018</u>	IMC®	IRC®

2017—2008

General-purpose Signaling Devices and Systems—with revisions through ~~May 2011~~
January 2016

Reason: THIS IS THE ADMIN STANDARDS UPDATE CODE CHANGE-ISPSC

The CP28 Code Development Policy, Section 4.6 requires the updating of referenced standards to be accomplished administratively, and be processed as a Code Change Proposal for consideration by the Administrative Code Change Committee. In September 2018, a letter was sent to each developer of standards that is referenced in the International Codes, asking them to provide ICC with a list of their standards in order to update to the current edition. Listed are the referenced standards that are to be updated based upon responses received from standards developers.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Not applicable.

Proposal # 5791

ADM47-ISPSC-19

ADM47-IWUIC-19

Chapter 7

ASTM	ASTM International	
Standard Reference Number	Title	Referenced in Code(s):
D2898—10 <u>D2898—2010(2017)</u>	Standard Test Methods for Accelerated Weathering of Fire-retardant-treated Wood for Fire Testing	IBC® IRC® IWUIC®
D6662—13 <u>D6662—2017</u>	Standard Specification for Polyolefin-based Plastic Lumber Decking Boards	IWUIC®
D7032—14 <u>D7032—2017</u>	Standard Specification for Establishing Performance Ratings for Wood-plastic Composite Deck Boards and Guardrail Systems (Guards or Handrails)	IBC® IRC® IWUIC®
E84—2016 <u>E84—2018B</u>	Standard Test Method for Surface-Burning Characteristics of Building Materials	IEBC® IFC® IMC® IRC® IWUIC®
E108—16 <u>E108—2017</u>	Standard Test Methods for Fire Tests of Roof Coverings	IBC® IEBC® IWUIC®
E119—2016 <u>E119—2018B</u>	Standard Test Methods for Fire Tests of Building Construction and Materials	IMC® IRC® IWUIC®
E136—16 <u>E136—2016A</u>	Test Method for Behavior of Materials in a Vertical Tube Furnace at 750° C	IBC® IEBC® IFGC® IMC® IWUIC®
E2768—2011 <u>(2018)</u>	Standard Test Method for Extended Duration Surface Burning Characteristics of Building Materials (30 Minute Tunnel Test)	IWUIC®

UL	UL LLC	
Standard Reference Number	Title	Referenced in Code(s):
263—2011	Standard for Fire Test of Building Construction and Materials— with Revisions through June 2015 <u>March 2018</u>	IMC® IRC® IWUIC®
723—2008 <u>723—2018</u>	Standard for Test for Surface Burning Characteristics of Building Materials— with Revisions through August 2013 <u>Materials</u>	IBC® IMC® IWUIC®
790—2004	Standard Test Methods for Fire Tests of Roof Coverings— with Revisions through July 2014 <u>October 2018</u>	IWUIC®

Reason: THIS IS THE ADMIN STANDARDS UPDATE CODE CHANGE FOR THE IWUIC.

The CP28 Code Development Policy, Section 4.6 requires the updating of referenced standards to be accomplished administratively, and be processed as a Code Change Proposal for consideration by the Administrative Code Change Committee. In September 2018, a letter was sent to each developer of standards that is referenced in the International Codes, asking them to provide ICC with a list of their standards in order to update to the current edition. Listed are the referenced standards that are to be updated based upon responses received from standards developers.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Not applicable.

Proposal # 5790

ADM47-IWUIC-19

ADM47-IECC-C-19

Chapter 6

AHAM		Association of Home Appliance Manufacturers	
Standard Reference Number	Title	Referenced in Code(s):	
ANSI/AHAM RAC-1—2008 <u>RAC-1—2015</u>	Room Air Conditioners	IECC	

AHRI		Air-Conditioning, Heating, & Refrigeration Institute	
Standard Reference Number	Title	Referenced in Code(s):	
210/240—2016 <u>240—2017</u>	Performance Rating of Unitary Air-conditioning and Air-source Heat Pump Equipment	IECC	
310/380—2014 <u>380—2017</u> (CSA-C744-04 <u>CSA-C744-17</u>)	Standard for Packaged Terminal Air Conditioners and Heat Pumps	IECC	
390 (I-P)—2015—2003	Performance Rating of Single Package Vertical Air-conditioners and Heat Pumps	IECC	
550/590 (I-P)—2015—2018	Performance Rating of Water-chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle	IECC	
1160 (I-P) —2014	Performance Rating of Heat Pump Pool Heaters <u>(with Addendum 1)</u>	IECC	
ISO/AHRI/ASHRAE 13256-1 (2017 <u>2012</u>)	Water-to-Air and Brine-to-Air Heat Pumps—Testing and Rating for Performance	IECC	IECC
ISO/AHRI/ASHRAE 13256-2 (2017 <u>2012</u>)	Water-to-Water and Brine-to-Water Heat Pumps —Testing and Rating for Performance	IECC	IECC

AMCA		Air Movement and Control Association International	
Standard Reference Number	Title	Referenced in Code(s):	
205—12 <u>205—19</u>	Energy Efficiency Classification for Fans	IECC	
220—08 (R2012) <u>220—19</u>	Laboratory Methods of Testing Air Curtain Units for Aerodynamic Performance Rating	IECC	
500D—12 <u>500D—18</u>	Laboratory Methods for Testing Dampers for Rating	IECC	

ANSI		American National Standards Institute	
Standard Reference Number	Title	Referenced in Code(s):	
Z21.10.3/CSA 4.3—11 <u>4.3—2017</u>	Gas Water Heaters, Volume III—Storage Water Heaters with Input Ratings Above 75,000 Btu per Hour, Circulating Tank and Instantaneous	IECC	IRC®
Z21.47/CSA 2.3—12 <u>2.3—2016</u>	Gas-fired Central Furnaces	IECC	IRC®
Z83.8/CSA 2.6—09 <u>2.6—2016</u>	Gas Unit Heaters, Gas Packaged Heaters, Gas Utility Heaters, and Gas-fired Duct Furnaces	IECC	IRC®

APSP		The Association of Pool & Spa Professionals	
Standard Reference Number	Title	Referenced in Code(s):	
14—2014 <u>14—2019</u>	American National Standard for Portable Electric Spa Energy Efficiency	IECC	

ASHRAE		ASHRAE	
Standard Reference Number	Title	Referenced in Code(s):	
ASHRAE 127-2007 <u>127-2012</u>	Method of Testing for Rating Computer <u>and Data Processing Room Unitary Air Conditioners</u>	IECC	
ANSI/ASHRAE/ACCA Standard 183-2007 <u>183-2014</u> RA2017	Peak Cooling and Heating Load Calculations in Buildings, Except Low-rise Residential Buildings	IECC	
ASHRAE 2016 <u>ASHRAE 2020</u>	ASHRAE HVAC Systems and Equipment Handbook <u>Handbook-2020</u>	IECC	
ISO/AHRI/ASHRAE 13256-1 (2017) <u>2012</u>	Water-to-Air and Brine-to-Air Heat Pumps—Testing and Rating for Performance	IECC	IECC
ISO/AHRI/ASHRAE 13256-2 (2017) <u>2012</u>	Water-to-Water and Brine-to-Water Heat Pumps—Testing and Rating for Performance	IECC	IECC
55-2013 <u>55-2017</u>	Thermal Environmental Conditions for Human Occupancy	IECC	
90.1-2016 <u>90.1-2019</u>	Energy Standard for Buildings Except Low-rise Residential Buildings	IECC	

ASME		American Society of Mechanical Engineers	
Standard Reference Number	Title	Referenced in Code(s):	
ASME A17.1-2016 <u>A17.1-2019</u> CSA B44-16 <u>B44-19</u>	Safety Code for Elevators and Escalators	IEBC® IFC® IRC®	IECC IPMC®

ASTM		ASTM International	
Standard Reference Number	Title	Referenced in Code(s):	
E90-14 <u>C90-2016A</u>	Specification for Load-bearing Concrete Masonry Units	IBC® IRC®	IECC
E1549-09(2014) <u>C1549-2016</u>	Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer	IECC	
E283-04 <u>E283-2004</u> (2012)	Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen	IBC® IECC	IECC IRC®
E779-10(2018)	Standard Test Method for Determining Air Leakage Rate by Fan Pressurization	IECC IRC®	IECC
E903-12 <u>E903-2012</u>	Standard Test Method Solar Absorptance, Reflectance and Transmittance of Materials Using Integrating Spheres (Withdrawn 2005)	IECC	
E1827-11 <u>E1827-2011</u> (2017)	Standard Test Methods for Determining Airtightness of Building Using an Orifice Blower Door	IECC IRC®	IECC
E1918-06(2015) <u>E1918-2016</u>	Standard Test Method for Measuring Solar Reflectance of Horizontal or Low-sloped Surfaces in the Field	IECC	
E2357-11 <u>E2357-2018</u>	Standard Test Method for Determining Air Leakage of Air Barriers Assemblies	IECC	

CRRC		Cool Roof Rating Council	
Standard Reference Number	Title	Referenced in Code(s):	
ANSI/CRRC-S100-2016 <u>CRRC-S100 (2020)</u>	Standard Test Methods for Determining Radiative Properties of Materials	IECC	

CTI		Cooling Technology Institute	
Standard Reference Number	Title	Referenced in Code(s):	
STD-201-11 <u>STD-201RS(17)</u>	Standard for Certification of Water Cooling Towers Thermal Performances	IECC	
DASMA		Door & Access Systems Manufacturers Association, International	
Standard Reference Number	Title	Referenced in Code(s):	
105-2016 <u>105-2017</u>	Test Method for Thermal Transmittance and Air Infiltration of Garage Doors and Rolling Doors	IECC IRC®	IECC
IES		Illuminating Engineering Society	
Standard Reference Number	Title	Referenced in Code(s):	
ANSI/ASHRAE/IESNA 90.1-2016 <u>90.1-2019</u>	Energy Standard for Buildings, Except Low-rise Residential Buildings	IECC	
ISO		International Organization for Standardization	
Standard Reference Number	Title	Referenced in Code(s):	
ISO/AHRI/ASHRAE 13256-1 (2017 <u>2012</u>)	Water-to-Air and Brine-to-Air Heat Pumps -Testing and Rating for Performance	IECC	
ISO/AHRI/ASHRAE 13256-2 (2017 <u>2012</u>)	Water-to-Water and Brine-to-Water Heat Pumps -Testing and Rating for Performance	IECC	
NEMA		National Electrical Manufacturers Association	
Standard Reference Number	Title	Referenced in Code(s):	
MG1-2014 <u>MG1-2016</u>	Motors and Generators	IECC	
NFRC		National Fenestration Rating Council, Inc.	
Standard Reference Number	Title	Referenced in Code(s):	
100-2017 <u>100-2020</u>	Procedure for Determining Fenestration Products U-factors	IECC IRC®	IECC
200-2017 <u>200-2020</u>	Procedure for Determining Fenestration Product Solar Heat Gain Coefficients and Visible Transmittance at Normal Incidence	IECC IRC®	IECC
400-2017 <u>400-2020</u>	Procedure for Determining Fenestration Product Air Leakage	IECC IRC®	IECC
UL		UL LLC	
Standard Reference Number	Title	Referenced in Code(s):	
710-12	Exhaust Hoods for Commercial Cooking Equipment—with Revisions through November 2019 <u>June 2018</u>	IECC IECC	IMC®

727-06.727-2018	Oil-fired Central Furnaces with Revisions through October 2013 <u>Furnaces</u>	IRC®	
731-05.731-2018	Oil-fired Unit Heaters with Revisions through October 2013 <u>Heaters</u>	IECC	IMC®
1784-01.1784-2015	Air Leakage Tests of Door Assemblies with Revisions through February 2015 <u>Assemblies</u>	IBC®	IECC

Reason: THIS IS THE ADMIN STANDARDS UPDATE CODE CHANGE FOR THE IECC-C.

The CP28 Code Development Policy, Section 4.6 requires the updating of referenced standards to be accomplished administratively, and be processed as a Code Change Proposal for consideration by the Administrative Code Change Committee. In September 2018, a letter was sent to each developer of standards that is referenced in the International Codes, asking them to provide ICC with a list of their standards in order to update to the current edition. Listed are the referenced standards that are to be updated based upon responses received from standards developers.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Not applicable.

Proposal # 5794

ADM47-IECC-C-19

ADM47-IECC-R-19

Chapter 6

ACCA		Air Conditioning Contractors of America	
Standard Reference Number	Title	Referenced in Code(s):	
ANSI/ACCA 2 Manual J—16	Residential Load Calculation—Eighth Edition	IECC	
ANSI/ACCA 3 Manual S—14	Residential Equipment Selection	IECC	
APSP		The Association of Pool & Spa Professionals	
Standard Reference Number	Title	Referenced in Code(s):	
ANSI/APSP/ICC 14—2014 14—2019	American National Standard for Portable Electric Spa Energy Efficiency	IECC	IECC IRC® ISPSC®
ANSI/APSP/ICC 15a—2014 15—2020	American National Standard for Residential Swimming Pool and Spa Energy Efficiency —includes Addenda A Approved January 9, 2019 Efficiency	IECC	IECC IRC® ISPSC®
ASHRAE		ASHRAE	
Standard Reference Number	Title	Referenced in Code(s):	
ASHRAE—2017 ASHRAE— 2021	ASHRAE Handbook of Fundamentals	IECC	IMC® IRC®
ASTM		ASTM International	
Standard Reference Number	Title	Referenced in Code(s):	
E283—04 E283— 2004(2012)	Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen	IBC®	IECC IRC®
E779—10 E779— 2010(2018)	Standard Test Method for Determining Air Leakage Rate by Fan Pressurization	IECC	IECC IRC®
E1827—11 E1827— 2011(2017)	Standard Test Methods for Determining Airtightness of Building Using an Orifice Blower Door	IECC	IECC IRC®
DASMA		Door & Access Systems Manufacturers Association	
Standard Reference Number	Title	Referenced in Code(s):	
105—2016 105—2017	Test Method for Thermal Transmittance and Air Infiltration of Garage Doors and Rolling Doors	IECC	IECC IRC®
HVI		Home Ventilating Institute	
Standard Reference Number	Title	Referenced in Code(s):	
916—09 916—18	Airflow Test Procedure	IECC	IRC®
NFRC		National Fenestration Rating Council, Inc.	
Standard Reference Number	Title	Referenced in Code(s):	

100—2017_100—2020	Procedure for Determining Fenestration Products U-factors	IECC IRC®	IECC
200—2017_200—2020	Procedure for Determining Fenestration Product Solar Heat Gain Coefficients and Visible Transmittance at Normal Incidence	IECC IRC®	IECC
400—2017_400—2020	Procedure for Determining Fenestration Product Air Leakage	IECC IRC®	IECC

RESNET	Residential Energy Services Network, Inc.	
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Standard Reference Number	Title	Referenced in Code(s):	
ANSI/RESNET/ICC 301—2014_301—2019	Standard for the Calculation and Labeling of the Energy Performance of Low-rise Residential Buildings Dwelling and Sleeping Units using an Energy Rating Index-First Published March 7, 2014— <u>Republished January 2016</u>	IECC IRC®	IECC
ANSI/RESNET/ICC 300—2016_380—2019	Standard for Testing Airtightness for Building Enclosures, of Building, Dwelling Unit and Sleeping Unit Enclosures: Airtightness of Heating and Cooling Air Distribution Systems, and Airflow of Mechanical Ventilation Systems — <u>Republished January 2016 Systems</u>	IECC IRC®	IECC

UL	UL LLC	
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Standard Reference Number	Title	Referenced in Code(s):	
127—11_127—2011	Standard for Factory-Built Fireplaces—with Revisions through May 2015 <u>Factory-built Fireplaces—with revisions through July 2016</u>	IECC	
515—11_515—2015	Electrical Resistance Heat Tracing for Commercial and Industrial Applications Including Revisions through July 2015	IECC	

Reason: THIS IS THE ADMIN STANDARDS UPDATE CODE CHANGE FOR THE IECC-R.

The CP28 Code Development Policy, Section 4.6 requires the updating of referenced standards to be accomplished administratively, and be processed as a Code Change Proposal for consideration by the Administrative Code Change Committee. In September 2018, a letter was sent to each developer of standards that is referenced in the International Codes, asking them to provide ICC with a list of their standards in order to update to the current edition. Listed are the referenced standards that are to be updated based upon responses received from standard developers.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Not applicable.

Proposal # 5802

ADM47-IECC-R-19

IBC Fire Safety Code Change Proposals

The following code change proposals are labeled as Fire Safety code change proposals because they are proposals for changes to sections in chapters of the International Building Code that are designated as the responsibility of the IBC-Fire Safety Code Development Committee (see page x of the Introductory pages of this monograph). However the changes included in this Group B code development cycle are to sections of the code that have been prefaced with a [S], meaning that they are the responsibility of a different IBC Code Development Committee—IBC-Structural Committee [S].

The committee assigned for each code change proposal is indicated in a banner statement near the beginning of the proposal.

FS1-19

IBC@: [BS] 202, TABLE 1404.2, [BS] 1404.10.2, ANSI Chapter 35 (New)

Proponent: Bill Griese, Tile Council of North America, representing Tile Council of North America (bgriese@tileusa.com); Brian Trimble, International Masonry Institute, representing International Masonry Institute (btrimble@imiweb.org)

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Building Code

Revise as follows:

[BS] PORCELAIN TILE. ~~Tile that conforms to the requirements of ANSI A137.1.3, Section 3.0 for ceramic~~ Ceramic tile having an absorption of 0.5 percent or less in accordance with ANSI A137.1, ~~Section 4.1 and Section 6.1 Table 10.~~ Table 10 or ANSI A137.3, Tables 4 or 5.

**TABLE 1404.2
MINIMUM THICKNESS OF WEATHER COVERINGS**

Portions of table not shown remain unchanged.

COVERING TYPE	MINIMUM THICKNESS (inches)
Porcelain tile	0.25 0.125 nominal

For SI: 1 inch = 25.4 mm, 1 ounce = 28.35 g, 1 square foot = 0.093 m².

- Wood siding of thicknesses less than 0.5 inch shall be placed over sheathing that conforms to Section 2304.6.
- Exclusive of texture.
- As measured at the bottom of decorative grooves.
- 16 ounces per square foot for cold-rolled copper and lead-coated copper, 12 ounces per square foot for copper shingles, high-yield copper and lead-coated high-yield copper.

[BS] 1404.10.2 Exterior adhered masonry veneers—porcelain tile. Adhered units weighing more than 3.5 pounds per square foot (0.17 kN/m²) shall not exceed ~~5/8 inch (15.8 mm) thickness and 24 48 inches (610 1219 mm)~~ in any face dimension nor more than ~~9 9~~ square feet (~~0.28 0.8~~ m²) in total face area and shall not weigh more than ~~9 6~~ pounds ~~psf~~ per square foot (~~0.43 0.29~~ kN/m²). Adhered units weighing less than or equal to 3.5 pounds per square foot (0.17 kN/m²) shall not exceed 72 inches (1829 mm) in any face dimension nor more than 17.5 square feet (1.6 m²) in total face area. Porcelain tile shall be adhered to an approved backing system.

Add new standard(s) as follows:

ANSI

American National Standards Institute
25 West 43rd Street, Fourth Floor
New York NY 10036

A137.3-17: American National Standard Specifications for Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs

Reason: This proposal is being submitted jointly by the Tile Council of North America (TCNA) and the International Masonry Institute (IMI). It has the support of their members and members of ANSI ASC A108 on ceramic tile.

The proposed Code change decreases the maximum allowable weight per square foot and increases the allowable facial size of porcelain tile adhered to building exteriors. It also updates the definition of porcelain tile, which today is standardized per industry specifications ANSI A137.1 and ANSI A137.3, as this more accurately depicts current recommendations from manufacturers and specifiers. The proposal not only acknowledges safer, lighter weight products, it also eliminates heavy products covering a small footprint by reducing the maximum allowable weight per square foot from 9 lbs to 6 lbs.

Currently, Section 1404.10.2 does not accurately reflect the most common porcelain tiles suitable for adhered exterior applications. Typical porcelain tile sizes today are larger than those limited by Code and, in some cases, thinner and lighter. Additionally, adhesives today are stronger and more flexible and have increased open time to facilitate full coverage across larger areas for installation.

In the past, porcelain tiles in the marketplace ranged in thickness from 5/16 inch to 3/8 inch and few were produced larger than 12 inches x 24 inches. Today, however, porcelain tiles are manufactured using conventional pressing technology as large as 48 x 48 inches. Additionally, newer press and extrusion technologies allow for lighter weight products, some as thin as 1/8 inch (which is the basis for the proposed revision to Table 1404.2 that reduces the minimum porcelain tile thickness from 0.25 inch to 0.125 inch) while still maintaining or exceeding material strength properties of porcelain tiles twice their thickness. Currently, porcelain tiles may be manufactured as large as 6 ft x 12 ft.

This proposal defines two distinct classes of porcelain tile commonly used in exterior adhered applications: those weighing less than or equal to 3.5

psf and those weighing more than 3.5 psf. For porcelain tiles weighing less than 3.5 psf, a limit of 17.5 square feet and 6 ft edge length is being proposed. This allows porcelain tiles manufactured as large as 6 ft x 12 ft to be cut modularly to meet the proposed Code criteria and to be installed within existing industry expansion joint spacing criteria.

For porcelain tiles weighing between 3.5 and 6.0 psf, the proposed limitation of 9 square feet and 4 ft edge length is being proposed to accommodate sizes which are commonly produced at conventional thicknesses and weights and still be safely adhered to building exteriors. Some common porcelain tile sizes today which are currently restricted by Code include 2 ft x 2 ft squares, 2 ft x 4 ft rectangles, and 6 in x 48 in planks.

While larger porcelain tile unit sizes are available than those in the criteria being proposed (e.g. tiles below 3.5 psf are available as large as 6 ft x 12 ft, and tiles above 3.5 psf are available as large as 4 ft x 4 ft), the goal of this proposal is to maintain a limit such that individual unit sizes do not exceed approximately 60 lbs. With this in mind, it is proposed that the maximum allowable weight per square foot be reduced by 33%.

The following are examples of common tile thickness, associated weight, and maximum possible unit weight based on proposed edge length, area, and weight per square foot limits.

Estimated Weight Based On Tile Thickness:		
Thickness	Weight/Area	Total Weight for Maximum Tile Size as Proposed
1/8 in (3.2 mm)	1.6 psf (0.08 kN/m ²)	28 lb (13 kg)
3/16 in (4.8 mm)	2.4 psf (0.12 kN/m ²)	43 lb (19 kg)
1/4 in (6.4 mm)	3.3 psf (0.16 kN/m ²)	57 lb (26 kg)
5/16 in (7.9 mm)	4.1 psf (0.19 kN/m ²)	37 lb (17 kg)
3/8 in (9.5 mm)	4.9 psf (0.23 kN/m ²)	44 lb (20 kg)
7/16 in (11.1 mm)	5.7 psf (0.27 kN/m ²)	51 lb (23 kg)

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Porcelain tiles addressed by this proposal are already standardized and used in practice.

Proposal # 4160

FS1-19

FS2-19

IBC®: 202 (New), [BS] 1404.14.1

Proponent: Matthew Dobson, Vinyl Siding Institute, representing Vinyl Siding Institute (mdobson@vinylsiding.org)

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Building Code

Add new definition as follows:

Nailable Substrate. A product or material such as framing, sheathing, or furring, composed of wood or wood-based materials or other materials providing fastener withdrawal resistance.

Revise as follows:

[BS] 1404.14.1 Application. The siding shall be applied over sheathing or materials listed in Section 2304.6. Siding shall be applied to conform to the *water-resistive barrier* requirements in Section 1402. Siding and accessories shall be installed in accordance with *approved* manufacturer's instructions. Unless otherwise specified in the *approved* manufacturer's instructions, nails used to fasten the siding and accessories shall have a minimum 0.313-inch (7.9 mm) head diameter and $\frac{1}{8}$ -inch (3.18 mm) shank diameter. The nails shall be corrosion resistant and shall be long enough to penetrate ~~the studs or nailing strip~~ a nailable substrate not less than $\frac{3}{4}$ inch (19 mm). For cold-formed steel light-frame construction, corrosion-resistant fasteners shall be used. Screw fasteners shall penetrate the cold-formed steel framing not fewer than three exposed threads. Other fasteners shall be installed in accordance with the *approved* construction documents and manufacturer's instructions. Where the siding is installed horizontally, the fastener spacing shall not exceed 16 inches (406 mm) horizontally and 12 inches (305 mm) vertically. Where the siding is installed vertically, the fastener spacing shall not exceed 12 inches (305 mm) horizontally and 12 inches (305 mm) vertically.

Reason: This change simply broadens how nailing strips and other nailable wood substrates are referenced. It offers a performance approach, by offering the potential for innovative nailing equivilencies, and creates a more generic term "nailable" substrate. This change will also make the IBC consistant with the IRC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
It is a change in concept.

Proposal # 5112

FS2-19

FS3-19

IBC®: [BS] 1404.14, [BS] 1404.14.1, 1404.14.1.1 (New), 1404.14.1.2 (New), 1404.14.2 (New)

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

Proponent: Matthew Dobson, representing Vinyl Siding Institute (mdobson@vinylsiding.org)

2018 International Building Code

Revise as follows:

[BS] 1404.14 Vinyl siding. Vinyl siding conforming to the requirements of this section and complying with ASTM D3679 shall be permitted on ~~exterior walls of buildings located in areas where V_{avg} as~~ where the design wind pressure determined in accordance with Section 1609.3.1 does not exceed 100 miles per hour (45 m/s) and the ~~building height is less than or equal to 40 feet (12 192 mm) in Exposure C. Where construction is~~ located in areas where ~~V_{avg} as determined in accordance with Section 1609.3.1 exceeds 100 miles per hour (45 m/s), or building heights are in~~ excess of 40 feet (12 192 mm) 30 psf. Where the design wind pressure exceeds 30 psf, tests or calculations indicating compliance with Chapter 16 shall be submitted. Vinyl siding shall be secured to the building so as to provide weather protection for the *exterior walls* of the building.

[BS] 1404.14.1 Application. The siding shall be applied over sheathing or materials listed in Section 2304.6. Siding shall be applied to conform to the *water-resistive barrier* requirements in Section 1402. Siding and accessories shall be installed in accordance with ~~approved manufacturer's~~ instructions. ~~Unless otherwise specified in the approved manufacturer's instructions, nails used to fasten the siding and accessories shall have a~~ minimum 0.313-inch (7.9 mm) head diameter and ~~$1/8$ -inch (3.18 mm) shank diameter. The nails shall be corrosion resistant and shall be long enough~~ to penetrate the studs or nailing strip not less than ~~$3/4$ -inch (19 mm).~~ For cold-formed steel light-frame construction, ~~corrosion-resistant fasteners~~ shall be used. Screw fasteners shall penetrate the cold-formed steel framing not fewer than three exposed threads. Other fasteners shall be installed in accordance with the ~~approved construction documents and manufacturer's instructions. Where the siding is installed horizontally, the~~ fastener spacing shall not exceed 16 inches (406 mm) horizontally and 12 inches (305 mm) vertically. ~~Where the siding is installed vertically, the~~ fastener spacing shall not exceed 12 inches (305 mm) horizontally and 12 inches (305 mm) vertically. ~~the approved manufacturer's instructions.~~

Add new text as follows:

1404.14.1.1 Fasteners and fastener penetration for wood construction. Unless otherwise specified in the approved manufacturer's instructions, nails used to fasten the siding and accessories shall be corrosion resistant and have a minimum 0.313-inch (7.9 mm) head diameter and $1/8$ -inch (3.18 mm) shank diameter. The total penetrative into nailable substrate shall be not less than 1 1/4 inch " inches (32 mm).

1404.14.1.2 Fastener spacing Unless specified otherwise by the manufacturer's instructions, fasteners shall be installed in the center of the slots of the nail hem and maximum spacing between fasteners shall be 16 inches (406 mm) for horizontal siding and 12 inches (305 mm) for vertical siding.

1404.14.2 Fasteners and fastener penetration for cold-formed steel light frame construction. For cold-formed steel light-frame light-framed construction, corrosion resistant fastener shall be used. Screw fasteners shall penetrate the cold-formed steel framing at least three exposed threads. Other fasteners shall be installed in accordance with the approved construction documents and manufacturer's instructions.

Reason: This change is mainly editorially. It cleans up and updates references to how to determine the suitability of siding in normal wind areas and high wind areas, by referencing the 30 psf threshold.

We break a part of the large complicated paragraph into several more simple paragraphs relating to installation over wood construction vs. metal construction.

Two changes that are important are the increased penetration requirement into the nailable substrate of the fasteners for wood construction from 3/4" to 1 1/4", this is an important and necessary change based on study and research over the last few years. This change will make the IBC consistent with the IRC. We also added a pointer to install the product in the middle of the nail hem for optimal performance relating to thermal expansion and contraction.

Cost Impact: The code change proposal will increase the cost of construction. There will be minor costs relating to larger fastener size for the increased penetration depth.

Proposal # 5297

FS3-19

FS4-19

IBC: 202 (New), 1404.19 (New), 1404.19.1 (New), 1404.19.1.1 (New), 1404.19.1.2 (New), 1404.19.2 (New), ASTM Chapter 35 (New)

Proponent: Matthew Dobson, Vinyl Siding Institute, representing Vinyl Siding Institute (mdobson@vinylsiding.org)

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Building Code

Add new definition as follows:

Insulated Vinyl Siding. A cladding product, with manufacturer-installed foam plastic insulated material as an integral part of the cladding product, having a thermal resistance of not less than R-2.

Add new text as follows:

1404.19 Insulated Vinyl Siding. Insulated Vinyl Siding complying with ASTM D7793 shall be permitted on exterior walls where the design wind pressure determined in accordance with 1609 does not exceed 30 psf. Where the design wind pressure exceeds 30 psf, tests or calculations indicating compliance with Chapter 16 shall be submitted. Siding shall be secured to the building so as to provide weather protection for the exterior walls of the building.

1404.19.1 Application. The siding shall be applied over sheathing or materials listed in Section 2304.6. Siding shall be applied to conform to the water-resistive barrier requirements in Section 1403.

1404.19.1.1 Fasteners and fastener penetration for wood construction. Unless otherwise specified in the approved manufacturer's instructions, nails used to fasten the siding and accessories shall be corrosion resistant and have a minimum 0.313-inch (7.9 mm) head diameter and 1/8-inch (3.18 mm) shank diameter. The total penetrative into nailable substrate shall be not less than 1 1/4" inches (32 mm).

1404.19.1.2 Fastener spacing. Unless specified otherwise by the manufacturer's instructions, fasteners shall be installed in the center of the slots of the nail hem and maximum spacing between fasteners shall be 16 inches (406 mm) for horizontal siding and 12 inches (305 mm) for vertical siding.

1404.19.2 Fasteners and fastener penetration for cold-formed steel light frame construction. For cold-formed steel light-framed construction, corrosion resistant fastener shall be used. Screw fasteners shall penetrate the cold-formed steel framing at least three exposed threads. Other fasteners shall be installed in accordance with the approved construction documents and manufacturer's instructions.

Add new standard(s) as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken PA 19428-2959

ASTM D7793-17: Standard Specification for Insulated Vinyl Siding

Reason: Insulated vinyl siding has been commercially available for almost 25 year and is being used in many low-rise apartments, hotels, and other light commercial applications. Published code compliance reports (ES reports) make it clear how insulated vinyl siding complies with the the IBC. By adding in these installation provisions it will help code officials to be able recognized both the proper standard for the product category and ensure proper installation of the product.

In the past, arguments have been made that the flame spread test be conducted on both the vinyl and foam together. This issue was well hashed out in the ASTM world. And the standard reflects the concensus of ASTM where these types of issues are typically decided. Vinyl has great fire properties including low flame spread and a low oxygen index. So adding this requirement that the product be tested as an assembly does not seem necessary. We don't require testing of cladding over foam sheathing for flame spread. It is not necessary to test insulated vinyl siding as an assembly.

The code does have certain additional requirements that are currently applicable to insulated vinyl siding when it is used in certain high density applications. Including being required to pass an NFPA 268 test and an ASTM E119 test. The product can and has passed both of these tests, as has been submitted previously.

The built environment would benefit from stronger recognition of this product category in the code, now that it has been in use for 25 years.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This is a simple recognition of product being used in the commercial market.

Proposal # 5214

FS4-19

IBC General Code Change Proposals

The following code change proposals are labeled as General code change proposals because they are proposals for changes to sections in chapters of the International Building Code that are designated as the responsibility of the IBC-General Code Development Committee (see page x of the Introductory pages of this monograph). However the changes included in this Group B code development cycle are to sections of the code that have been prefaced with a [S] and [RB], meaning that they are the responsibility of a different IBC Code Development Committee—IBC-Structural Committee [S] and IRC Code Development Committee—IRC-Building.

The committees assigned for each code change proposal is indicated in a banner statement near the beginning of the proposal.

G1-19

IBC@: [BS] 202

Proponent: Oren Guttman, McFarland Johnson, representing self (oguttman@mjinc.com)

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Building Code

Revise as follows:

[BS] ALLOWABLE STRESS DESIGN. A method of proportioning structural members, such that elastically computed stresses produced in the members by ~~nominal~~ allowable loads do not exceed specified allowable stresses (also called "working stress design").

Reason: In the 2018 IBC the use of the word nominal has been updated throughout section 1609 to indicate that the unfactored W , which is W_{ult} , is also $W_{nominal}$. Most notably in section 1609.3.1 where the word nominal was removed. In the 2018 IBC section 1609.3.1 reads $V_{asd} = allowable...$, whereas in the 2015 IBC section 1609.3.1 read $V_{asd} = nominal...$

W_{asd} is no longer $W_{nominal}$, though it is still being used that way by many engineers. The one last place I have found to update this is in the definition of allowable stress design in chapter 2.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
There are no construction cost impacts to this change.

Proposal # 3725

G1-19

G2-19

IBC®: [BS] 202; IEBC®: [BS] 202

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE

2018 International Building Code

Revise as follows:

[BS] DANGEROUS. Any building, structure or portion thereof that meets any of the conditions described below shall be deemed dangerous:

1. The building or structure has collapsed, has partially collapsed, has moved off its foundation or lacks the necessary support of the ground.
2. There exists a significant risk of collapse, detachment or dislodgment of any portion, member, appurtenance or ornamentation of the building or structure under ~~service loads~~ permanent, routine, or frequent loads; under actual loads already in effect; or under snow, wind, rain, flood, earthquake, or other environmental loads when such loads are imminent.

2018 International Existing Building Code

[BS] DANGEROUS. Any building, structure or portion thereof that meets any of the conditions described below shall be deemed dangerous:

1. The building or structure has collapsed, has partially collapsed, has moved off its foundation, or lacks the necessary support of the ground.
2. There exists a significant risk of collapse, detachment or dislodgement of any portion, member, appurtenance or ornamentation of the building or structure under ~~service loads~~ permanent, routine, or frequent loads; under actual loads already in effect; or under snow, wind, rain, flood, earthquake, or other environmental loads when such loads are imminent.

Reason: This proposal solves a problem with the definition of Dangerous going back to 2010. This proposal presents the consensus of the proponents, the IBC-S committee, and the Public Comment voters regarding proposal G4-16 in the last cycle.

The problem involves the words "service loads" in the current definition. With IBC Interpretation 23-10 (issued 12/8/2010), ICC interpreted "service loads" to be the same as "nominal" or unfactored loads, but this is incorrect and contrary to the intent of the definition when it was written.

In the last cycle, the IBC-S committee deliberated over a number of ways to clarify the intent and settled on the best solution: simply to remove the words "service loads" and replace them with the text shown here. This solution avoids any conflict with definitions or interpretations of "service loads" in other codes or standards. With this consensus, the IBC-S committee Disapproved G4 and asked the proponent to revise the proposal accordingly with a public comment.

At the PCH, G4-16 was easily approved as modified (and as shown here) by a show of hands. 58% of OGV voters supported the modified proposal, but since the PCH hand votes could not be added, the OGV vote fell short of the 2/3 requirement, and the clear consensus from the IBC-S committee, the proponent, and the PCH voters could not be approved.

For those concerned about interpretation of any of the new text, note: 1. This issue was already considered by IBC-S and by the PCH voters, who approved the text as shown. 2. The CURRENT definition already includes wording -- "necessary support," "significant risk" -- that requires some interpretation and judgment. 3. The whole purpose of this definition, as documented clearly in the reason statements when the definition was changed several cycles ago, is to give discretion to the code official and to rely on the code official's judgment, so that a designation of dangerous, and protection of the public, need not wait for the results of a quantitative test or analysis.

Bibliography: IBC Interpretation 23-10 is available at https://www2.iccsafe.org/cs/committeeArea/pdf_file/EB_09_23_10.pdf.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal merely clarifies the current code intent.

Proposal # 4634

G2-19

G3-19

BC: [BS] 202

Proponent: Jennifer Goupil, American Society of Civil Engineers (ASCE), representing American Society of Civil Engineers (ASCE) (jgoupil@asce.org)

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE

2018 International Building Code

Revise as follows:

[BS] DEAD LOAD. The weight of materials of construction incorporated into the building, including but not limited to walls, floors, roofs, ceilings, stairways, built-in partitions, finishes, cladding and other similarly incorporated architectural and structural items, and the weight of fixed service equipment, ~~such as cranes, plumbing stacks and risers, electrical feeders, heating, ventilating and air conditioning systems and automatic sprinkler systems, including cranes and material handling systems.~~

Reason: This proposal coordinates the definition of Dead Load in the IBC with the definition contained in the referenced design load standard, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7). Note, this change is editorial and does not change which items are considered as dead load.

This change also simplifies the text of the IBC. The detailed list of fixed service equipment items, plumbing stacks and risers, electrical feeders, etc., is removed and the general term material handling systems is added. Both changes coordinate the IBC with ASCE 7. Detailed lists unnecessarily complicate definitions and are better suited for commentary text. In fact, the IBC commentary already lists these items and more, except electrical feeders. To coordinate with this proposal, electrical feeders should be added to the text of IBC commentary by ICC staff.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal contains editorial changes and clarifications.

Proposal # 3792

G3-19

G4-19 Part I

PART I — IBC®: 202 (New)

PART II — IRC®: 202 (New)

Proponent: Tim Earl, representing The Gypsum Association (tearl@gbhinternational.com)

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE

2018 International Building Code

Add new definition as follows:

GLASS MAT GYPSUM PANEL A gypsum panel consisting of a noncombustible core primarily of gypsum, surfaced with glass mat partially or completely embedded in the core.

GYPSUM SHEATHING Gypsum panel products specifically manufactured with enhanced water resistance for use as a substrate for exterior surface materials.

GYPSUM WALLBOARD A gypsum board used primarily as an interior surfacing for building structures.

Proposal # 4906

G4-19 Part I

G4-19 Part II

IRC®: 202 (New)

Proponent: Tim Earl, representing The Gypsum Association (tearl@gbhinternational.com)

2018 International Residential Code

Add new definition as follows:

GLASS MAT GYPSUM PANEL A gypsum panel consisting of a noncombustible core primarily of gypsum, surfaced with glass mat partially or completely embedded in the core.

GYPSUM SHEATHING Gypsum panel products specifically manufactured with enhanced water resistance for use as a substrate for exterior surface materials.

GYPSUM WALLBOARD A gypsum board used primarily as an interior surfacing for building structures.

Reason: This clarifies the terms already used in the code and harmonizes the terms and definitions to what is being used by ASTM and the industry than what currently exists. These same definitions are also being proposed for the IBC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This simply clarifies the terms and harmonizes to what is being used by ASTM and the industry.

Proposal # 4913

G4-19 Part II

G5-19

IBC®: [BS] 202; IFC®: [BS] 202

Proponent: Tim Earl, representing The Gypsum Association (tearl@gbhinternational.com)

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE

2018 International Building Code

Revise as follows:

[BS] GYPSUM BOARD. ~~The generic name for a family of sheet products consisting of a noncombustible core primarily of gypsum with paper surfacing. Gypsum wallboard, gypsum sheathing, gypsum base for gypsum veneer plaster, exterior gypsum soffit board, predecorated gypsum board and water-resistant gypsum backing board complying with the standards listed in Tables 2506.2, 2507.2 and Chapter 35 are types of gypsum board.~~

[BS] GYPSUM PANEL PRODUCT. ~~The general name for a family of sheet products consisting essentially of gypsum. Gypsum board and glass mat gypsum panels are examples of gypsum panel products.~~

2018 International Fire Code

[BS] GYPSUM BOARD. ~~Gypsum wallboard, gypsum sheathing, gypsum base for gypsum veneer plaster, exterior gypsum soffit board, predecorated gypsum board or water-resistant gypsum backing board complying with the standards listed in Tables 2506.2 and 2507.2 and Chapter 35 of the International Building Code.~~ The generic name for a family of sheet products consisting of a noncombustible core primarily of gypsum with paper surfacing.

Reason: This proposal revises the definitions to match the definitions in industry publications and ASTM standards, making them more technically correct.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is an administrative change with no impact on cost.

Proposal # 4377

G5-19

G6-19

IBC®: 202 (New)

Proponent: Gregory Robinson, representing National Council of Structural Engineers Associations (NCSEA) (grobenson@lbyd.com)

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE

2018 International Building Code

Add new definition as follows:

HIGH-LOAD DIAPHRAGM. A wood structural panel blocked diaphragm utilizing multiple rows of fasteners.

Reason: The phrase “high-load diaphragm” is used in Chapter 17 and Chapter 23 without ever receiving a formal definition in Chapter 2. The definition provided here is intended to align with the common usage in Table 2306.2(2). As this phrase has no “ordinarily accepted meaning” it is appropriate to define it explicitly in Chapter 2.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
There will be no increase in construction cost from this proposal, as the goal is purely to improve clarity of the existing code requirements.

Proposal # 4220

G6-19

G7-19

IBC®: 202 (New)

Proponent: John Woestman, Kellen Company, representing Extruded Polystyrene Foam Association (jwoestman@kellencompany.com)

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE

2018 International Building Code

Add new definition as follows:

OCCUPIABLE ROOF. An unenclosed space on a roof designed for human occupancy in which individuals congregate for amusement, educational or similar purposes and which is equipped with means of egress meeting the requirements of this code.

Reason: There needs to be a clear definition of “occupiable roof” to help alleviate confusion with the definition of occupiable space. A roof is not an enclosed space, therefore the thermal barrier requirements, smoke development index, etc., used with interior finishes of an enclosed space does not apply. Rather, the occupiable roof should be constructed as a roof meeting the Occupancy Classification and Use in Section 302.1, height and area limitations in Section 503.1, the structural requirements of Chapter 16, and egress requirements as specified by the code. The existing roof fire requirements in IBC Sections 1505.1, 1508.1, 2603.3 Exception 3, 2603.4.1.5 and 2603.6 also apply to occupiable roofs.

The proposed definition was derived from the current definition of occupiable space.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal should not affect the cost of construction.

Proposal # 5181

G7-19

G8-19

IBC®: [BS] 202

Proponent: Wanda Edwards, Wanda Edwards Consulting, Inc., representing RCI, Inc. (wedwards@rci-online.org)

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE

2018 International Building Code

Revise as follows:

[BS] POSITIVE ROOF DRAINAGE. The drainage condition in which ~~consideration has been made~~ an evaluation is required for all loading deflections of the roof deck, and additional slope ~~has been~~ shall be provided to ensure drainage of the roof within 48 hours of precipitation.

Reason: The first part of the change is to delete the term consideration and replace it with evaluation. The term consideration is vague and unenforceable. The change will clarify that an evaluation is required – not just a consideration. The definition of positive roof drainage refers to the drainage condition where **consideration** has been made for loading deflections. The term consideration is vague and unenforceable. This change clarifies that an evaluation is required – not consideration. The term evaluation is consistent with the provisions in Section 1608 and 1611 on ponding instability. The link between 1608, 1611 and definition of positive drainage will be described below.

The definition does not describe what drainage conditions require consideration. If you go to Section 1511.1, Exception #1 you see that the condition mentioned in the definition of positive roof drainage is where the roof does not provide the code required minimum slope of 1/4" inch per foot. So, the definition allows roofs without the minimum slope if "consideration" has been made for all loading deflections of the roof deck, and additional slope has been provided to ensure drainage of the roof within 48 hours of precipitation.

The route to determine that an evaluation is required is a long and winding road. The code defines susceptible bay as a roof or portion thereof with a slope less than 1/4" inch per foot. If you look at Section 1608 - Snow Loads and 1611 - Rain Loads, you will see that both sections require an evaluation of susceptible bays in accordance with ASCE 7. It is clear that roofs or portions of roofs that do not provide the minimum slope are considered susceptible bays and require an evaluation and must provide positive drainage.

Roofs that do not provide the minimum slope required by the code are more prone to collapse due to the accumulation of water. It should be clear in the definition that an evaluation is required. Also, the definition is in past tense; *consideration has been made, additional slope has been provided*. The language should be changed to say *shall* in lieu of has been. It is mandatory that these two requirements be met, and the definition should state that

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal is to clarify the current requirements of the code. The proposal will not change the current code requirements and will not increase or decrease the cost of construction.

Proposal # 5235

G8-19

G9-19

IBC®: [BF] 202

Proponent: Mike Fischer, Kellen Company, representing The Asphalt Roofing Manufacturers Association (mfischer@kellencompany.com)

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE

2018 International Building Code

Revise as follows:

[BF] STEEP SLOPE. A roof slope ~~greater than~~ two units vertical in 12 units horizontal (17-percent slope) or greater.

Reason: Steep slope roofing requirements are triggered at a slope of 2:12. Low slope requirements in Sections 1504.6 and 1504.7 are triggered at "less than" 2:12. Asphalt shingles are defined as a steep slope roof covering; Section 1507.2.2 permits installation of asphalt shingles at 2:12 or greater. Underlayment requirements include roof slope of equal to or greater than 2:12 in Table 1507.1.1(2). The proposal corrects the definition to be consistent with the requirements in Chapter 15.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The proposal is editorial.

Proposal # 5665

G9-19

G10-19

IBC: [BS] 202

Proponent: Kristen Owen, Cosultant, representing Self (kowen4568@gmail.com)

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE

2018 International Building Code

Revise as follows:

[BS] TREATED WOOD. Wood products that are ~~conditioned to enhance fire-retardant or preservative properties.~~ modified to reduce deterioration and destruction by wood destroying organisms and fire .

Reason: The word "conditioned" in the current definition does not relate to Treated Wood. "Conditioned" references moisture control which is not part of the definition of Treated Wood.

This Code change proposal reflects a clearer definition of Treated Wood and brings the Code up to date by the inclusion of newer standards in the referenced American Wood Protection Association Standards.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is a definition change only and therefore no cost change to construction.

Proposal # 2133

G10-19

G11-19

IBC®: (New)

Proponent: Edwin Huston, representing National Council of Structural Engineers' Associations (NCSEA (huston@smithhustoninc.com))

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE

2018 International Building Code

Add new definition as follows:

Underpinning The alteration of an existing foundation to transfer loads to a lower elevation using new piers, piles, or other permanent structural support elements installed below the existing foundation.

Reason: Underpinning is referenced multiple times in the code with no clear definition as to what constitutes underpinning and separates it from the temporary bracing used to install it. This definition will bring clarity to the existing use in the code.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal only adds a definition.

Proposal # 5463

G11-19

G12-19 Part I

PART I — IBC®: [BS] 202

PART II — IRC: [RB]202

Proponent: Don Scott, Representing National Council of Structural Engineers Association, representing Representing National Council of Structural Engineers Association (dscott@pcs-structural.com)

THIS IS A TWO PART PROPOSAL. PART I WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. PART II WILL BE HEARD BY THE IRC-BUILDING COMMITTEE. PLEASE CHECK THE RESPECTIVE HEARING AGENDAS.

2018 International Building Code

Revise as follows:

[BS] WINDBORNE DEBRIS REGION. Areas within hurricane-prone regions located:

1. Within 1 mile (1.61 km) of the ~~eastal~~ mean high-water line, where an Exposure D condition exists upwind at the waterline and the basic design wind speed, V , is 130 mph (58 m/s) or greater; or
2. In areas where the basic design wind speed is 140 mph (63.6 m/s) or greater.

For *Risk Category* II buildings and structures and *Risk Category* III buildings and structures, except health care facilities, the windborne debris region shall be based on Figure 1609.3.(1). For *Risk Category* IV buildings and structures and *Risk Category* III health care facilities, the windborne debris region shall be based on Figure 1609.3(2).

Proposal # 5425

G12-19 Part I

G12-19 Part II

IRC: [RB]202

Proponent: Don Scott, Representing National Council of Structural Engineers Association, representing Representing National Council of Structural Engineers Association (dscott@pcs-structural.com)

2018 International Residential Code

[RB] WINDBORNE DEBRIS REGION. Areas within *hurricane-prone regions* located in accordance with one of the following:

1. Within 1 mile (1.61 km) of the ~~coastal~~ mean high-water line where an Exposure D condition exists upwind at the waterline and the ultimate design wind speed, V_{ult} is 130 mph (58 m/s) or greater.

2. In areas where the ultimate design wind speed, V_{ult} is 140 mph (63.6 m/s) or greater; or Hawaii.

Reason: Significant confusion has arisen in hurricane-prone regions in trying to determine windborne debris regions because the term "coastal mean high waterline" is not a mapped or defined term. Due to this lack of definition, some jurisdictions have incorrectly interpreted areas within 1 mile of the mean high waterline along narrow inland tidal waterways to be in windborne debris regions. The primary intent behind paragraph No. 1, is that within one mile of the coast, hurricane wind speeds will be governed by the wind speed over the open water, i.e. an Exposure Category D rather than an inland Exposure Category C situation on which the basic wind speed and paragraph No. 2 are based. This CCP clarifies that the waterline has to be classified as an Exposure D in order for paragraph No. 1 to apply. It also deletes the word "coastal" since wind speed increases could occur at large inland waterways in hurricane-prone regions as well. Also, NOAA maintains a database of the "mean high waterline" values in the US, which can be used in conjunction with this definition.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This code change proposal is location dependent on its impact on construction costs, however by providing a definition of the windborne debris zone, it will eliminate confusion as to where to apply the windborne debris protection requirements.

Proposal # 5747

G12-19 Part II

G13-19

IBC: [BS] 403.2.3.1, [BS] 403.2.3.2, [BS] 403.2.3.4

Proponent: Michael Schmeida, Gypsum Association, representing Gypsum Association

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE

2018 International Building Code

[BS] 403.2.3 Structural integrity of interior exit stairways and elevator hoistway enclosures. For *high-rise buildings of Risk Category III or IV* in accordance with Section 1604.5, and for all buildings that are more than 420 feet (128 m) in *building height*, enclosures for *interior exit stairways* and elevator hoistway enclosures shall comply with Sections 403.2.3.1 through 403.2.3.4.

Revise as follows:

[BS] 403.2.3.1 Wall assembly materials - Soft Body Impact. The ~~wall assemblies~~ panels making up the enclosures for *interior exit stairways* and elevator hoistway enclosures shall meet or exceed Soft Body Impact Classification Level 2 as measured by the test method described in ASTM C1629/C1629M.

[BS] 403.2.3.2 Wall assembly materials - Hard Body Impact. The ~~face of the wall assemblies~~ panels making up the enclosures for *interior exit stairways* and elevator hoistway enclosures that are not exposed to the interior of the enclosures for *interior exit stairways* or elevator hoistway enclosure shall be ~~constructed~~ in accordance with one of the following ~~methods~~:

1. The wall assembly shall incorporate ~~not no~~ fewer than two layers of impact-resistant ~~construction board~~ panels, each of which meets or exceeds Hard Body Impact Classification Level 2 as measured by the test method described in ASTM C1629/C1629M.
2. The wall assembly shall incorporate ~~not no~~ fewer than one layer of impact-resistant ~~construction material~~ panels that meets or exceeds Hard Body Impact Classification Level 3 as measured by the test method described in ASTM C1629/C1629M.
3. The wall assembly incorporates multiple layers of any material, tested in tandem, that meets or exceeds Hard Body Impact Classification Level 3 as measured by the test method described in ASTM C1629/C1629M.

[BS] 403.2.3.3 Concrete and masonry walls. Concrete or masonry walls shall be deemed to satisfy the requirements of Sections 403.2.3.1 and 403.2.3.2.

Revise as follows:

[BS] 403.2.3.4 Other wall ~~assemblies~~ materials. Any other wall ~~assembly materials~~ that ~~provides~~ provide impact resistance equivalent to that required by Sections 403.2.3.1 and 403.2.3.2 for Hard Body Impact Classification Level 3, as measured by the test method described in ASTM C1629/C1629M, shall be permitted.

Reason: This clarifies that it is the wall panel/material that is tested per C1629/C1629M and not a full wall assembly. Full wall assembly testing is outside of the scope of C1629/C1629M. Section 1.1.1 of C1629/C1629M states, "panel product performance is not intended to classify the system for abuse resistance."

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is simply a clarification of the application of C1629/C1629M

Proposal # 4493

G13-19

G14-19

IBC@: [BS] 403.2.3.1, [BS] 403.2.3.2, [BS] 403.2.3.4

Proponent: Tim Earl, representing The Gypsum Association (tearl@gbhinternational.com)

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE

2018 International Building Code

Revise as follows:

[BS] 403.2.3.1 Wall assembly. The wall assemblies making up the enclosures for *interior exit stairways* and elevator hoistway enclosures shall meet or exceed Soft Body Impact Classification Level 2 as measured by the test method described in ASTM C1629/1629M when tested from the exterior side of the enclosures.

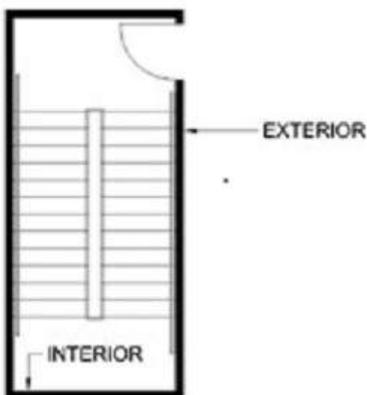
[BS] 403.2.3.2 Wall assembly materials. The exterior face of the wall assemblies making up the enclosures for *interior exit stairways* and elevator hoistway enclosures ~~that are not exposed to the interior of the enclosures for interior exit stairways or elevator hoistway enclosure~~ shall be constructed in accordance with one of the following methods:

1. The wall assembly shall incorporate not fewer than two layers of impact-resistant construction board each of which meets or exceeds Hard Body Impact Classification Level 2 as measured by the test method described in ASTM C1629/C1629M.
2. The wall assembly shall incorporate not fewer than one layer of impact-resistant construction material that meets or exceeds Hard Body Impact Classification Level 3 as measured by the test method described in ASTM C1629/C1629M.
3. The wall assembly incorporates multiple layers of any material, tested in tandem, that meets or exceeds Hard Body Impact Classification Level 3 as measured by the test method described in ASTM C1629/C1629M.

[BS] 403.2.3.4 Other wall assemblies. Any other wall assembly that provides impact resistance equivalent to that required by Sections 403.2.3.1 for Soft Body Impact Classification Level 3 and 403.2.3.2 for Hard Body Impact Classification Level 3, as measured by the test method described in ASTM C1629/C1629M, shall be permitted.

Reason: This proposal clarifies which side of these enclosure wall assemblies must be tested for abuse and impact resistance. 403.2.3.2 currently states that the exterior side is tested, but it does so in very confusing language. This proposal cleans that up and reiterates the point in 403.2.3.1. Also note that, due to the manner of construction of these enclosure wall assemblies, testing from the exterior side represents the worst case. This proposal also cleans up 403.2.3.4, which currently implies that 403.2.3.1 and 403.2.3.2 both apply to hard body impact testing, which is not the case. The first section is for soft body impact testing. This is simply a grammatical revision that clarifies the intent of the section.

For clarification, the exterior side is the side which does not face into the enclosure, as the figure below illustrates.



Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal simply clarifies the requirements in this section, with no technical changes.

Proposal # 4412

G14-19

G15-19

IBC: 3307.2(New), 3307.2.1(New), 3307.2.2(New), 3307.2.3(New)

Proponent: Dale Biggers, P.E. GeoCoalition, representing GeoCoalition (dbiggers@bohbro.com); Daniel Stevenson, P.E., representing GeoCoalition (dstevenson@berkelapg.com); Lori Simpson, P.E., G.E., representing GeoCoalition (lsimpson@langan.com)

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE

2018 International Building Code

Add new text as follows:

3307.2 Excavation retention systems. Where a retaining system is used to provide support of an excavation for protection of adjacent structures, the system shall conform to the requirements in Section 3307.2.1 through 3307.2.3.

3307.2.1 Excavation retention system design. Excavation retention systems shall be designed by a registered design professional to provide vertical and lateral support.

3307.2.2 Excavation retention system monitoring. The retention system design shall include requirements for monitoring of the system and adjacent structures for horizontal and vertical movement. The earth retention system design shall be modified as determined by the monitoring.

3307.2.3 Retention system removal. Elements of the system shall only be removed when adequate replacement support is provided by backfill or by the new structure. Removal shall be performed in such a manner that protects the adjacent property.

Reason: The Code presently refers to underpinning as the major means of protecting adjacent foundations. Excavation retaining systems are more common with underpinning considered a last resort.

A properly performing excavation retention system is necessary for some new buildings with basements and even in relatively shallow excavations where adjacent structures are in close proximity.

Movements of adjacent structures are typically largest during installation, excavation, and removal of the retention system. Monitoring of the system and adjacent structure needs to be performed for the entire duration.

Monitoring may include surveying or inclinometers and are standard procedures in current construction.

We also propose minor changes (which refer to this proposal) in 1803.5.7 and 1804.1, both titled "**Excavation near foundations**".

This proposal is presented for your consideration by the GeoCoalition .

The GeoCoalition is a consortium of eight trade and professional associations and our active group includes 37 geotechnical engineers, structural engineers, and specialty contractors from across the country.

To access the GeoCoalition roster,

please see : <http://piledrivers.org/geocoalition-members/>

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal should not increase the cost of construction. Proper earth retention systems for protecting existing adjacent structures will eliminate potentially large remediation costs.

Proposal # 4969

G15-19

G16-19

IBC:

G101.5(New), G103.1, G103.2, G103.3, G103.4, G103.5, G103.6, G103.6.1, G103.7, G103.8, G103.9, G104.1, G104.2, G104.3, G104.4, G104.5, G11

Proponent: Gregory Wilson, representing Federal Emergency Management Agency (gregory.wilson2@fema.dhs.gov); Rebecca Quinn, RCQuinn Consulting, on behalf of Federal Emergency Management Agency, representing Federal Emergency Management Agency (rcquinn@earthlink.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE

2018 International Building Code

Add new text as follows:

G101.5 Designation of floodplain administrator. The [INSERT JURISDICTION'S SELECTED POSITION TITLE] is designated as the floodplain administrator and is authorized and directed to enforce the provisions of this appendix. The floodplain administrator is authorized to delegate performance of certain duties to other employees of the jurisdiction. Such designation shall not alter any duties and powers of the building official.

Revise as follows:

G103.1 Permit applications. All applications for permits ~~must~~ shall comply with the following:

1. The ~~building official~~ floodplain administrator shall review all permit applications to determine whether proposed development is located in flood hazard areas established in Section G102.2.
2. Where a proposed development site is in a flood hazard area, all development to which this appendix is applicable as specified in Section G102.1 shall be designed and constructed with methods, practices and materials that minimize flood damage and that are in accordance with this code and ASCE 24.

G103.2 Other permits. It shall be the responsibility of the ~~building official~~ floodplain administrator to ensure that approval of a proposed development shall not be given until proof that necessary permits have been granted by federal or state agencies having jurisdiction over such development.

G103.3 Determination of design flood elevations. If design flood elevations are not specified, the ~~building official~~ floodplain administrator is authorized to require the applicant to meet one of the following:

1. Obtain, review and reasonably utilize data available from a federal, state or other source.
2. Determine the design flood elevation in accordance with accepted hydrologic and hydraulic engineering techniques. Such analyses shall be performed and sealed by a registered design professional, ~~professional~~. Studies, analyses and computations shall be submitted in sufficient detail to allow review and approval by the ~~building official~~ floodplain administrator. The accuracy of data submitted for such determination shall be the responsibility of the applicant.

G103.4 Activities in riverine flood hazard areas. In riverine flood hazard areas where design flood elevations are specified but floodways have not been designated, the ~~building official~~ floodplain administrator shall not permit any new construction, substantial improvement or other development, including fill, unless the applicant submits an engineering analysis prepared by a registered design professional, demonstrating that the cumulative effect of the proposed development, when combined with all other existing and anticipated flood hazard area encroachment, will not increase the design flood elevation more than 1 foot (305 mm) at any point within the community.

G103.5 Floodway encroachment. Prior to issuing a permit for any floodway encroachment, including fill, new construction, substantial improvements and other development or land-disturbing activity, the ~~building official~~ floodplain administrator shall require submission of a certification, prepared by a registered design professional, along with supporting technical data, demonstrating that such development will not cause any increase of the base flood level.

G103.6 Watercourse alteration. Prior to issuing a permit for any alteration or relocation of any watercourse, the ~~building official~~ floodplain administrator shall require the applicant to provide notification of the proposal to the appropriate authorities of all adjacent government jurisdictions, as well as appropriate state agencies. A copy of the notification shall be maintained in the permit records and submitted to FEMA.

G103.6.1 Engineering analysis. The ~~building official~~ floodplain administrator shall require submission of an engineering analysis, prepared by a registered design professional, demonstrating that the flood-carrying capacity of the altered or relocated portion of the watercourse will not be decreased. Such watercourses shall be maintained in a manner that preserves the channel's flood-carrying capacity.

G103.7 Alterations in coastal areas. Prior to issuing a permit for any alteration of sand dunes and mangrove stands in coastal high-hazard areas and coastal A zones, the ~~building official~~ floodplain administrator shall require submission of an engineering analysis, prepared by a registered design professional, demonstrating that the proposed alteration will not increase the potential for flood damage.

G103.8 Records. The ~~building official~~ floodplain administrator shall maintain a permanent record of all permits issued in flood hazard areas, including supporting certifications and documentation required by this appendix and copies of inspection reports, design certifications and documentation of

elevations required in Section 1612 of this code and Section R322 of the International Residential Code.

G103.9 Inspections. Development for which a permit under this appendix is required shall be subject to inspection. The ~~building official~~floodplain administrator or the ~~building official's floodplain administrator's~~ designee shall make, or cause to be made, inspections of all development in flood hazard areas authorized by issuance of a permit under this appendix.

G104.1 Required. Any person, owner or owner's authorized agent who intends to conduct any development in a flood hazard area shall first make application to the ~~building official~~floodplain administrator and shall obtain the required *permit*.

G104.2 Application for permit. The applicant shall file an application in writing on a form furnished by the ~~building official~~floodplain administrator. Such application shall:

1. Identify and describe the development to be covered by the *permit*.
2. Describe the land on which the proposed development is to be conducted by legal description, street address or similar description that will readily identify and definitely locate the site.
3. Include a site plan showing the delineation of flood hazard areas, floodway boundaries, flood zones, design flood elevations, ground elevations, proposed fill and excavation and drainage patterns and facilities.
4. Include in subdivision proposals and other proposed developments with more than 50 lots or larger than 5 acres (20 234 m²), base flood elevation data in accordance with Section 1612.3.1 if such data are not identified for the flood hazard areas established in Section G102.2.
5. Indicate the use and occupancy for which the proposed development is intended.
6. Be accompanied by construction documents, grading and filling plans and other information deemed appropriate by the ~~building official~~floodplain administrator.
7. State the valuation of the proposed work.
8. Be signed by the applicant or the applicant's authorized agent.

G104.3 Validity of permit. The issuance of a permit under this appendix shall not be construed to be a permit for, or approval of, any violation of this appendix or any other ordinance of the jurisdiction. The issuance of a permit based on submitted documents and information shall not prevent the ~~building official~~floodplain administrator from requiring the correction of errors. The ~~building official~~floodplain administrator is authorized to prevent occupancy or use of a structure or site that is in violation of this appendix or other ordinances of this jurisdiction.

G104.4 Expiration. A permit shall become invalid if the proposed development is not commenced within 180 days after its issuance, or if the work authorized is suspended or abandoned for a period of 180 days after the work commences. Extensions shall be requested in writing and justifiable cause demonstrated. The ~~building official~~floodplain administrator is authorized to grant, in writing, one or more extensions of time, for periods not more than 180 days each.

G104.5 Suspension or revocation. The ~~building official~~floodplain administrator is authorized to suspend or revoke a permit issued under this appendix wherever the permit is issued in error or on the basis of incorrect, inaccurate or incomplete information, or in violation of any ordinance or code of this jurisdiction.

G105.2 Records. The ~~building official~~floodplain administrator shall maintain a permanent record of all variance actions, including justification for their issuance.

G105.7 Conditions for issuance. Variances shall only be issued by the board of appeals where all of the following criteria are met:

1. A technical showing of good and sufficient cause that the unique characteristics of the size, configuration or topography of the site renders the elevation standards inappropriate.
2. A determination that failure to grant the variance would result in exceptional hardship by rendering the lot undevelopable.
3. A determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, nor create nuisances, cause fraud on or victimization of the public or conflict with existing local laws or ordinances.
4. A determination that the variance is the minimum necessary, considering the flood hazard, to afford relief.
5. Notification to the applicant in writing over the signature of the ~~building official~~floodplain administrator that the issuance of a variance to construct a structure below the base flood level will result in increased premium rates for flood insurance up to amounts as high as \$25 for \$100 of insurance coverage, and that such construction below the base flood level increases risks to life and property.

Reason: When local jurisdictions join the National Flood Insurance Program they are required to designate the local official responsible for enforcing floodplain management regulations. Some jurisdictions identify an official other than the building official, in part because many responsibilities are not directly related to enforcement of requirements for buildings. In those jurisdictions, the building official and the official designated as the floodplain administrator work together to fulfill the communities commitments to the NFIP.

This proposal addresses a concern raised in the last cycle by stating the designation of the floodplain administrator does not alter any duties and responsibilities of the building official.

Appendix G is scoped to apply to "development," which is defined in Appendix G, and it governs activities other than buildings and structures. The

authority under which Appendix G is enforced is the jurisdiction's agreement with the NFIP and is specified in Appendix G, not the building code. When a local jurisdiction uses IBC Appendix G to regulate development other than buildings it should be able to designate the appropriate official, which may or may not be the building official. The role of the floodplain administrator is limited to the provisions of the appendix. Jurisdictions may choose to designate the building official as the floodplain administrator.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
There is no cost impact because this proposal is related to designation of personnel by individual jurisdictions.

Proposal # 4333

G16-19

G17-19

IBC: G103.10(New)

Proponent: Gregory Wilson, representing Federal Emergency Management Agency (gregory.wilson2@fema.dhs.gov); Rebecca Quinn, RCQuinn Consulting, on behalf of Federal Emergency Management Agency, representing Federal Emergency Management Agency (rcquinn@earthlink.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE

2018 International Building Code

Add new text as follows:

G103.10 Use of changed technical data. The building official and the applicant shall not use changed flood hazard area boundaries or base flood elevations for proposed buildings or developments unless the building official or applicant has applied for a conditional Flood Insurance Rate Map (FIRM) revision and has received the approval of the Federal Emergency Management Agency (FEMA).

Reason: Virtually every community with identified areas subject to flooding adopts the Federal Emergency Management Agency's Flood Insurance Study and Flood Insurance Rate Maps (FIRMs) as the official maps. If a community develops its own flood study or if an applicant provides data or studies that show a change to a FIRM is appropriate, the data must be submitted to FEMA so the official maps are maintained with the best available information.

FEMA has a formal process to amend flood data. Local officials do not have the authority to change FEMA's maps and data, which means the effective FIRMs and data must be used until and unless changed by FEMA. If a flood zone or Base Flood Elevation is changed by a study and that change is not shown on the FIRM, decisions regarding future permit requirements and NFIP flood insurance policies would not be based on the best available information. Also, the current effective FIRMs are used by mortgage lenders to determine which borrowers must have flood insurance. If new studies are not provided to FEMA, some property owners might be forced to buy flood insurance even though a new study shows their locations are "out" of the SFHA. Or if new studies show a lower BFE, policies would not be rated based on those BFEs because the FIRMs weren't revised.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

There is no cost impact because communities that participate in the NFIP are already required to submit, or require applicants to submit, new data and studies to FEMA.

Proposal # 4427

G17-19

G18-19

IBC@: G105.1, G105.5, G105.6, G105.7

Proponent: Gregory Wilson, representing Federal Emergency Management Agency (gregory.wilson2@fema.dhs.gov); Rebecca Quinn, RCQuinn Consulting, on behalf of Federal Emergency Management Agency, representing Federal Emergency Management Agency (rcquinn@earthlink.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE

2018 International Building Code

Revise as follows:

G105.1 General. The ~~board of appeals established pursuant to Section 113 shall jurisdiction shall~~ establish or designate a board to hear and decide requests for variances. The board ~~of appeals~~ shall base its determination on technical justifications, and has the right to attach such conditions to variances as it deems necessary to further the purposes and objectives of this appendix and Section 1612.

G105.5 Restrictions. The board ~~of appeals~~ shall not issue a variance for any proposed development in a floodway if any increase in flood levels would result during the base flood discharge.

G105.6 Considerations. In reviewing applications for variances, the board ~~of appeals~~ shall consider all technical evaluations, all relevant factors, all other portions of this appendix and the following:

1. The danger that materials and debris may be swept onto other lands resulting in further injury or damage.
2. The danger to life and property due to flooding or erosion damage.
3. The susceptibility of the proposed development, including contents, to flood damage and the effect of such damage on current and future owners.
4. The importance of the services provided by the proposed development to the community.
5. The availability of alternate locations for the proposed development that are not subject to flooding or erosion.
6. The compatibility of the proposed development with existing and anticipated development.
7. The relationship of the proposed development to the comprehensive plan and flood plain management program for that area.
8. The safety of access to the property in times of flood for ordinary and emergency vehicles.
9. The expected heights, velocity, duration, rate of rise and debris and sediment transport of the floodwaters and the effects of wave action, if applicable, expected at the site.
10. The costs of providing governmental services during and after flood conditions including maintenance and repair of public utilities and facilities such as sewer, gas, electrical and water systems, streets and bridges.

G105.7 Conditions for issuance. Variances shall only be issued by the board ~~of appeals~~ where all of the following criteria are met:

1. A technical showing of good and sufficient cause that the unique characteristics of the size, configuration or topography of the site renders the elevation standards inappropriate.
2. A determination that failure to grant the variance would result in exceptional hardship by rendering the lot undevelopable.
3. A determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, nor create nuisances, cause fraud on or victimization of the public or conflict with existing local laws or ordinances.
4. A determination that the variance is the minimum necessary, considering the flood hazard, to afford relief.
5. Notification to the applicant in writing over the signature of the building official that the issuance of a variance to construct a structure below the base flood level will result in increased premium rates for flood insurance up to amounts as high as \$25 for \$100 of insurance coverage, and that such construction below the base flood level increases risks to life and property.

Reason: This proposal allows jurisdictions to establish or designate a board to hear and decide requests for variances. The NFIP gives the community the authority to approve or disapprove variances from the strict application of the minimum floodplain management requirements. The IBC authorizes the building official, not the board of appeals, to grant variances for buildings in flood hazard areas. When a local jurisdiction uses IBC Appendix G to regulate development other than buildings it should be able to designate the appropriate board or body, which may be the board of appeals or another body, such as the planning commission, the elected governing body, or a committee of department leadership.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
There is no cost impact because this proposal is related to designation of a deliberative body by individual jurisdictions.

Proposal # 4336

G18-19

G19-19

IBC@: G105.4, G201.2

Proponent: Gregory Wilson, representing Federal Emergency Management Agency (gregory.wilson2@fema.dhs.gov); Rebecca Quinn, RCQuinn Consulting, on behalf of Federal Emergency Management Agency, representing Federal Emergency Management Agency (rcquinn@earthlink.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE

2018 International Building Code

Revise as follows:

G105.4 Functionally dependent facilities-uses. A variance is authorized to be issued for the construction or substantial improvement of a ~~structure and for other development necessary for the conduct of a~~ functionally dependent ~~facility-use~~ provided that the criteria in Section 1612.1 are met and the variance is the minimum necessary to allow the construction or substantial improvement, and that all due consideration has been given to methods and materials that minimize flood damages during the design flood and do not create additional threats to public safety.

G201.2 Definitions. DEVELOPMENT. Any man-made change to improved or unimproved real estate, including but not limited to, buildings or other structures, temporary structures, temporary or permanent storage of materials, mining, dredging, filling, grading, paving, excavations, operations and other land-disturbing activities.

FUNCTIONALLY DEPENDENT FACILITY USE. A ~~facility use~~ that cannot ~~be used for~~ perform its intended purpose unless it is located or carried out in close proximity to ~~water, such as a docking or port facility~~ water. The term includes only docking facilities, port facilities necessary for the loading or unloading of cargo or passengers, and shipbuilding or and ship repair facilities. The term does not include long-term storage, manufacture, sales or service facilities.

Reason: This proposal makes the definition consistent with the definition in the Code of Federal Regulations (44 CFR Section 59.1) used by the National Flood Insurance Program and the NFIP provisions that allow granting of variances for functionally dependent uses (44 CFR Section 60.6(a) (7)).

The CFR definition includes a definitive list of functionally dependent uses, while the current IBC Appendix G definition only offers a list of examples by using the phrase "such as," which could allow other types of facilities to be issued a variance. Granting a functionally dependent use variance to any facility other than those listed in the CFR definition does not meet the minimum NFIP requirement. This proposal removes that inconsistency so that minimum NFIP requirements are met.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposal is substantially editorial. No additional cost. This proposal does not increase construction requirements or costs.

Proposal # 4429

G19-19

G20-19

IBC®: G201.2

Proponent: Gregory Wilson, representing Federal Emergency Management Agency (gregory.wilson2@fema.dhs.gov); Rebecca Quinn, RCQuinn Consulting, on behalf of Federal Emergency Management Agency, representing Federal Emergency Management Agency (rcquinn@earthlink.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE

2018 International Building Code

Revise as follows:

G201.2 Definitions. MANUFACTURED HOME. A structure that is transportable in one or more sections, built on a permanent chassis, designed for use with or without a permanent foundation when attached to the required utilities, and constructed to the Federal ~~Mobile~~ Manufactured Home Construction and Safety Standards and rules and regulations promulgated by the U.S. Department of Housing and Urban Development. The term also includes mobile homes, park trailers, travel trailers and similar transportable structures that are placed on a site for 180 consecutive days or longer.

Reason: The U.S. Department of Housing and Urban Development (HUD) modified 24 CFR Part 3280 Manufactured Home Construction and Safety Standards a number of times since 2008, most recently in 2018. G201 includes a definition for “Manufactured Home” that refers to units constructed to Federal Manufactured Home Construction and Safety Standards promulgated by HUD.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
There is no cost impact because this proposal updates a reference to HUD standards.

Proposal # 4430

G20-19

G21-19

IBC: Appendix O(New)

Proponent: Gregory Robinson, representing National Council of Structural Engineers Associations (NCSEA) (grobenson@lbyd.com)

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE

2018 International Building Code

Add new text as follows:

Appendix O **SPECIAL INSPECTIONS OF LIGHT-FRAME CONSTRUCTION**

SECTION O101

GENERAL

O101.1 Purpose The purpose of this appendix is to provide inspection requirements when a jurisdiction does not have the resources necessary to complete structural aspects of frame inspections required by Section 110.3.3.

O101.2 Scope. Special inspections shall be provided for light-frame construction in accordance with Chapter 17 and the additional requirements of Sections O102 and O103.

Exceptions:

1. Special inspections and tests are not required for construction of a minor nature or as warranted by conditions in the jurisdiction as approved by the building official.
2. Unless otherwise required by the building official, special inspections and tests are not required for Group U occupancies that are accessory to a residential occupancy including those specified in Section 312.1.

SECTION O102 **LIGHT-FRAME WOOD CONSTRUCTION**

O102.1 Required special inspections. Special inspections for light-frame wood construction shall be provided in accordance with Table O102.1.

TABLE O102.1
REQUIRED SPECIAL INSPECTIONS OF LIGHT-FRAME WOOD CONSTRUCTION

<u>TYPE</u>	<u>CONTINUOUS SPECIAL INSPECTION</u>	<u>PERIODIC SPECIAL INSPECTION</u>
1. Inspect Grading of Wood Materials:		-
a. <u>Sawn lumber framing</u>		X (a)
b. <u>Structural composite lumber</u>		X (b)
c. <u>Wood structural panels</u>		X (c)
2. Inspect Framing and Details:		-
a. <u>Framing layout, member sizes and bearing lengths</u>		X (a)
b. <u>Blocking and bridging</u>		X (b)
c. <u>Holes and notches^a</u>		X (c)

<u>3. Inspect Connections</u> <u>a. Bolted and screwed connections, including diameter, length, spacing and edge distance</u> <u>b. Nailed connections, including diameter, length, type and spacing of nails</u> <u>c. Proprietary hangers and framing anchors, including fastener sizes and quantities</u> <u>d. Tie-down anchors, including anchor rod size and fastener sizes and quantities</u>		- <u>X (a)</u> <u>X (b)</u> <u>X (c)</u> <u>X (d)</u>
<u>4. Inspect Shear Walls and Diaphragms</u> <u>a. Panel grade and thickness^b</u> <u>b. Fastener size, length and spacing</u> <u>c. Framing member sizes at panel edges</u> <u>d. Blocking at panel edges</u>		- <u>X (a)</u> <u>X (b)</u> <u>X (c)</u> <u>X (d)</u>
<u>5. Inspect Metal-Plate Connected Wood Trusses</u> <u>a. Multi-ply truss connections for compliance with approved truss submittal package</u>		- <u>X (a)</u>

a. Inspections of holes and notches shall be performed after electrical, mechanical, and plumbing rough-ins have been completed.

b. Applies to wood structural panels and gypsum board panels.

SECTION O103 COLD-FORMED STEEL LIGHT-FRAME CONSTRUCTION

O103.1 Required special inspections. Special inspections and qualifications of welding and mechanical fastening special inspectors for cold-formed steel light frame construction, which is designed and installed in accordance with Section 2211.1, shall be in accordance with the quality assurance inspection requirements of Chapter D of AISI S240, excluding Section D6.9 of AISI S240.

SECTION O104.1 REFERENCED STANDARDS

AISI S240-15

North American Standard for Cold-Formed Steel Structural Framing

O103.1

Reason: Requirements for special inspections of wood and cold-formed steel construction have been largely omitted from the code, primarily because many of the jurisdictions that are active in the code development process already perform framing inspections per section 110.3.4 and the need for additional, *special* inspections is either redundant or not apparent. However, in many areas of the country building departments do not have the funding, staff, time, or other resources to complete the same level of detailed framing inspections that occur in those larger and more active jurisdictions.

This appendix provides an basis for structural framing inspections when a jurisdiction chooses to adopt these provisions because it doesn't have the resources to complete those inspections. Note that the exemptions for certain seismic design categories, wind speeds, etc. are not included in this appendix, because those exemptions do not apply to Section 110.3.4, which this appendix takes the place of.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

In accordance with the model code, the responsibility for inspection of light-frame construction lies with the building department. If a building department opts to have inspections completed by a special inspector rather than its own staff, the associated cost would presumably shift from permit fees to testing agency fees.

Staff Analysis: The referenced standard, AISI S240-15, is currently referenced in other 2018 I-codes.

2019 GROUP B – PROPOSED CHANGES TO THE INTERNATIONAL BUILDING CODE – STRUCTURAL

INTERNATIONAL BUILDING CODE – STRUCTURAL COMMITTEE

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TENTATIVE ORDER OF DISCUSSION 2019 PROPOSED CHANGES TO THE INTERNATIONAL BUILDING CODE - STRUCTURAL

The following is the tentative order in which the proposed changes to the code will be discussed at the public hearings. Proposed changes which impact the same subject have been grouped to permit consideration in consecutive changes.

Proposed change numbers that are indented are those which are being heard out of numerical order. Indentation does not necessarily indicate that one change is related to another. Proposed changes may be grouped for purposes of discussion at the hearing at the discretion of the chair. Note that some S code change proposals may not be included on this list, as they are being heard by another committee.

EB2-19	EB154-19	G17-19	S35-19
EB15-19	EB155-19	G18-19	S36-19
EB16-19	EB156-19	G19-19	S37-19
EB18-19	EB157-19	G20-19	S38-19
EB43-19	EB158-19	S1-19	S39-19
EB44-19	EB159-19	S2-19	S40-19
EB45-19	EB160-19	S3-19	S41-19
EB53-19	EB161-19	S4-19	S42-19
EB54-19	EB162-19	S5-19	S43-19
EB55-19	EB163-19	S6-19	S44-19
EB56-19	EB164-19	S7-19	S45-19
EB57-19	EB165-19	S8-19	S46-19
EB58-19	ADM23-19 Part II	S9-19	S47-19
EB66-19	FS1-19	S10-19	S48-19
EB67-19	FS2-19	S11-19	S49-19
EB68-19	FS3-19	S12-19	S50-19
EB69-19	FS4-19	S13-19	S51-19
EB75-19	PC1-19	S14-19	S52-19
EB76-19	PC2-19	S15-19	S53-19
EB135-19	PC3-19	S16-19	S54-19
EB136-19	PC4-19	S17-19	S55-19
EB137-19	PC5-19	S18-19	S56-19
EB138-19	G1-19	S19-19	S57-19
EB139-19	G2-19	S20-19	S58-19
EB140-19	G3-19	S21-19	S59-19
EB141-19	G4-19 Part I	S22-19	S60-19
EB142-19	G5-19	S23-19	S61-19
EB143-19	G6-19	S24-19	S62-19
EB144-19	G7-19	S25-19	S63-19
EB145-19	G8-19	S26-19	S64-19
EB146-19	G9-19	S27-19	S65-19
EB147-19	G10-19	S28-19	S66-19
EB148-19	G11-19	S29-19	S67-19
EB149-19	G12-19 Part I	S30-19	S68-19
EB150-19	G13-19	S31-19	S69-19
EB151-19	G14-19	S32-19	S70-19
EB152-19	G15-19	S33-19 Part I	S71-19
EB153-19	G16-19	S34-19 Part I	S72-19

S73-19	S128-19	S184-19 Part I
S74-19	S129-19	S185-19
S75-19	S130-19	S186-19
S76-19	S131-19	S187-19
S77-19	S132-19	S188-19
S78-19	S133-19	S189-19
S79-19	S134-19	S190-19
S80-19	S135-19	S191-19
S81-19	S136-19	S192-19
S82-19	S137-19	S193-19
S83-19	S138-19	S194-19
S84-19	S139-19	S195-19
S85-19	S140-19	S196-19
S86-19	S141-19	S197-19
S87-19	S142-19	S198-19
S88-19	S143-19	S199-19
S89-19	S144-19	S200-19
S90-19	S145-19	
S91-19	S146-19	
S92-19	S147-19	
S93-19	S148-19	
S94-19	S149-19	
S95-19	S150-19	
S96-19	S151-19	
S97-19	S152-19	
S98-19	S153-19	
S99-19	S154-19	
S100-19	S155-19	
S101-19	S156-19	
S102-19	S157-19	
S103-19	S158-19	
S104-19	S159-19	
S105-19	S160-19	
S106-19	S161-19	
S107-19	S162-19	
S108-19	S163-19	
S109-19	S164-19	
S110-19	S165-19	
G21-19	S166-19	
S111-19	S167-19	
S112-19	S168-19	
S113-19	S169-19	
S114-19	S170-19	
S115-19	S171-19	
S116-19	S172-19	
S117-19	S173-19	
S118-19	S174-19	
S119-19	S175-19	
S120-19	S176-19	
S121-19	S177-19	
S122-19	S178-19	
S123-19	S179-19	
S124-19	S180-19	
S125-19	S181-19	
S126-19	S182-19	
S127-19	S183-19 Part I	

S1-19

IBC: 1511.1 (IEBC 705.1)

Proponent: Wanda Edwards, representing RCI, Inc. (wedwards@rci-online.org)

2018 International Building Code

SECTION 1511 REROOFING

Revise as follows:

1511.1 General. Materials and methods of application used for recovering or replacing an existing roof covering shall comply with the requirements of Chapter 15.

Exceptions:

1. *Roof replacement or roof recover* of existing low-slope roof coverings shall not be required to meet the minimum design slope requirement of one-quarter unit vertical in 12 units horizontal (2-percent slope) in Section 1507 for roofs that provide positive roof drainage and meet the requirements of Section 1608.3.
2. Recovering or replacing an existing roof covering shall not be required to meet the requirement for secondary (emergency overflow) drains or scuppers in Section 1503.4 for roofs that provide for positive roof drainage. For the purposes of this exception, existing secondary drainage or scupper systems required in accordance with this code shall not be removed unless they are replaced by secondary drains or scuppers designed and installed in accordance with Section 1503.4.

2018 International Existing Building Code

[BS] 705.1 General. Materials and methods of application used for recovering or replacing an existing roof covering shall comply with the requirements of Chapter 15 of the International Building Code.

Exceptions:

1. *Roof replacement or roof recover* of existing low-slope roof coverings shall not be required to meet the minimum design slope requirement of one-quarter unit vertical in 12 units horizontal (2-percent slope) in Section 1507 of the International Building Code for roofs that provide positive roof drainage and meet the requirements of Section 1608.3 of the International Building Code.
2. Recovering or replacing an existing roof covering shall not be required to meet the requirement for secondary (emergency overflow) drains or scuppers in Section 1502 of the International Building Code for roofs that provide for positive roof drainage. For the purposes of this exception, existing secondary drainage or scupper systems required in accordance with this code shall not be removed unless they are replaced by secondary drains or scuppers designed and installed in accordance with Section 1502 of the International Building Code.

Reason: The proposed change is a reference to Section 1608.3 – Ponding instability. The added language is a reminder to designers that roofs which do not provide the minimum slope required by the code, are susceptible bays and must be analyzed for ponding instability. By definition a susceptible bay is a roof or portion thereof with a slope less than 1/4" inch per foot. Roofs that do not have a minimum slope of 1/4" inch per foot must provide positive drainage **and** a ponding analysis. The requirement for the ponding analysis is often overlooked and this change will clarify that the ponding analysis is required.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code proposal is a clarification and does not alter the requirements of the code. Therefore, the proposal has no cost impact.

Proposal # 5211

S1-19

S2-19

IBC: 1511.1 (IEBC 705.1)

Proponent: Wanda Edwards, Wanda Edwards Consulting, Inc., representing RCI, Inc. (wedwards@rci-online.org)

2018 International Building Code

SECTION 1511 REROOFING

Revise as follows:

1511.1 General. Materials and methods of application used for recovering or replacing an existing roof covering shall comply with the requirements of Chapter 15.

Exceptions:

1. *Roof replacement or roof recover* of existing low-slope roof coverings shall not be required to meet the minimum design slope requirement of one-quarter unit vertical in 12 units horizontal (2-percent slope) in Section 1507 for roofs that provide positive roof drainage.
2. Recovering or replacing an existing roof covering shall ~~not be required to~~ meet the requirement for secondary (emergency overflow) drains or scuppers in Section 1502.2 ~~for roofs that provide for positive roof drainage~~. For the purposes of this exception, existing secondary drainage or scupper systems required in accordance with this code shall not be removed unless they are replaced by secondary drains or scuppers designed and installed in accordance with Section 1503.4.

2018 International Existing Building Code

[BS] 705.1 General. Materials and methods of application used for recovering or replacing an existing roof covering shall comply with the requirements of Chapter 15 of the International Building Code.

Exceptions:

1. *Roof replacement or roof recover* of existing low-slope roof coverings shall not be required to meet the minimum design slope requirement of one-quarter unit vertical in 12 units horizontal (2-percent slope) in Section 1507 of the International Building Code for roofs that provide positive roof drainage.
2. Recovering or replacing an existing roof covering shall not be required to meet the requirement for secondary (emergency overflow) drains or scuppers in Section 1502 of the International Building Code ~~for roofs that provide for positive roof drainage~~. For the purposes of this exception, existing secondary drainage or scupper systems required in accordance with this code shall not be removed unless they are replaced by secondary drains or scuppers designed and installed in accordance with Section 1502 of the International Building Code.

Reason: In the 2015 the IBC added Exception #2 to Section 1511.1. This exception allows a roof replacement or roof recover to omit secondary drainage if none is present on the existing roof and the roof provides positive drainage. Roofs that provide positive roof drainage do not meet the minimum slope code requirement of 1/4" inch per foot. This exception has created a serious life safety issue because roofs that do not provide adequate slope are prone to collapse when the rainwater accumulation exceeds the design values.¹

There are several reasons for roof collapses. First, many existing buildings were built before the code addressed requirements related to roof slope, roof drains or scuppers. Existing roofs may not have adequate slope or an adequate secondary drainage system and what exists does not meet any code. Most roof collapses are due to inadequate overflow drainage or inadequate slope. Roof drainage design is complicated by the fact that three designers should share in the responsibility for drainage design: the architect, structural engineer and plumbing engineer. Frequently, the structural engineer is not involved in the drainage design nor is a ponding analysis performed.

Remember, code requirements are minimum allowable standards and do not address some of the critical issues of drainage design. For instance, the code does not address flow rates through drains as a function of hydraulic head. The information contained in the IPC is the maximum drainage capacity of the roof drains with no reference to hydraulic head. Because the roof drainage is so important to performance of the roof a reroof should automatically trigger an analysis of the existing drainage system

In a white paper presented at the 2018 RCI Annual Convention, Dr. Steve Patterson, PE and Dr. Medan Mehta, PE details the problems of not installing secondary roof drainage and the failures that they have investigated. The paper gives an in-depth analysis of roof drainage design and how water accumulates on the roof and results in collapse. The paper also reviews the code history of drainage design and requirements. Their research confirmed that secondary drainage has been a code requirement since the 80's. Exception #2 of Section 1511.1 represents the deletion of a long-standing code requirement.

Ponding instability is defined as the progressive increase in the accumulation of water on the roof due to insufficient stiffness of the roof framing. As the water accumulates on the roof, the roof deflects, and the deflection continues to increase with the accumulation of more water due to the increased roof deflection. The requirement to check for ponding instability has been in the code for at least 14 years. The code does not require a ponding analysis unless the slope is less than 1/4" inch per foot one. The requirement of a ponding analyses often are overlooked and these analyses are not being performed.

"Allowing roof slopes less than 1/4" inch per foot creates many problems. Water should drain freely and quickly – let alone be allowed to remain on the roof for two days. No one tests the roof to see if there is ponding – they don't flood the roof and wait two days to see if there is any ponding on the roof. The roof could have no slope and be code compliant. If there are parapet walls and no overflow drainage, the roof is highly susceptible to ponding."²

Roof drainage is one of the most important roof design elements and the overflow drainage is its most part – the function of the overflow drainage is to prevent the roof from collapsing – an important life safety issue. For these reasons, secondary drainage should once again be required in the code. "Fundamentally, any roof that has drainage issues – including but not limited to the lack of appropriate slope or the lack of adequate overflow- should be evaluated by when a building is reroofed in the same as required for roofing."³

Bibliography: 1. Wanda Edwards. Secondary Drainage and Ponding Requirements of IBC and IEBC. Interface, December 2017 issue.
2. Stever Patterson and Medan Mehta. Roof Drainage, Roof Collapses and the Codes. March 2018, 32nd Annual RCI Convention proceedings, page 122

3. Ibid.

Cost Impact: The code change proposal will increase the cost of construction

The code change will increase the cost of construction when compared to the 2018 IBC. It will not represent a cost increase when compared to the 2012 IBC.

Proposal # 5234

S2-19

S3-19

IBC: 1511.6.1 (New)

Proponent: Bill McHugh, The McHugh Company, representing Chicago Roofing Contractors Association (bill@mc-hugh.us)

2018 International Building Code

1511.6 Flashings. Flashings shall be reconstructed in accordance with *approved* manufacturer's installation instructions. Metal flashing to which bituminous materials are to be adhered shall be primed prior to installation.

Add new text as follows:

1511.6.1 Flashing Heights. Wall and curb flashings shall be not less than 8 inches (203 mm) above the roof covering surface. A reduction of the required roof assembly thickness to accommodate the limited heights shall be in accordance with the roof covering manufacturer's instructions.

Reason: The purpose of this code proposal is to provide the code official guidance when roofing work takes place on existing buildings. When the scope of work is to replace the roof covering, (See 202 definition for roof covering replacement), the building owner and manager should not have to rebuild the rooftop to accommodate thick roofing components.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This code proposal will provide the building owner and manager with the option to not have to rebuild the roof assembly in some cases. In other cases, it does not provide cost savings.

Proposal # 2088

S3-19

S4-19

IBC: 1511.5 (New)

Proponent: Bill McHugh, The McHugh Company, representing Chicago Roofing Contractors Association (Bill@mc-hugh.us)

2018 International Building Code

Add new text as follows:

1511.5 Roof Covering Replacement. Where an existing roof covering is removed, exposing insulation or sheathing and only a new roof covering is installed.

Reason: The purpose of this proposal is to put code language that ties in with the new definition in section 202 for Roof Covering Replacement. This provides guidance to code users for an area that is not covered at all by the code. This situation, roof covering replacement, is a question that's asked about frequently. This is where the roof covering system life can be extended by adding a new roof covering material alone by 'peeling' off the old roof covering material. There are situations where this method is not only practical but preferred. In fact, the City of Chicago added this definition through it's 2016 Roofing Memorandum.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This code proposal provides an option not available to the building owner and manager. The result is it will be no increase in the cost of construction where or a big savings in cost due to not having to rework the roof assembly to accommodate roofing component thicknesses.

Proposal # 2100

S4-19

S5-19

IBC: 1511.3 (IEBC 705.3)

Proponent: Mike Fischer, Kellen Company, representing The Polyisocyanurate Insulation Manufacturers Association (mfischer@kellencompany.com); Marcin Pazera, representing The Polyisocyanurate Insulation Manufacturers Association (mpazera@pima.org)

2018 International Building Code

Revise as follows:

1511.3 Roof replacement. *Roof replacement* shall include the removal of all existing layers of roof coverings and roof assembly materials down to the roof deck.

Exception: Where the existing roof assembly includes an ice barrier membrane that is adhered to the roof deck, the existing ice barrier membrane shall be permitted to remain in place and covered with an additional layer of ice barrier membrane in accordance with Section 1507.

Reason: The current code language instructs the user to remove all roofing materials down to the deck when performing a roof replacement. The exception for ice barrier membrane illustrates that fact. The definition of roof replacement includes instructions to repair damaged substrate (such as the roof deck and supporting structure):

ROOF REPLACEMENT. The process of removing the existing *roof covering*, repairing any damaged substrate and installing a new *roof covering*.

IBC Section 1511.1 reads:

Materials and methods of application used for recovering or replacing an existing roof covering shall comply with the requirements of Chapter 15.

Requirements for roof assemblies in Chapter 15 include assembly testing for wind and fire resistance. The assembly tests typically include all materials including fasteners, insulation, and cover boards. There have been indications of a practice known as "peel and replace" where only the outermost layer (roof covering membrane) is removed, and another membrane subsequently applied. This practice makes it impossible to meet the IBC provisions for repairing damaged substrate because the deck will not be exposed for inspection. It also conflicts with 1511.3 because the requirements for wind and fire testing are based on assembly tests with known materials, not an assembly of new and existing materials that may or may not comply with current material properties and standards.

This proposal is a clarification of the current code provisions, industry recommendations, and test requirements. The need to install new roof assembly materials in a roof replacement in a manner that is consistent with tested assemblies is necessary to demonstrate code compliance and ensure that the system will perform as intended. This interpretation of the intent of the code is consistent with industry guidance on the subject.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal is a clarification to current requirements.

Proposal # 5588

S5-19

S6-19

IBC: SECTION 1511 (IEBC 706), 1511.3.1.1 (IEBC 705.3.1.1)

Proponent: Wanda Edwards, Wanda Edwards Consulting, Inc., representing RCI, Inc. (wedwards@rci-online.org)

2018 International Building Code

SECTION 1511 REROOFING

Revise as follows:

1511.3.1.1 Exceptions. A *roof recover* shall not be permitted where any of the following conditions occur:

1. Where the existing roof or roof covering is water soaked or has deteriorated to the point that the existing roof or roof covering is not adequate as a base for additional roofing.
2. Where the existing roof covering is slate, clay, cement or asbestos-cement tile.
3. Where the existing roof has two or more applications of any type of roof covering and the roof coverings are not removed down to the deck.

Reason: This code proposal is for clarification that when there are two or more roof coverings, a new roof covering can not be installed until the coverings are removed to the roof deck. Often, the contractor does not remove coverings down to the deck and this will remind the contractor that it is required.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This code proposal is a clarification of the current code requirements and with not effect the cost of construction.

Proposal # 5585

S6-19

S7-19

IBC: 1511.3.1.1 (IEBC 705.3.1.1), 1511.4 (IEBC 705.4)

Proponent: Wanda Edwards, Wanda Edwards Consulting, Inc., representing RCI, Inc. (wedwards@rci-online.org)

2018 International Building Code

SECTION 1511 REROOFING

1511.3.1 Roof recover. The installation of a new roof covering over an existing roof covering shall be permitted where any of the following conditions occur:

1. Where the new roof covering is installed in accordance with the roof covering manufacturer's approved instructions.
2. Complete and separate roofing systems, such as standing-seam metal roof panel systems, that are designed to transmit the roof loads directly to the building's structural system and that do not rely on existing roofs and roof coverings for support, shall not require the removal of existing roof coverings.
3. Metal panel, metal shingle and concrete and clay tile roof coverings shall be permitted to be installed over existing wood shake roofs when applied in accordance with Section 1511.4.
4. The application of a new protective roof coating over an existing protective roof coating, metal roof panel, built-up roof, spray polyurethane foam roofing system, metal roof shingles, mineral-surfaced roll roofing, modified bitumen roofing or thermoset and thermoplastic single-ply roofing shall be permitted without tear off of existing roof coverings.

Revise as follows:

1511.3.1.1 Exceptions. A *roof recover* shall not be permitted where any of the following conditions occur:

1. Where the existing roof or roof covering is water soaked or has deteriorated to the point that the existing roof or roof covering is not adequate as a base for additional roofing.
2. Where the existing roof covering is slate, clay, cement or asbestos-cement tile.
3. Where the existing roof has two or more applications of any type of roof covering.
4. Where the existing roof covering is wood shakes or shingles and the roof covering was not installed in accordance with Section 1511.4

1511.4 Roof recovering. Where the application of a new roof covering over wood shingle or shake roofs creates a combustible concealed space, the entire existing surface shall be covered with gypsum board, mineral fiber, glass fiber or other *approved* materials securely fastened in place. The installation of a new roof covering over wood shakes or shingles shall require the entire existing surface be covered with gypsum board or other approved rigid materials to provide for secure fastening.

Reason: Most manufacturers recommend the installation of a rigid decking material over the wood shakes or shingles to provide a solid surface for the securement of the new roof cover. The roof is being recovered because of deterioration of the wood shake or shingles and may be rotten and unable to provide a solid surface for fasteners to maintain attachment. Without a rigid deck and rotten or decayed shakes or shingles the fasteners will not keep the new roof covering attached. The installation of rigid deck also prevents seeing undulations in the new roof covering.

Cost Impact: The code change proposal will increase the cost of construction

There may be some increase in the cost of construction if the manufacturers installation instructions do not require the installation of a rigid decking material over the wood shakes or shingles. If the manufacturers installation instructions require the rigid decking material there is no increase in cost.

Proposal # 5569

S7-19

S8-19

IBC: SECTION 1511 (IEBC 705), 1511.1 (IEBC 705.1)

Proponent: Mark Graham, representing National Roofing Contractors Association (NRCA) (mgraham@nrca.net)

2018 International Building Code

SECTION 1511 REROOFING

Revise as follows:

1511.1 General. Materials and methods of application used for recovering or replacing an existing roof covering shall comply with the requirements of ~~Chapter 15, this section and Sections 1503 through 1509.~~

Exceptions Exception:

1. *Roof replacement or roof recover* of existing low-slope roof coverings shall not be required to meet the minimum design slope requirement of one-quarter unit vertical in 12 units horizontal (2-percent slope) in Section 1507 for roofs that provide positive roof drainage.
2. ~~Recovering or replacing an existing roof covering shall not be required to meet the requirement for secondary (emergency overflow) drains or scuppers in Section 1503.4 for roofs that provide for positive roof drainage. For the purposes of this exception, existing secondary drainage or scupper systems required in accordance with this code shall not be removed unless they are replaced by secondary drains or scuppers designed and installed in accordance with Section 1503.4.~~

Reason: This code change proposal is intended to clarify the code's intent regarding reroofing, including roof re-covering and roof replacement. A reroofing project is not intended to require the need to upgrade any rooftop structures (Section 1510-Rooftop Structures) to the edition of the code that is current at the time of reroofing. A literal interpretation of the code's current requirement in Section 1511.1-General can be interpreted to require any rooftop structures to be upgraded when reroofing.

Similarly, a reroofing project is not intended to require the need to upgrade the roof area's roof drainage (Section 1502-Roof Drainage) to the edition of the code that is current at the time of reroofing. This is already addressed, in part, in Section 1511.1, Exception 2.

Limiting the sections of Chapter 15 applicable to reroofing addresses these issues and allows for eliminating Section 1511.1's Exception 2.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This code change proposal clarifies the code's intent; it is not intended to increase or decrease the stringency of the code.

Proposal # 5414

S8-19

S9-19

IBC: 1511.1 (IEBC 705.1)

Proponent: Wanda Edwards, Wanda Edwards Consulting, Inc., representing RCI, Inc. (wedwards@rci-online.org)

2018 International Building Code

SECTION 1511 REROOFING

Revise as follows:

1511.1 General. Materials and methods of application used for recovering or replacing an existing roof covering shall comply with the requirements of Chapter 15.

~~Exceptions~~**Exception:**

- ~~1. Roof replacement or roof recover of existing low-slope roof coverings shall not be required to meet the minimum design slope requirement of one-quarter unit vertical in 12 units horizontal (2-percent slope) in Section 1507 for roofs that provide positive roof drainage.~~
- ~~2. Recovering or replacing an existing roof covering shall not be required to meet the requirement for secondary (emergency overflow) drains or scuppers in Section 1503.4 for roofs that provide for positive roof drainage. For the purposes of this exception, existing secondary drainage or scupper systems required in accordance with this code shall not be removed unless they are replaced by secondary drains or scuppers designed and installed in accordance with Section 1503.4.~~

Reason: In 2015 the IBC added Exception #2 to Section 1511.1. This exception allows a roof replacement or roof recover to omit secondary drainage if none is present on the existing roof and the roof provides positive drainage. Roofs that provide positive roof drainage do not meet the minimum slope code requirement of 1/4" inch per foot. This exception has created a serious life safety issue because roofs that do not provide adequate slope are prone to collapse when the rainwater accumulation exceeds the design values.

There are several reasons for roof collapses. First, many existing buildings were built before the code addressed requirements related to roof slope, roof drains or scuppers. Existing roofs may not have adequate slope or an adequate secondary drainage system and what exists does not meet any code. Most roof collapses are due to inadequate overflow drainage or inadequate slope. Frequently, the structural engineer is not involved in the drainage design nor is a ponding analysis performed, and this exception does not require the installation of secondary drainage.

In a white paper presented at the 2018 RCI Annual Convention, Dr. Steve Patterson, PE and Dr. Medan Mehta, PE details the problems of not installing secondary roof drainage and the failures that they have investigated. The paper gives an in-depth analysis of roof drainage design and how water accumulates on the roof and results in collapse. The paper also reviews the code history of drainage design and requirements. Their research confirmed that secondary drainage has been a code requirement since the 80's. Exception #2 of Section 1511.1 represents the deletion of a long-standing code requirement. Roof drainage is one of the most important roof design elements and the overflow drainage is its most part – the function of the overflow drainage is to prevent the roof from collapsing – an important life safety issue. For these reasons, secondary drainage should once again be required in the code.

Bibliography: Steve Patterson and Medan Mehta. Roof Drainage Design, Roof Collapses and the Codes. March 2018, 32nd Annual RCI Convention proceedings, page 122.

Cost Impact: The code change proposal will increase the cost of construction

When compared to the 2018 IBC, the proposal will increase the cost of construction. However, comparing the proposal to the 2012 IBC, there will be no increase in cost.

Proposal # 5213

S9-19

S10-19

IBC: 1511.5 (IEBC 705.5)

Proponent: Mark Graham, National Roofing Contractors Association (NRCA), representing National Roofing Contractors Association (NRCA) (mgraham@nrca.net)

2018 International Building Code

Revise as follows:

1511.5 Reinstallation of materials. Existing slate, clay or cement tile shall be permitted for reinstallation, except that damaged, cracked or broken slate or tile shall not be reinstalled. Existing vent flashing, metal edgings, drain outlets, collars and metal counterflashings shall not be reinstalled where rusted, damaged or deteriorated. ~~Aggregate-Existing ballast that is damaged, cracked or broken shall not be reinstalled. Existing aggregate surfacing materials from built-up roofs shall not be reinstalled.~~

Reason: This proposal is intended to clarify the intent of the code.

Small diameter aggregate, such as that used as surfacing on built-up roof membranes, is generally considered not appropriate for re-use because the aggregate is contaminated with the existing roof's bitumen flood coat; this is already addressed in the last sentence of Sec. 1511.5. However, it is recognized in the roof industry existing aggregate ballast and pavers, such as that used on ballasted single-ply membrane roof systems, is appropriate for re-use, provided the pavers are not damaged, cracked or broken. Since the code's current language prohibiting the re-use of aggregate surfacing can be interpreted as also applying to aggregate and paver ballast, aggregate and paver ballast is sometimes disposed of unnecessarily.

This proposal is intended to provide differentiation between aggregate and paver ballast, and aggregate surfacing using the code's already existing terminology and is intended to eliminate the need for unnecessarily disposing of roof ballast materials.

Cost Impact: The code change proposal will decrease the cost of construction

In situations where existing aggregate or paver ballast is re-used, the material cost of the aggregate or paver ballast is saved.

Proposal # 4822

S10-19

S11-19

IBC: 1402.2, 1402.3 (New), 1705.16(New)

Proponent: Benjamin Meyer, representing self (2ben.meyer@gmail.com)

2018 International Building Code

Revise as follows:

1402.2 Weather protection. *Exterior walls* shall provide the building with a weather-resistant *exterior wall envelope*. The *exterior wall envelope* shall include flashing, as described in Section 1404.4. The *exterior wall envelope* shall be designed and constructed in such a manner as to prevent the accumulation of water within the wall assembly by providing a *water-resistive barrier* behind the exterior veneer, as described in Section 1403.2, and a means for draining water that enters the assembly to the exterior. Protection against condensation in the *exterior wall* assembly shall be provided in accordance with Section 1404.3.

Exceptions:

1. A weather-resistant *exterior wall envelope* shall not be required over concrete or masonry walls designed in accordance with Chapters 19 and 21, respectively.
2. Compliance with the requirements for a means of drainage, and the requirements of Sections 1403.2 and 1404.4, shall not be required for an *exterior wall envelope* that has been demonstrated through testing to resist wind-driven rain, including joints, penetrations and intersections with dissimilar materials, in accordance with ASTM E331 under the following conditions:
 - 2.1. *Exterior wall envelope* test assemblies shall include not fewer than one opening, one control joint, one wall/eave interface and one wall sill. Tested openings and penetrations shall be representative of the intended end-use configuration.
 - 2.2. *Exterior wall envelope* test assemblies shall be not less than 4 feet by 8 feet (1219 mm by 2438 mm) in size.
 - 2.3. *Exterior wall envelope* assemblies shall be tested at a minimum differential pressure of 6.24 pounds per square foot (psf) (0.297 kN/m²).
 - 2.4. *Exterior wall envelope* assemblies shall be subjected to a minimum test exposure duration of 2 hours.

The *exterior wall envelope* design shall be considered to resist wind-driven rain where the results of testing indicate that water did not penetrate control joints in the *exterior wall envelope*, joints at the perimeter of openings or intersections of terminations with dissimilar materials. Special Inspections of the weather-resistant *exterior wall envelope* shall comply with 1402.3.

3. *Exterior insulation and finish systems* (EIFS) complying with Section 1407.4.1.

Add new text as follows:

1402.3 Special inspections. Special Inspections of the weather-resistant exterior wall envelope shall be as required in Chapter 17.

1705.16 Weather-resistant exterior wall envelope. Special inspections and tests shall be based on the weather-resistant exterior wall envelope design as designated in the approved construction documents.

Reason: The weather-resistant exterior wall envelope is a site-assembled system that is often concealed when construction is complete. To repair or replace poor initial installation or workmanship of the water-resistive barrier assembly (1403.2) and flashing (1404.4) often requires extensive disassembly and replacement of the surrounding exterior cladding, fenestration and structural components.

This proposal allows the AHJ to designate a Special inspection for the critical water management building system when the design complexity calls for additional inspections through the construction documents.

Cost Impact: The code change proposal will increase the cost of construction

Cost will only be increased where the design complexity in the construction documents calls for it. This is the condition where special inspection of the concealed system is critical.

Proposal # 2340

S11-19

S12-19

IBC: 1503.3, 1503.3.1 (New), 1503.3.2 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Building Code

Revise as follows:

1503.3 Coping- Parapet walls. Parapet walls shall be ~~properly coped with noncombustible, weatherproof materials of a width not less than the thickness of the parapet wall.~~ coped or covered in accordance with Sections 1503.3.1 and 1503.3.2. The top surface of the parapet wall shall provide positive drainage.

Add new text as follows:

1503.3.1 Fire-resistance-rated parapet walls. Parapet walls required by section 705.11 shall be coped or covered with non-combustible, weatherproof materials of a width not less than the thickness of the parapet wall.

Revise as follows:

1503.3.2 Other parapet walls. Parapet walls meeting one of the exceptions in Section 705.11 shall be coped or covered with weatherproof materials of a width not less than the thickness of the parapet wall.

Reason: The current language in this section is in dire need of an update, as it does not address current technologies or practices. This language is a carry over from the legacy code and was meant to apply to the coping of masonry parapet walls. The use of the word coping is also confusing, as it is often used interchangeably with the word covered. Depending on the type of roofing system that is being used, traditional metal or masonry copings are not always used to cap or cover a parapet wall.

This proposal provides the much needed clarity as to when and how parapet walls are to be properly coped or covered. The requirement has been broken out into 2 subsections for the two different parapet wall types. 1503.3.1 is for parapet walls that are required to comply with 705.11 must be coped or covered with weatherproof and noncombustible materials.

1503.3.2 is for parapet walls that do not have to comply with 705.11, are required to be coped or covered with weatherproof materials.

This revision will provide additional options for maintaining a continuous air barrier. For example, the roof membrane could be used to wrap the top of the parapet wall and extend down the exterior side of the wall. The membrane could then be tied into the wall air barrier system. See also Figures 1 through 4.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/building-code-action-committee-bcac/>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

No additional materials or detailing will be required based on this code change proposal; therefore it will not increase the cost of construction.

Proposal # 4127

S12-19

S13-19

IBC: 1503.3, 1503.3.1 (New), 1503.3.2 (New)

Proponent: Amanda Hickman, The Hickman Group, representing The Single-Ply Roofing Industry (SPRI) (amanda@thehickmangroup.com)

2018 International Building Code

Revise as follows:

1503.3 Coping- Parapet Walls. Parapet walls shall be properly coped with noncombustible, weatherproof materials of a width not less than the thickness of the parapet wall or covered in accordance with Sections 1503.3.1 and 1503.3.2. The top surface of the parapet wall shall provide positive drainage.

Add new text as follows:

1503.3.1 Fire-resistance-rated parapet walls. Parapet walls required by section 705.11 shall be coped or covered with non-combustible, weatherproof materials of a width not less than the thickness of the parapet wall.

1503.3.2 Other parapet walls. Parapet walls meeting one of the exceptions in Section 705.11 shall be coped or covered with weatherproof materials of a width not less than the thickness of the parapet wall.

Reason: This proposal clarifies how to properly cope or cover the two different types of parapet wall types (those that must comply with Section 705.11 and those that do not).

The current language does not address current technologies or practices. This language is a carry over from the legacy code and was meant to apply to the coping of masonry parapet walls. The use of the word coping is also confusing, as it is often used interchangeably with the word covered. Depending on the type of roofing system that is being used, traditional metal or masonry copings are not always used to cap or cover a parapet wall.

This revision will provide additional options for maintaining a continuous air barrier. For example, the roof membrane could be used to wrap the top of the parapet wall and extend down the exterior side of the wall. The membrane could then be tied into the wall air barrier system.



Examples of covered parapets as required by 1503.3.2.



Examples of coped parapets as required by 1503.3.1.



Fascia on 6" wide by 4" high "Parapet"



Note 4" high
x 6" wide
"parapet"

Adelman Travel - Fascia on radius "parapet" @
6" high x 6" wide



Hyvee Iowa Fascia on 18" parapet condition



Rowan project – Fascia on 24” parapet



Cost Impact: The code change proposal will decrease the cost of construction

The code change proposal will decrease the cost of construction. This proposal clarifies the difference between parapet wall types and how they should be covered or coped. Where metal coping is not required this proposal would lead to a decrease in the cost of construction by reducing material and labor. This could result in a cost reduction as much as \$5-10 per foot.

Proposal # 4542

S13-19

S14-19

IBC: 1504.2.1, 1504.2.1.2, 1504.2.1.3 (New), ASTM Chapter 35

Proponent: Rob Brooks, Rob Brooks and Associates, LLC, representing DowDuPont (rob@rtbrooks.com)

2018 International Building Code

Revise as follows:

1504.2 Wind resistance of clay and concrete tile. Wind loads on clay and concrete tile roof coverings shall be in accordance with Section 1609.5.

1504.2.1 Testing. Testing of concrete and clay roof tiles shall be in accordance with Sections 1504.2.1.1, 1504.2.1.2 and ~~1504.2.1.2~~, 1504.2.1.3.

1504.2.1.1 Overturning resistance. Concrete and clay roof tiles shall be tested to determine their resistance to overturning due to wind in accordance with Chapter 15 and either SBCCI SSTD 11 or ASTM C1568.

1504.2.1.2 Wind tunnel testing. Where concrete and clay roof tiles do not satisfy the limitations in Chapter 16 for rigid tile, a wind tunnel test shall be used to determine the wind characteristics of the concrete or clay tile roof covering in accordance with Chapter 15 and either SBCCI SSTD 11 and Chapter 15, or ASTM C1569.

Add new text as follows:

1504.2.1.3 Air permeability testing. The lift coefficient for concrete and clay tile shall be 0.2 or shall be determined in accordance with SBCCI SSTD 11 or ASTM C1570.

Add new standard(s) as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken PA 19428-2959

C1569-03(2016): Standard Test Method for Wind Resistance of Concrete and Clay Roof Tiles (Wind Tunnel Method)

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken PA 19428-2959

C1570-03(2016): Standard Test Method for Wind Resistance of Concrete and Clay Roof Tiles (Air Permeability Method)

Reason: Reason: In 2003, ASTM International Subcommittee C15.06 replicated SSTD 11-99 by subdividing the SBCCI standard into three different ASTM standards:

- 1) ASTM C1568- 03, Standard Test Method for Wind Resistance of Concrete and Clay Roof Tiles (Mechanical Uplift Resistance Method),
- 2) ASTM C1569-03, Standard Test Method for Wind Resistance of Concrete and Clay Roof Tiles (Wind Tunnel Method), and
- 3) ASTM C1570-03, Standard Test Method for Wind Resistance of Concrete and Clay Roof Tiles (Air Permeability Method).

In the previous code cycle, ASTM C1568 for mechanical uplift resistance was added to Section 1504.2.1.1 as an alternate to SSTD 11-99. This code change adds ASTM C1569 to Section 1504.2.1.2 for wind tunnel testing.

The ASTM C1569 test method determines the uplift forces acting as a result of the simulated wind when tiles are attached to a section a roof deck in accordance with the manufacturer?s instructions.

The cross-correlation of ASTM C1569 and SSTD 11 is as follows:

C1569 Section 5 relates to SSTD 11 Section 801

C1569 Section 7.2 relates to SSTD 11 Section 802

C1569 Section 7.5 relates to SSTD 11 Section 803

C1569 Section 7.6 relates to SSTD 11 Section 804

C1569 Section 7.7 relates to SSTD 11 Section 805

C1569 Section 7.8 relates to SSTD 11 Section 806

C1569 Section 7.9 relates to SSTD 11 Section 807

This code change also adds ASTM C1570 to Section 1504.2.1.3 for air permeability testing.

The ASTM C1570 test method measures the ability of the roof system to relieve wind-induced uplift pressures as a result of the overall air permeability of the roof assembly as it relates to the resistance of the roof system to damage induced by the wind. It serves to evaluate the uplift coefficient CL, referenced in IBC Section 1609.5.3, Equation 16-34, where the lift coefficient determination states: The lift coefficient for concrete and clay tile shall be 0.2 or shall be determined by test in accordance with Section 1504.2.1. That pointer has been modified to Section 1504.2.1.3.

The cross-correlation of ASTM C1570 and SSTD 11 is as follows:

C1570 Section 1.2 relates to SSTD 11 Section 901

C1570 Section 4.1 relates to SSTD 11 Section 902.1

C1570 Section 6 relates to SSTD 11 Section 902.2

C1570 Section 7 relates to SSTD 11 Section 902.3

C1570 Section 8 relates to SSTD 11 Section 902.4

C1570 Section 9 relates to SSTD 11 Section 902.5

C1570 Section 10 relates to SSTD 11 Section 902.6

C1570 Section 11 relates to SSTD 11 Section 902.7

C1570 Section 12 relates to SSTD 11 Section 903

C1570 Section 13 relates to SSTD 11 Section 904

There are no technical changes proposed with this code change request. ASTM C1569 and C1570 are simply a duplication of the relevant sections of SSTD 11-99 with regard to the wind tunnel and air-permeability test methods. This modification now references ASTM consensus standards that will have the capability to be updated in the future, as SSTD 11 has not been updated since 1999.

Bibliography: Additional information on the background and development of the ASTM standards is available at [<http://rci-online.org/wp-content/uploads/2014-11-smith-masters-gurley.pdf>]

The chronology of the progression of these standardized test methods is found in Table 1 at [https://www.researchgate.net/publication/299487049_A_study_of_wind_load_interaction_for_roofing_field_tiles]



Cost Impact: The code change proposal will not increase or decrease the cost of construction
The ASTM standards replicate the current requirements of SBCCI SSTD-99, and therefore will not increase the cost of construction.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM C1569-03(2016) and C1570-03(2016) , with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 4163

S14-19

S15-19

IBC®: 1504.4, 1504.8

Proponent: Amanda Hickman, The Hickman Group, representing The Single-Ply Roofing Industry (SPRI) (amanda@thehickmangroup.com); Jay Crandell, P.E., ARES Consulting, representing self (jcrandell@aresconsulting.biz)

2018 International Building Code

Revise as follows:

1504.4 Ballasted low-slope single-ply roof systems. Ballasted low-slope (roof slope < 2:12) single-ply roof system coverings installed in accordance with Sections 1507.12 and 1507.13 shall be designed in accordance with ~~Section 1504.8~~ and ANSI/SPRI RP-4.

1504.8 Surfacing and ballast materials in hurricane-prone regions. For a building located in a hurricane-prone region as defined in Section 202, or on any other building with a mean roof height exceeding that permitted by Table 1504.8 based on the exposure category and basic wind speed at the site, the following materials shall not be used on the roof:

1. Aggregate used as surfacing for roof coverings.
2. Aggregate, gravel or stone used as ballast.

Exception: Ballasted single-ply roof systems complying with Section 1504.4

Reason: This proposal makes a much-needed correction to section 1504.4 for ballasted roof systems for low-slope single-ply roofs. This proposal revises Section 1504.4 so that ballasted roofs comply with ANSI/SPRI RP-4 and not 1504.8. The requirements in RP-4 were developed for the appropriate application, installation and to prevent ballast scour for this specific type of single-ply ballasted system. The scour wind speed is below that at which blowoff would occur. It also provides design options for various conditions.

Section 1504.8 is based on the wind speeds for blow-off and only deals with smaller aggregate used for surfacing of built up roofs (BUR) and sprayed polyurethane foam (SPUF) roofs, which are completely different systems than ballasted roofs. For this reason an exception has been added in Section 1504.8 for ballasted single-ply roof systems complying with Section 1504.4.

The requirements in ANSI/SPRI RP-4 are based on a complete set of wind tunnel tests conducted in the largest commercially available wind tunnel in North America located at the National Research Council Canada. In this test series all variables that would impact the wind performance of ballasted single ply roof assemblies were evaluated, including stone size and size distribution as specified in ASTM D7655 Standard Classification for Size of stone used as ballast for membrane roof systems.

In this series of tests three critical windspeeds were identified for each condition of parapet height and stone size, windspeed 1 is the speed at which the stone distribution first begins to move, windspeed 2 is the speed is that which if maintained would result in stone scouring, and windspeed three is the speed at which stone blow-off occurs. The requirements in the Design Table of ANSI/SPRI RP-4 are based on windspeed 2, or the windspeed at which stone scour would occur.

The requirements of this standard have been updated based on field performance and in the most recent edition the design tables have been revised to reflect current methodology for interpreting wind tunnel data. Section 1504.8 does not consider the critical variables of parapet height and stone size and should not be applicable to ballasted single ply roof systems.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal only clarifies what design requirements are to be used for ballasted single-ply roof systems.

Proposal # 4545

S15-19

S16-19

IBC®: 1504.5

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Amanda Hickman, representing The Single-Ply Roofing Industry (SPRI) (amanda@thehickmangroup.com)

2018 International Building Code

Revise as follows:

1504.5 Edge ~~securement~~ systems for low-slope roofs. ~~Low-slope Metal edge systems, except gutters, installed on built-up, modified bitumen and single-ply roof system metal edge securement, except gutters~~ systems having a slope less than 2:12, shall be designed and installed for wind loads in accordance with Chapter 16 and tested for resistance in accordance with Test Methods RE-1, RE-2 and RE-3 of ANSI/SPRI ES-1, except basic design wind speed, V, shall be determined from Figures 1609.3(1) through 1609.3(8) as applicable.

Reason: KULIK: This proposal is intended to clarify that regardless if the roof membrane is either independently or dependently terminated, the edge metal system needs to be properly tested to the appropriate standard. Metal edge systems prevent water infiltration, and in many cases to also secure the roof membrane. Loss of the edge system or components of the edge system during a high wind event could allow for water infiltration even if the roof membrane remains secure. Furthermore, any component of the edge system that becomes disengaged during a high wind event will become a projectile that can damage the roof membrane and other building components (windows, doors, walls, etc.), and possibly injure people. Therefore, metal edge systems should be tested per ES-1 whether they secure the membrane or not.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/building-code-action-committee-bcac/>.

HICKMAN: This proposal clarifies that the edge metal systems need to be properly tested to the appropriate standard regardless if the roof membrane is either independently or dependently terminated.

Metal edge systems prevent water infiltration, and in many cases to also secure the roof membrane. Loss of the edge system or components of the edge system during a high wind event could allow for water infiltration even if the roof membrane remains secure.

Furthermore, any component of the edge system that becomes disengaged during a high wind event will become a projectile that can damage the roof membrane and other building components (windows, doors, walls, etc.), and possibly injure people. Therefore, metal edge systems should be tested per ES-1 whether they secure the membrane or not.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

KULIK: This proposal just clarifies that this test applies to edge metal regardless of installation method.

HICKMAN: The code change proposal will not increase or decrease the cost of construction. This proposal only clarifies that this test applies to edge metal regardless of installation method.

Proposal # 4128

S16-19

S17-19

IBC: 1504.5.1 (New), SPRI Chapter 35 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Amanda Hickman, representing The Single-Ply Roofing Industry (SPRI) (amanda@thehickmangroup.com)

2018 International Building Code

Add new text as follows:

1504.5.1 Gutter securement for low-slope roofs. External gutters that are used to secure the edge of the roof membrane on low-slope (less than 2:12 slope) built-up, modified bitumen, and single ply roofs, shall be designed, constructed and installed to resist wind loads in accordance with Section 1609 and shall be tested in accordance with Test Methods G-1 and G-2 of SPRI GT-1.

SPRI

Single-Ply Roofing Institute
465 Waverly Oaks Road, Suite 421
Waltham MA 02452

GT-1-2016: Test Standard for Gutter Systems

Reason: KULIK: Studies of the aftermath of high-wind events revealed that many gutter systems did not resist the loads that occur during these high-wind events. Examples of these observations are shown below. SPRI developed the gutter test standard to address this issue. The wind resistance tests included in this standard measure the resistance of the gutter system to wind forces acting outwardly (away from the building) and to wind forces acting upwardly tending to lift the gutter off of the building. The standard also measures the resistance of the gutter system to static forces of water, snow and ice acting downward. The six figures at the end of this reason statement are examples of gutter failures during high wind events observed during investigations conducted by the Roofing Industry Committee on Weather Issues (RICOWI).

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on theBCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/building-code-action-committee-bcac/>.









HICKMAN: This proposal requires that gutters that are used as part of the edge securement of single-ply roof membranes be tested to the appropriate standard for acceptable wind resistance performance.

Studies of the aftermath of high-wind events revealed that many gutter systems did not resist the loads that occur during these high-wind events. When gutters are used to secure the roof membrane, a gutter failure can become a much bigger problem as it can cause a roof failure. Examples of these observations are shown below.

SPRI developed the gutter test standard to address this issue. The wind resistance tests included in this standard measure the resistance of the gutter system to wind forces acting outwardly (away from the building) and to wind forces acting upwardly tending to lift the gutter off of the building. Following are examples of gutter failures during high wind events observed during investigations conducted by the Roofing Industry Committee on Weather Issues (RICOWI).





2.11-2. Membrane peeled away from the insulation and detached from the roof in most



2.11-10. Photo of gutter/cleat attachment is a good example of damage progression.



3-08-1. Small retail building. Close up of windblown, deflected gutter.



3-08-2. Small retail building. Roof view of lifted gutter and metal edge. Note roof membrane has not peeled back.



3-09-2. Large retail building. Gutter metal blew across the roof, puncturing the roof membrane and breaking skylights.



3-09-3. Large retail building. Broken skylights became wind-borne debris, puncturing roof membrane—SE view.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

KULIK: Even though there would be some increased cost to the manufacturer due to the testing of the gutter, it would be negligible, estimated around \$0.058 /LF. This would be a one-time cost amortized over production time of the gutter. The nominal cost would most likely not increase the cost of construction. Not every gutter is required to be tested (depends on profile and attachment type). Once the gutter is tested, it is good forever so the cost of the test is spread out over time and over all the feet of gutter produced.

HICKMAN: The code change proposal will not increase or decrease the cost of construction. This would be a one-time cost amortized over production time of the gutter. Once the gutter is tested, it is good forever so the cost of the test is spread out over time and over all the feet of gutter produced. Even though there would be some increased cost to the manufacturer due to the testing of the gutter, it would be negligible, less than \$0.05 /LF. Not every gutter is required to be tested (depends on profile and attachment type).

Staff Analysis: A review of the standard proposed for inclusion in the code, SPRIGT-1-2016 , with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

S18-19

IBC@: 1504.7

Proponent: Mike Fischer, representing The Asphalt Roofing Manufacturers Association (mfischer@kellenccompany.com)

2018 International Building Code

Revise as follows:

1504.7 Impact resistance. Roof coverings installed on low-slope roofs (roof slope < 2:12) in accordance with Section 1507 shall resist impact damage based on the results of tests conducted in accordance with ASTM D3746, ASTM D4272 or the "Resistance to Foot Traffic Test" in ~~Section 5.5 of~~ FM 4470.

Reason: The proposal removes the section reference to avoid correlation issues should the referenced standard section numbering be revised in the future. The correct refernce is section 4.6 of FM 4470 which has been corrected from section 5.5 per the errata for IBC 2018.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The proposal is editorial.

Proposal # 5681

S18-19

S19-19

IBC: 1504.8, 1607.13.6 (New)

Proponent: Edwin Huston, representing National Council of Structural Engineers' Associations (NCSEA (huston@smithhustoninc.com))

2018 International Building Code

Revise as follows:

1504.8 Surfacing and ballast materials in hurricane-prone regions. For a building located in a hurricane-prone region as defined in Section 202, or on any other building with a mean roof height exceeding that permitted by Table 1504.8 based on the exposure category and basic wind speed at the site, the following materials shall not be used on the roof:

1. Aggregate used as surfacing for roof coverings.
2. Aggregate, gravel or stone used as ballast.

Exception: A roof that complies with all of the following:

1. A parapet is placed on all exterior sides of the roof.
2. The parapet is tall enough to retain the volume of roofing material, regardless of wind direction.
3. The roof and parapet are designed for the additional live load of the retained aggregate at the edge of the roof.

Add new text as follows:

1607.13.6 Surfacing and ballast materials. For a building located in a hurricane-prone region, or on any other building with a mean roof height exceeding that permitted by Table 1504.8 based on the exposure category and basic wind speed at the site, where aggregate is used as surfacing for roof coverings or aggregate, gravel or stone is used as ballast and a parapet is placed on all exterior sides of the roof to retain the volume of roofing material, the roof and parapet shall be designed for the additional live load of the retained aggregate, regardless of wind direction.

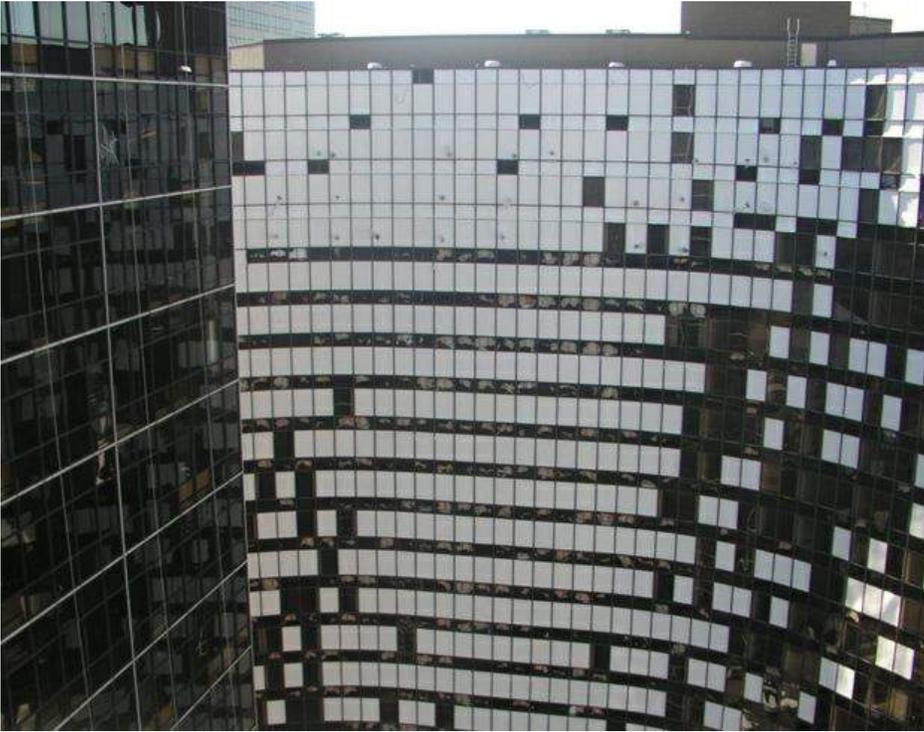
Reason: In the 2018 code change cycle, S20-16 proposed the replacement of Table 1504.8 with a table that would allow aggregate roofing systems to be used on roofs in various wind speed and wind exposure conditions if the building being designed had a parapet whose minimum height equaled or exceeded the parapet height noted in the revised table.

The reason statement for the 2018 code change S20-16 implies that this proposal was based on "the K-W design method (Kind Wardlaw 1976), the wind tunnel studies underlying the KW design method (Kind 1977), or a quantitative analysis of observed good and bad roofing system performances in real wind events".

NCSEA opposed S20-16. The proposal was revised by a public comment from the proponents, which was unsuccessful. However, members of the Structural Committee appeared to be in favor of using parapets to retain roofing aggregate.

Aggregate blow-off from roofs was reported in Houston, TX during Hurricane Alicia in 1982, in Miami-Dade County, FL during Hurricane Andrew, in New Orleans, LA during Hurricane Katrina, and in other cities during these and other events. After Hurricane Katrina, the NCSEA Code Advisory Committee witnessed the damage to the glazing systems of The New Orleans Shopping Center Office Building and The Amoco Building both of which were on Poydrus Street in New Orleans, LA. The glazing systems of these buildings were damaged by aggregate blown off buildings on the north side of Poydrus Street. We also witnessed the damage to the glazing system of the Hyatt Regency Hotel from the vantage point of the roof of the Amoco Building. The Amoco Building previously had an aggregate ballasted roof. Most of the aggregate had been blown off of the roof. Much of the aggregate that remained on the roof was ramped up against the parapet on the south side of the building. Once the aggregate ramp height equaled the parapet height, the remaining aggregate was swept up the ramp and off the roof. Directly south of the Amoco Building, windows of the Hyatt Regency Hotel had been broken (see Figure 1), and aggregate was retrieved from the bedrooms of the hotel.

Figure 1 - Glazing failures in Hyatt Regency Hotel, New Orleans, LA following Hurricane Katrina.



Source NCSEA Code Advisory Committee

Wind speeds in New Orleans, LA during Hurricane Katrina were reported as being less than the design wind speeds from ASCE7.

In the 2006 Public Comment Hearing John Loscheider testified that the national roofing Contractors Association's magazine reported aggregate roofing blow-off damage to other buildings in New Orleans after Hurricane Katrina.

The presence of aggregate ramps and aggregate blow-off has been reported previously. For example, aggregate ramps were observed against the six-foot tall parapets of the National Hurricane Center in Miami after Hurricane Andrew. We understand that aggregate blow-off from this roof was also reported.

This code change proposal would allow buildings, whose height exceeds the limitations of Table 1504.8, to be constructed using an aggregate surfaced or aggregate ballasted roof, if the building had a parapet that was of sufficient height that it could retain the volume of aggregate.

We note that there are other alternates to aggregate used as surfacing for roof coverings or for aggregate, gravel or stone used as ballast. They are probably more expensive, but we believe that they are almost certainly less expensive than the window replacement costs due to aggregate blow-off.

If the aggregate is transported to the edge of the roof, there may be the need for additional gravity load capacity. This requirement is dealt with by adding section 1607.13.6.

Bibliography: Crandell, J. H. and Smith, T.L. (2010) Design Method Improvements to Prevent Roof Aggregate Blow-Off, Hugo Conference International Building Code. Falls Church, VA

Kind, R.J. and Wardlaw R.L. (1976). Design of Rooftops Against Gravel Blow-Off. National Aeronautical Establishment, National Research Council, Canada. Kind, R.J. (1977). Further Wind Tunnel Tests on Building Models to Measure Wind Speeds at Which Gravel is Blown Off Rooftops. LTR-LA-189. National Aeronautical Establishment, National Research Council, Canada.

National Institute of Standards and Technology, Technical Note 1476 (2006) Performance of Physical Structures in Hurricane Katrina and Hurricane Rita: A Reconnaissance Report

Federal Emergency Management Agency FIA-22 (1993, Building Performance: Hurricane Andrew in Florida

Federal Emergency Management Agency FEMA 548 (2006), Summary Report on Building Performance Hurricane Katrina 2005

Cost Impact: The code change proposal will increase the cost of construction

Increasing parapet height may increase the cost of construction if the parapet retention system is used, but it is not mandated, it is listed as an alternate. Another roofing alternative may be less expensive.

Proposal # 5465

S19-19

S20-19

IBC®: 1504.8

Proponent: Jay Crandell, P.E., ARES Consulting, representing self (jcrandell@aresconsulting.biz); Ellen Thorp, EPDM Roofing Association; Mike Fischer (mfischer@kellencompany.com)

2018 International Building Code

Revise as follows:

1504.8 Surfacing and ballast materials in hurricane-prone regions. For a building located in a hurricane-prone region as defined in Section 202, or on any other building with a mean roof height exceeding that permitted by Table 1504.8 based on the exposure category and basic wind speed at the site, the following materials shall not be used on the roof:

1. Aggregate used as surfacing for roof coverings.
2. Aggregate, gravel or stone used as ballast.

Exception: Where the aggregate surfaced roof system and parapets shall be designed by a *registered design professional* to control aggregate blow-off.

Reason: There are proven and accepted design methods to control aggregate blow-off from roofs which are superior to those in Table 1504.8. These include the prescribed provisions in the code-referenced ANSI/SPRI RP-4 standard and also the design methodology used to develop those provisions (Kind and Wardlaw, 1976). Newer methodologies based on Kind and Wardlaw (1976) are explained and verified as being effective based on comparison to numerous sources of field data (Crandell and Smith, 2009; Crandell and Fischer, 2010; Morrison, 2011).

Why is this important? The provisions of existing Table 1504.8 lack any requirement for use of parapets for building heights of up to 170-feet in height because the science and design approach behind the table is seriously flawed. Consequently, the requirements in Table 1504.8 are incomplete and potentially unsafe. For these reasons, alternative solutions by registered design professionals should be explicitly permitted. This proposal is also compatible with a separate proposal (by the same proponents) to fix the many problems with existing Table 1504.8 and Section 1504.8 as explained in the reason statement to that proposal.

Bibliography: Crandell, J. H. and Smith, T.L.. (2010) Design Method Improvements to Prevent Roof Aggregate Blow -Off, Hurricane Hugo 20th Anniversary Symposium on Building Safer Communities – Improving Disaster Resistance, ATC-77, North Charleston, SC, October 22-23, 2009
Kind, R.J. and Wardlaw R.L. (1976). Design of Rooftops Against Gravel Blow -Off. National Aeronautical Establishment, National Research Council, Canada.

Crandell, J. H. and Fischer, M. (2010). Winds of Change: Resolving Roof Aggregate Blow -Off, RCI 25th International Convention and Trade Show, March 25-30, 2010, RCI, Inc., Raleigh, NC

Morrison, R.V. (2011). Field Investigation of Aggregate Blow-off of Spray Polyurethane Foam Roofs, *RCI Interface*, Technical Journal of RCI, Inc. (presented at RICOWI Fall Symposium, November 11, 2010)

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The proposed exception provides an alternative to Table 1504.8 and does not replace or change it.

Proposal # 5001

S20-19

S21-19

IBC®: 1504.8, TABLE 1504.8

Proponent: Jay Crandell, P.E., ARES Consulting, representing self; Mike Fischer (mfischer@kellencompany.com); Ellen Thorp, EPDM Roofing Association

2018 International Building Code

Delete and substitute as follows:

1504.8 Surfacing and ballast materials in hurricane-prone regions. For a building located in a hurricane-prone region as defined in Section 202, or on any other building with a mean roof height exceeding that permitted by Table 1504.8 based on the exposure category and basic wind speed at the site, the following materials shall not be used on the roof:

- 1- Aggregate used as surfacing for roof coverings.
- 2- Aggregate, gravel or stone used as ballast.

1504.8 Wind resistance of aggregate-surfaced roofs. Aggregate surfaced roofs shall comply with Table 1504.8.

TABLE 1504.8

MAXIMUM ALLOWABLE MEAN ROOF HEIGHT PERMITTED FOR BUILDINGS WITH AGGREGATE ON THE ROOF IN AREAS OUTSIDE A HURRICANE-PRONE REGION

NOMINAL DESIGN WIND SPEED, V_{ref} (mph) ^{b, d}	MAXIMUM MEAN ROOF HEIGHT (ft) ^{a, e}		
	Exposure category		
	B	C	D
85	170	60	30
90	110	35	15
95	75	20	NP
100	55	15	NP
105	40	NP	NP
110	30	NP	NP
115	20	NP	NP
120	15	NP	NP
Greater than 120	NP	NP	NP

For SI: 1 foot = 304.8 mm; 1 mile per hour = 0.447 m/s.

- a- Mean roof height as defined in ASCE 7.
- b- For intermediate values of V_{ref} , the height associated with the next higher value of V_{ref} shall be used, or direct interpolation is permitted.
- c- NP = gravel and stone not permitted for any roof height.
- d- V_{ref} shall be determined in accordance with Section 1609.3.1.

TABLE 1504.8

MINIMUM REQUIRED PARAPET HEIGHT (INCHES) FOR AGGREGATE SURFACED ROOFS^{a, b, c}

AGGREGATE SIZE	MEAN ROOF HEIGHT (ft)	WIND EXPOSURE AND BASIC DESIGN WIND SPEED (MPH)																	
		Exposure B								Exposure C ^d									
		≤95	100	105	110	115	120	130	140	150	≤95	100	105	110	115	120	130	140	150
ASTM D1863 (No. 7 or No. 67) or ASTM D7655 (No. 4)	15	2	2	2	2	12	12	16	20	24	2	13	15	18	20	23	27	32	37
	20	2	2	2	2	12	14	18	22	26	12	15	17	19	22	24	29	34	39
	30	2	2	2	13	15	17	21	25	30	14	17	19	22	24	27	32	37	42
	50	12	12	14	16	18	21	25	30	35	17	19	22	25	28	30	36	41	47
	100	14	16	19	21	24	27	32	37	42	21	24	26	29	32	35	41	47	53

	150	17	19	22	25	27	30	36	41	46	23	26	29	32	35	38	44	50	56
ASTM D1863 (No.6)	15	2	2	2	2	12	12	12	15	18	2	2	2	13	15	17	22	26	30
	20	2	2	2	2	12	12	13	17	21	2	2	12	15	17	19	23	28	32
	30	2	2	2	2	12	12	16	20	24	2	12	14	17	19	21	26	31	35
	50	12	12	12	12	14	16	20	24	28	12	15	17	19	22	24	29	34	39
	100	12	12	14	16	19	21	26	30	35	16	18	21	24	26	29	34	39	45
	150	12	14	17	19	22	24	29	34	39	18	21	23	26	29	32	37	43	48

For SI: 1 inch = 25.4 mm; 1 foot = 304.8 mm; 1 mile per hour = 0.447 m/s.

a. Interpolation shall be permitted for mean roof height and parapet height.

b. Basic design wind speed, V, and wind exposure shall be determined in accordance with Section 1609.

c. Where the minimum required parapet height is indicated to be 2 inches (51 mm), a gravel stop shall be permitted and shall extend not less than 2 inches (51 mm) from the roof surface and not less than the height of the aggregate.

d. For Exposure D, add 8 inches (203 mm) to the parapet height required for Exposure C and the parapet height shall not be less than 12 inches (305 mm).

Reason: In summary, this proposal has the following features:

1. Updates Table 1504.8 to a “basic design wind speed” basis and eliminates use of ASD wind speed to be consistent with changes made throughout the IBC in previous cycle to correlate with newer wind maps based on “ultimate” wind speeds (now called basic design wind speed).
2. Provides an engineering and scientific basis for roof design to prevent aggregate blow-off based on over 200 wind tunnel tests coupled with subsequent field studies from several different hurricane events with documented conditions and performance. See Bibliography (Kind-Wardlaw, 1976; Kind, 1977; Crandell & Smith, 2009; Crandell & Fischer, 2010; etc.)
3. Corrects unsafe conditions that the current Table 1504.8 allows based on scientifically incorrect assumptions (e.g., allows 170’ tall buildings with aggregate surfaced roofs and NO PARAPET).
4. Accounts for aggregate size distribution in the referenced ASTM aggregate standards, including the minimum permitted aggregate size in the referenced mixes as addressed in the referenced wind tunnel studies for this proposal which replicated actual aggregate size distribution (Kind, 1977) as also confirmed in field studies (e.g., Crandell & Smith, 2009).
5. Has been independently confirmed by later field study subsequent to the original research with the purpose of verifying the accuracy and effectiveness of the design methodology based on actual performance of real buildings and real hurricane events (Morrison, 2011).

This proposal is consistent with S19-16 and a public comment (PC#2) that was submitted in response to the structural committee’s direction in 2016. The public comment was approved at public hearing only to be spuriously overturned during the on-line governmental vote. What follows, for the record, are the reason statements from the original S19-16 proposal and PC#2 (with modest editing to fit the context of this proposal):

A) From the original S19-16 proposal (excerpt slightly edited):

The current provisions in Section 1504.8, and specifically Table 1504.8, are not based on the Kind-Wardlaw (K-W) design method (Kind Wardlaw 1976), the wind tunnel studies underlying the K-W design method (Kind 1977), or a quantitative analysis of observed good and bad roofing system performances in real wind events. Instead, current building code requirements are based on variation in surface pressure with building height which is known to be an inappropriate predictor of aggregate blow -off or scour due to pressure equalization effects (Smith, 1997). Furthermore, these recent requirements do not address critical parameters such as aggregate size and parapet height which govern performance. This code change proposal replaces the current Table 1504.8 with one based on the K-W design method and new research by the Asphalt Roofing Manufacturers Association (ARMA) (Crandell and Fischer, 2010). Results demonstrate that the use of aggregate-surfaced roofing systems is a viable option in high wind areas with appropriate aggregate sizing and parapet design. The K-W design method has been simplified, improved, and calibrated to a number of field observations from actual hurricane events to refine its application to low-slope, built-up roof (BUR) and sprayed polyurethane foam (SPF) roof systems (Crandell Smith, 2009).

B) From PC2 on S19-16 (slightly edited):

In response to the structural committee’s comments and indication that “this proposal is headed in the right direction”, this public comment addresses the committee’s recommendation to simplify and improve readability of the table (which was partly a font size or CDP access table

formatting issue). These revisions are technically consistent with the original S19-16 proposal and the referenced research.

The 2016 committee also mentioned that questions were raised with regard to how the provisions were developed from the referenced research. The methodology (and design procedure) is clearly documented in the referenced research in an understandable, repeatable, and scientific manner (see original S19-16 proposal's reason statement (above) and bibliography (below) for referenced research reports and papers. The procedure used is consistent with the findings of many wind tunnel studies and uses the same principles as applied in the ANSI/SPRI RP-4 standard currently referenced in the code. It is also consistent with the treatment of aggregate blow-off as incorporated in wind risk models. Furthermore, the analytical procedure was evaluated by comparison to numerous documented field studies of successful and failed loose aggregate surfaced roofs systems in various high wind events to confirm its ability to reliably predict performance as a means to design roofs (or develop prescriptive provisions as proposed) to prevent roof aggregate blow-off. Thus, a robust combination of current engineering practice, wind tunnel data, and field research was used to support development of the requirements as proposed for Table 1504.8.

However, this proposal does not merely provide a more academic solution. It is necessary to correct deficiencies in the current code provisions. For example, the current Table 1504.8 allows buildings up to 170' tall or buildings in areas with design wind speeds up to 120 mph with NO PARAPET which creates a general safety hazard (e.g., falling debris from the roof) and unacceptable wind damage vulnerability (i.e., aggregate blow-off risk). This proposal corrects this safety and building performance issue based on correct scientific principles and sound engineering practices.

If implemented, this proposal will serve to prevent many past observations of roof aggregate blow-off from being repeated. Simply put, this proposal is implementing lessons learned in a rational, scientific manner based on real-world and wind tunnel laboratory data to prevent history from repeating itself in an unfavorable manner. Any argument against this proposal as being inadequate is an argument to leave the code in a far worse condition from a building safety and performance standpoint.

In closing, the following quote from Morrison (2011) provides independent, confirmation of the design methodology used for this proposal and is based on the documented performance (and aggregate and parapet conditions) of 20 buildings with aggregate surfaced roofs experiencing Hurricanes Francis and Jeanne in 2004:

"The major intent of this study was to determine the validity of Crandell's Modified Kind-Wardlaw Design Method for Buildings of All Heights [Crandell & Smith, 2009; Crandell & Fischer, 2010].

An X-value calculation was determined to compare the adjusted critical wind speed (V_{cr}) to the actual estimated wind speed (V_{roof}). Per Crandell's Method, a positive X-value would be "safe" from the standpoint of aggregate blow-off. Indeed, this was consistent with the observations.

In fact, Crandell's Method appears to be quite conservative since 12 of the 20 roofs observed had negative X-values but no observed or reported aggregate blow-off. The single roof that did experience blow-off had an X-value of -52. While this might suggest that Crandell's Method has a "safety factor" of about 50 mph wind speed, this is only one sample, and there were multiple uncertainties in this analysis."

In summary, this proposal is a significant improvement of the existing provisions in the code and will result in better performing and safer aggregate surfaced roofs based on a proven and robust design approach.

Bibliography: Crandell, J. H. and Smith, T.L.. (2009) Design Method Improvements to Prevent Roof Aggregate Blow -Off, Hurricane Hugo 20th Anniversary Symposium on Building Safer Communities – Improving Disaster Resistance, ATC-77, North Charleston, SC, October 22-23, 2009
Kind, R.J. and Wardlaw R.L. (1976). Design of Rooftops Against Gravel Blow -Off. National Aeronautical Establishment, National Research Council, Canada.

Kind, R.J. (1977). Further Wind Tunnel Tests on Building Models to Measure Wind Speeds at Which Gravel is Blown Off Rooftops. LTR-LA-189. National Aeronautical Establishment, National Research Council, Canada.

Smith, T.L. (June 1997). Aggregate Blow -Off from BUR and SPF Roofs: Recognizing the Potential Hazards and Avoiding Problems. Proceedings of The 8th U.S. Conference on Wind

Engineering, AAWE.

ANSI/SPRI RP-4 (2013). Wind Design Standard for Ballasted Single-Ply Roofing Systems. SPRI, Waltham, MA (www.spri.org)

Crandell, J. H. and Fischer, M. (2010). Winds of Change: Resolving Roof Aggregate Blow -Off, RCI 25th International Convention and Trade Show, March 25-30, 2010, RCI, Inc., Raleigh, NC

Morrison, R.V. (2011). Field Investigation of Aggregate Blow-off of Spray Polyurethane Foam Roofs, *RCI Interface*, Technical Journal of RCI, Inc. (presented at RICOWI Fall Symposium, November 11, 2010)

Cost Impact: The code change proposal will increase the cost of construction

Overall, the proposed new Table 1504.8 will provide additional options for use of aggregate surfaced roofs that are safer than the current provisions and which may reduce cost. In some cases, depending on current practice and the basic design wind speed condition for a building site, a parapet (or taller parapet) and/or larger aggregate may be required for compliance. In these cases, an incremental cost increase can be expected.

Proposal # 5005

S21-19

S22-19

IBC®: SECTION 1506 (New), 1506.1

Proponent: Mark Graham, National Roofing Contractors Association (NRCA), representing National Roofing Contractors Association (NRCA) (mgraham@nrca.net)

2018 International Building Code

SECTION 1506 MATERIALS

Revise as follows:

1506.1 Scope. The requirements set forth in this section shall apply to the application of roof-covering materials specified herein. Roof coverings shall be applied in accordance with this chapter and the ~~manufacturer's installation instructions.~~ roof covering listing. Installation of roof coverings shall comply with the applicable provisions of Section 1507.

Reason: This code change proposal is intended to clarify the intent of the code.

The requirement for roof coverings "...be applied in accordance with... the manufacturer's installation instructions." is unnecessary and redundant in this section because this is already required in Section 1507-Requirements for Roof Coverings.

A requirement for the roofing covering to be applied according to the listing is added here for clarity. Section 1505-Fire Classification already requires roof assemblies and roof coverings to be listed and Section 1506.3 requires materials and product packaging to bear testing agency labels.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The stringency of the code is not increased or decreased by this code change proposal.

Proposal # 4961

S22-19

S23-19

IBC®: 1507.1.1, TABLE 1507.1.1(1), ASTM Chapter 35 (New)

Proponent: Gregory Keeler, representing Owens Corning (greg.keeler@owenscorning.com)

2018 International Building Code

Revise as follows:

1507.1.1 Underlayment. Underlayment for asphalt shingles, clay and concrete tile, metal roof shingles, mineral-surfaced roll roofing, slate and slate-type shingles, wood shingles, wood shakes, metal roof panels and *photovoltaic shingles* shall conform to the applicable standards listed in this chapter. Underlayment materials required to comply with ASTM D226, D1970, D4869, ~~and D6757~~ and ASTM WK51913 shall bear a label indicating compliance with the standard designation and, if applicable, type classification indicated in Table 1507.1.1(1). Underlayment shall be applied in accordance with Table 1507.1.1(2). Underlayment shall be attached in accordance with Table 1507.1.1(3).

Exceptions:

1. As an alternative, self-adhering polymer modified bitumen underlayment complying with ASTM D1970 and installed in accordance with the manufacturer's installation instructions for the deck material, roof ventilation configuration and climate exposure for the roof covering to be installed shall be permitted.
2. As an alternative, a minimum 4-inch-wide (102 mm) strip of self-adhering polymer modified bitumen membrane complying with ASTM D1970 and installed in accordance with the manufacturer's installation instructions for the deck material shall be applied over all joints in the roof decking. An approved underlayment for the applicable roof covering for design wind speeds less than 120 mph (54 m/s) shall be applied over the 4-inch-wide (102 mm) membrane strips.
3. As an alternative, two layers of underlayment complying with ASTM D226 Type II ~~or~~ ASTM D4869 Type IV ASTM WK51913 shall be permitted to be installed as follows: Apply a 19-inch (483 mm) strip of underlayment parallel with the eave. Starting at the eave, apply 36-inch-wide (914 mm) strips of underlayment ~~felt~~, overlapping successive sheets 19 inches (483 mm). The underlayment shall be attached with corrosion-resistant fasteners in a grid pattern of 12 inches (305 mm) between side laps with a 6-inch (152 mm) spacing at side and end laps. End laps shall be 4 inches (102 mm) and shall be offset by 6 feet (1829 mm). Underlayment shall be attached using metal or plastic cap nails with a nominal cap diameter of not less than 1 inch (25.4 mm). Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a thickness of not less than 0.010 inch (mm). Thickness of the outside edge of plastic caps shall be not less than 0.035 inch (mm). The cap nail shank shall be not less than 0.083 inch for ring shank cap nails and 0.091 inch (mm) for smooth shank cap nails. The cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than 3/4 inch (19.1 mm) into the roof sheathing.
4. Structural metal panels that do not require a substrate or underlayment.

**TABLE 1507.1.1(1)
UNDERLAYMENT TYPES**

ROOF COVERING	SECTION	MAXIMUM BASIC DESIGN WIND SPEED, V < 140 MPH	MAXIMUM BASIC DESIGN WIND SPEED, V ≥ 140 MPH
Asphalt shingles	1507.2	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV ASTM D6757 <u>ASTM WK51913</u>	ASTM D226 Type II ASTM D4869 Type IV ASTM D6757 <u>ASTM WK51913</u>
Clay and concrete tiles	1507.3	ASTM D226 Type II <u>ASTM WK51913</u> ASTM D2626 Type I ASTM D6380 Class M mineral surfaced roll roofing	ASTM D226 Type II <u>ASTM WK51913</u> ASTM D2626 Type I ASTM D6380 Class M mineral surfaced roll roofing
Metal panels	1507.4	Manufacturer's instructions	ASTM D226 Type II ASTM D4869 Type IV <u>ASTM WK51913</u>

Metal roof shingles	1507.5	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV <u>ASTM WK51913</u>	ASTM D226 Type II ASTM D4869 Type IV <u>ASTM WK51913</u>
Mineral-surfaced roll roofing	1507.6	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV <u>ASTM WK51913</u>	ASTM D226 Type II ASTM D4869 Type IV <u>ASTM WK51913</u>
Slate shingles	1507.7	ASTM D226 Type II ASTM D4869 Type III or IV <u>ASTM WK51913</u>	ASTM D226 Type II ASTM D4869 Type IV <u>ASTM WK51913</u>
Wood shingles	1507.8	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV <u>ASTM WK51913</u>	ASTM D226 Type II ASTM D4869 Type IV <u>ASTM WK51913</u>
Wood shakes	1507.9	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV <u>ASTM WK51913</u>	ASTM D226 Type II ASTM D4869 Type IV_ <u>ASTM WK51913</u>
Photovoltaic shingles	1507.17	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV ASTM D6757 <u>ASTM WK51913</u>	ASTM D226 Type II ASTM D4869 Type IV ASTM D6757_ <u>ASTM WK51913</u>

Add new text as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken PA 19428-2959

WK51913: New Specification for Mechanically Attached Polymeric Roof Underlayment Used in Steep Slope Roofing

Reason: This proposal references an ASTM Work Item for a new ASTM Standard that will apply exclusively to synthetic underlayments. The proposal simply stipulates new performance requirements for products that are already in widespread use.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal references a proposed ASTM Standard that will, for the first time, apply specific performance requirements to synthetic underlayment products that are already in widespread use and will therefore not affect the cost of construction.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM WK51913, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 5322

S23-19

S24-19

IBC®: 1507.1.1

Proponent: Mike Fischer, Kellen Company, representing The Asphalt Roofing Manufacturers Association (mfischer@kellencompany.com)

2018 International Building Code

Revise as follows:

1507.1.1 Underlayment. Underlayment for asphalt shingles, clay and concrete tile, metal roof shingles, mineral-surfaced roll roofing, slate and slate-type shingles, wood shingles, wood shakes, metal roof panels and *photovoltaic shingles* shall conform to the applicable standards listed in this chapter. Underlayment materials required to comply with ASTM D226, D1970, D4869 and D6757 shall bear a label indicating compliance with the standard designation and, if applicable, type classification indicated in Table 1507.1.1(1). Underlayment shall be applied in accordance with Table 1507.1.1(2). Underlayment shall be attached in accordance with Table 1507.1.1(3).

Exceptions:

- ~~1.~~ ~~As an alternative, self-adhering polymer modified bitumen underlayment complying with ASTM D1970 and installed in accordance with the manufacturer's installation instructions for the deck material, roof ventilation configuration and climate exposure for the roof covering to be installed shall be permitted.~~
- ~~2.1.~~ As an alternative, a minimum 4-inch-wide (102 mm) strip of self-adhering polymer modified bitumen membrane complying with ASTM D1970 and installed in accordance with the manufacturer's installation instructions for the deck material shall be applied over all joints in the roof decking. An approved underlayment for the applicable roof covering for design wind speeds less than 120 mph (54 m/s) shall be applied over the 4-inch-wide (102 mm) membrane strips.
- ~~3.2.~~ As an alternative, two layers of underlayment complying with ASTM D226 Type II or ASTM D4869 Type IV shall be permitted to be installed as follows: Apply a 19-inch (483 mm) strip of underlayment parallel with the eave. Starting at the eave, apply 36-inch-wide (914 mm) strips of underlayment felt, overlapping successive sheets 19 inches (483 mm). The underlayment shall be attached with corrosion-resistant fasteners in a grid pattern of 12 inches (305 mm) between side laps with a 6-inch (152 mm) spacing at side and end laps. End laps shall be 4 inches (102 mm) and shall be offset by 6 feet (1829 mm). Underlayment shall be attached using metal or plastic cap nails with a nominal cap diameter of not less than 1 inch (25.4 mm). Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a thickness of not less than 0.010 inch (mm). Thickness of the outside edge of plastic caps shall be not less than 0.035 inch (mm). The cap nail shank shall be not less than 0.083 inch for ring shank cap nails and 0.091 inch (mm) for smooth shank cap nails. The cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than $\frac{3}{4}$ inch (19.1 mm) into the roof sheathing.
- ~~4.3.~~ Structural metal panels that do not require a substrate or underlayment.

Reason: The requirements for ASTM D1970 underlayment are redundant as the standard is listed in Section 1507.1.1.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The proposal is editorial.

Proposal # 5678

S24-19

S25-19

IBC®: 1507.3.1

Proponent: Shahen Akelyan (shahen.akelyan@lacity.org)

2018 International Building Code

Revise as follows:

1507.3.1 Deck requirements. Concrete and clay tile shall be installed only over solid ~~sheathing or spaced~~ structural sheathing boards.

Reason: Section 1507.3.1 is amended to require concrete and clay tiles to be installed **only** over solid structural sheathing boards. The change is necessary because there were numerous observations of tile roofs pulling away from wood framed buildings following the 1994 Northridge Earthquake. The SEAOSC/LA City Post Northridge Earthquake committee findings indicated significant problems with tile roofs was due to inadequate design and/or construction. Therefore, the amendment is needed to minimize such occurrences in the event of future significant earthquakes. This amendment will reduce the failure of concrete and clay tile roofs during a significant earthquake and is in accordance with the scope and objectives of the California Building Code.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The revision limits use of spaced sheathing which does no increase any cost.

Proposal # 4874

S25-19

S26-19

IBC@: 1507.8.1

Proponent: David Roodvoets (davelee@ix.netcom.com)

2018 International Building Code

Revise as follows:

1507.8.1 Deck requirements. Wood shingles shall be installed on solid or spaced sheathing. Where spaced sheathing is used, sheathing boards shall be not less than 1-inch by 4-inch (25 mm by 102 mm) nominal dimensions and shall be spaced on centers equal to the weather exposure to coincide with the placement of fasteners. The spaced sheathing shall be open to the building interior and shall not be backed with spray foam or other material.

Reason: Shingles installed over spaced sheathing have underlayment that interweaves with the shingles and is subject to wetting. Although most drying of the underlayment is to the outside, there is some drying that must occur into the building. Spray foam prevents this drying, allowing moisture to accumulate below the shingle. Direct backing of the shingle with insulating foam also raises the temperature of the shingle and accelerates deterioration.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This change is primarily to stop a practice that often occurs as a retrofit. It is not a normal part of any construction process or system, but can sometimes be added to a building interior during modifications.

Proposal # 4715

S26-19

S27-19

IBC@: 1507.8.6, 1507.9.7

Proponent: David Roodvoets (davelee@ix.netcom.com)

2018 International Building Code

Revise as follows:

1507.8.6 Attachment. Fasteners for wood shingles shall be ~~corrosion resistant with hot dipped galvanized box nails, or Type 304 stainless steel box nails.~~ Where used within 15 miles of salt water coasts stainless steel box nails shall be Type 316. Fasteners for Fire retardant treated shingles or pressure impregnated preservative shingles shall be stainless steel type 316. Fasteners shall have a minimum penetration of $\frac{3}{4}$ inch (19.1 mm) into the sheathing. For sheathing less than $\frac{1}{2}$ inch (12.7 mm) in thickness, the fasteners shall extend through the sheathing. Each shingle shall be attached with not fewer than two fasteners.

1507.9.7 Attachment. Fasteners for wood shakes shall be ~~corrosion resistant with hot dipped galvanized, or Type 304 stainless steel box nails.~~ Where used within 15 miles of salt water coasts stainless steel box nails shall be Type 316. Fasteners for fire retardant treated shakes or pressure impregnated preservative treated shakes shall be stainless steel Type 316. Fasteners shall have a minimum penetration of $\frac{3}{4}$ inch (19.1 mm) into the sheathing. For sheathing less than $\frac{1}{2}$ inch (12.7 mm) in thickness, the fasteners shall extend through the sheathing. Each shake shall be attached with not fewer than two fasteners.

Reason: This change is to harmonize the text in 1507.8.6 and 1507.9.7 of the code, with the requirements in Table 1507.8 and have the same requirements in the IBC as in the IRC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The code change proposal will not increase or decrease the cost of construction. This change is primarily to stop a practice that often occurs as a retrofit. It is not a normal part of any construction process or system, but can sometimes be added to a building interior during modifications.

Proposal # 4708

S27-19

S28-19

IBC®: 1507.3.6 (New)

Proponent: Rick Allen, International Staple, Nail and Tool Association, representing International Staple, Nail and Tool Association
(rallen@isanta.org)

2018 International Building Code

Revise as follows:

1507.3.6 Fasteners. Tile fasteners shall be corrosion resistant and not less than 11-gage, [0.120 inch (3 mm)], ⁵/₁₆-inch (8.0 mm) head, and of sufficient length to penetrate the deck not less than ³/₄ inch (19.1 mm) or through the thickness of the deck, whichever is less. Attaching wire for clay or concrete tile shall not be smaller than 0.083 inch (2.1 mm). Perimeter fastening areas include three tile courses but not less than 36 inches (914 mm) from either side of hips or ridges and edges of eaves and gable rakes.

Reason: ASTM F1667-18 requires that when gage is used as a diameter for nails, a decimal equivalent must also be shown. This requirement was put in place because of the multiple and conflicting wire gage tables that are used in the manufacturing of nails.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal will not change the cost of production. It only provides clarification required by ASTM F1667-18

Proposal # 4086

S28-19

S29-19

IBC®: 1507.9.1

Proponent: David Roodvoets (davelee@ix.netcom.com)

2018 International Building Code

Revise as follows:

1507.9.1 Deck requirements. Wood shakes shall only be used on solid or spaced sheathing. Where spaced sheathing is used, sheathing boards shall be not less than 1-inch by 4-inch (25 mm by 102 mm) nominal dimensions and shall be spaced on centers equal to the weather exposure to coincide with the placement of fasteners. Where 1-inch by 4-inch (25 mm by 102 mm) spaced sheathing is installed at 10 inches (254 mm) on center, additional 1-inch by 4-inch (25 mm by 102 mm) boards shall be installed between the sheathing boards. The spaced sheathing shall be open to the building interior and shall not be backed with spray foam or other material.

Reason: Shakes installed over spaced sheathing have underlayment that interweaves with the shakes and is subject to wetting. Although most drying of the underlayment is to the outside; there is some drying that must occur into the building. Spray foam prevents the drying, allowing moisture to accumulate below the shake. Direct backing of the shake with insulating foam also raises the temperature of the shake and accelerates deterioration.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The requirements as noted in this code change were first included in Table 1507.8 in the IBC in 2015, but the text did not match the table. The International Residential Code text in sections 905.8.6 and 905.7.5 beginning in the 2015 version requires that hot dipped galvanized, or stainless fasteners be used. This use of hot dipped galvanized or stainless steel was defined and has been required in the manufacturer's installation literature since 2010. (Cedar Shake and Shingle Bureau; New Roof Construction Manual) Therefore code compliance has required the use of this grade of fastener, and therefore the change will not add to the cost of construction. This change is only to note that the table is correct and that the text should match.

Proposal # 4727

S29-19

S30-19

IBC®: TABLE 1507.10.2

Proponent: Chadwick Collins, Kellen Company, representing Asphalt Roofing Manufacturers Association (Ccollins@kellencompany.com)

2018 International Building Code

Revise as follows:

TABLE 1507.10.2
BUILT-UP ROOFING MATERIAL STANDARDS

MATERIAL STANDARD	STANDARD
Acrylic coatings used in roofing	ASTM D6083
Aggregate surfacing	ASTM D1863; <u>D7655</u>
Asphalt adhesive used in roofing	ASTM D3747
Asphalt cements used in roofing	ASTM D2822; D3019; D4586
Asphalt-coated glass fiber base sheet	ASTM D4601
Asphalt coatings used in roofing	ASTM D1227; D2823; D2824; D4479
Asphalt glass felt	ASTM D2178
Asphalt primer used in roofing	ASTM D41
Asphalt-saturated and asphalt-coated organic felt base sheet	ASTM D2626
Asphalt-saturated organic felt (perforated)	ASTM D226
Asphalt used in roofing	ASTM D312
Coal-tar cements used in roofing	ASTM D4022; D5643
Coal-tar saturated organic felt	ASTM D227
Coal-tar pitch used in roofing	ASTM D450; Type I or II
Coal-tar primer used in roofing, dampproofing and waterproofing	ASTM D43
Glass mat, coal tar	ASTM D4990
Glass mat, venting type	ASTM D4897
Mineral-surfaced inorganic cap sheet	ASTM D3909
Thermoplastic fabrics used in roofing	ASTM D5665, D5726

Reason: This proposal adds an accepted ASTM standard for specification of aggregate for built-up roofs. It also coordinates with a separate proposal providing improved provisions for parapet height and aggregate size to control aggregate blow-off in extreme wind events.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal lists an additional aggregate ASTM standard, which is already listed in the referenced standards, and therefore would not impact current construction costs.

Proposal # 5454

S30-19

S31-19

IBC: 1507.12, 1507.12.1, 1507.12.2, TABLE 1507.12.2 (New), 1507.12.3, 1507.13, 1507.13.1, 1507.13.2, 1507.13.3

Proponent: Mark Graham, National Roofing Contractors Association (NRCA), representing National Roofing Contractors Association (NRCA) (mgraham@nrca.net)

2018 International Building Code

Revise as follows:

1507.12 Thermoset single-ply Single-ply roofing. The installation of ~~thermoset~~ single-ply roofing shall comply with the provisions of this section.

1507.12.1 Slope. ~~Thermoset single-ply Single-ply~~ membrane roofs shall have a design slope of not less than one-fourth unit vertical in 12 units horizontal (2-percent slope) for drainage.

1507.12.2 Material standards. ~~Thermoset single-ply Single-ply~~ roof coverings shall comply with ~~ASTM D4637 or ASTM D5019~~; the material standards in Table 1507.12.2.

Add new text as follows:

**TABLE 1507.12.2
SINGLE-PLY ROOFING MATERIAL STANDARDS**

MATERIAL	MATERIAL STANDARD
<u>Chlorosulfated polyethylene (CSPE) or polyisobutylene (PIB)</u>	<u>ASTM D5019</u>
<u>Ethylene propylene diene monomer (EPDM)</u>	<u>ASTM D4637</u>
<u>Ketone Ethylene Ester (KEE)</u>	<u>ASTM D6754</u>
<u>Polyvinyl Chloride (PVC)</u>	<u>ASTM D4434</u>
<u>Thermoplastic polyolefin (TPO)</u>	<u>ASTM D6878</u>

Revise as follows:

1507.12.3 Ballasted ~~thermoset~~ low-slope roofs. Ballasted ~~thermoset~~ low-slope roofs (roof slope < 2:12) shall be installed in accordance with this section and Section 1504.4. Stone used as ballast shall comply with ASTM D448 or ASTM D7655.

Delete without substitution:

~~**1507.13 Thermoplastic single-ply roofing.** The installation of thermoplastic single-ply roofing shall comply with the provisions of this section.~~

~~**1507.13.1 Slope.** Thermoplastic single-ply membrane roofs shall have a design slope of not less than one-fourth unit vertical in 12 units horizontal (2-percent slope).~~

~~**1507.13.2 Material standards.** Thermoplastic single-ply roof coverings shall comply with ASTM D4434, ASTM D6754 or ASTM D6878.~~

~~**1507.13.3 Ballasted thermoplastic low-slope roofs.** Ballasted thermoplastic low-slope roofs (roof slope < 2:12) shall be installed in accordance with this section and Section 1504.4. Stone used as ballast shall comply with ASTM D448 or ASTM D7655.~~

Reason: This code change proposal is intended to clarify and streamline the code's requirements applicable to single-ply membrane roof systems. The code currently addresses thermoset (i.e., EPDM, CSPE) single-ply membrane roofs in Section 1507.12 and thermoplastic (i.e., PVC, KEE, TPO) single-ply membrane roofs in Section 1507.13. Other than the references to specific ASTM material standards, the other requirements in Section 1507.12 and Section 1507.13 are identical.

This code change proposal combines the requirements for single-ply membrane roof systems into one subsection, Section 1507.12-Single-ply Roofs. Also, the ASTM material standards references are provided in a new table, Table 1507.12.2-Single-ply Roofing Material Standards; this type of material standards table is similar in format to Table 1507.10.2-Built-up Roofing Material Standards, et. al.

No changes to the technical requirements for single-ply membrane roof systems are included in this code change proposal.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This code change proposal only reformats and rearranges the code's current requirements.

S32-19

IBC:1507.15.2

Proponent: Mark Graham, representing National Roofing Contractors Association (NRCA) (mgraham@nrca.net)

2018 International Building Code

1507.15 Liquid-applied roofing. The installation of liquid-applied roofing shall comply with the provisions of this section.

1507.15.1 Slope. Liquid-applied roofing shall have a design slope of not less than one-fourth unit vertical in 12 units horizontal (2-percent slope).

Revise as follows:

1507.15.2 Material standards. Liquid-applied roofing shall comply with ASTM C836, ASTM C957, ~~ASTM D1227 or ASTM D3468, ASTM D6083, ASTM D6694 or ASTM D6947. D3468.~~

Reason: This code change proposal is intended to clarify the code's intent regarding the use of liquid-applied roof coverings. Currently, the material standards included in Section 1507.15.2 incorrectly include a combination of liquid-applied roof coverings and roof coating products. This proposal intends to remove the material standards for roof coating products from Section 1507.15-Liquid-applied Roofing to facilitate adding a new dedicated roof coating section in a separate code change proposal.

ASTM C836 (liquid-applied waterproofing membrane), ASTM C957 (liquid-applied waterproofing membrane with wearing surface) and ASTM D3468 (neoprene and CSPE used in roofing and waterproofing) are specific liquid-applied roof coverings. These three material standards are intended to remain in this section.

ASTM D1227 (asphaltic emulsion coating) and ASTM D6083 (acrylic roof coating) are specific roof coatings products, not liquid-applied roof coverings. These two standards are proposed to be removed from this section and be added to a new dedicated roofing coating section in a separate code change proposal.

Also, ASTM D6694 and ASTM D6947 are proposed to be removed from this section. ASTM D6694 (silicone for use in SPF roof systems) and ASTM D6947 (polyurethane for use in SPF roof systems) are specific roof coating products intended for use in SPF roof systems and are already included in Section 1507.14-Spray Polyurethane Foam Roofing.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This code change proposal is a rearrangement of the code's current requirements regarding regarding liquid-applied roof covering and roof coating products.

Proposal # 5302

S32-19

S33-19 Part I

PART I — IBC®: 1507.17.6, 1507.17.8, 1507.18.5, 1507.18.7, UL Chapter 35 (New)

PART II — IRC: R902.3, R905.16.6, R905.16.4, TABLE R905.16.6 (New), R905.17.5, R905.17.7, UL Chapter 44 (New)

Proponent: Jonathan Roberts, UL LLC, representing UL LLC (jonathan.roberts@ul.com)

2018 International Building Code

Revise as follows:

1507.17.6 Material standards. *Photovoltaic shingles* shall be *listed* and labeled in accordance with UL ~~4703~~ 7103.

1507.17.8 Wind resistance. *Photovoltaic shingles* shall ~~be tested in accordance with procedures and acceptance criteria in ASTM D3161.~~
~~*Photovoltaic shingles* shall comply with the classification requirements of Table 1504.1.1 for the appropriate maximum nominal design wind speed.~~
~~*Photovoltaic shingle* packaging shall bear a *label* to indicate compliance with the procedures in ASTM D3161 and the required classification from Table 1504.1.1.~~

1507.18.5 Material standards. BIPV roof panels shall be listed and labeled in accordance with UL ~~4703~~ 7103.

Delete without substitution:

~~**1507.18.7 Wind resistance.** BIPV roof panels shall be tested in accordance with UL 1897. BIPV roof panel packaging shall bear a label to indicate compliance with UL 1897.~~

Add new standard(s) as follows:

UL

UL LLC
333 Pfingsten Road
Northbrook IL 60062-2096

7103-19: Outline of Investigation for Building-Integrated Photovoltaic Roof Coverings

Proposal # 4885

S33-19 Part I

S33-19 Part II

IRC: R902.3, R905.16.6, R905.16.4, TABLE R905.16.6 (New), R905.17.5, R905.17.7, UL Chapter 44 (New)

Proponent: Jonathan Roberts, UL LLC, representing UL LLC (jonathan.roberts@ul.com)

2018 International Residential Code

Revise as follows:

R902.3 Building-integrated photovoltaic product. Building-integrated photovoltaic products installed as the roof covering shall be tested, listed and labeled for fire classification in accordance with ~~Section R902.4~~, UL 7103. Class A, B or C BIPV products shall be installed where the edge of the roof is less than 3 feet (914 mm) from a lot line.

R905.16.6 Wind resistance. ~~Photovoltaic shingles shall be tested in accordance with procedures and acceptance criteria in ASTM D3161. Photovoltaic shingles shall comply with the classification requirements of Table R905.2.4.1 R905.16.6 for the appropriate maximum basic wind speed. Photovoltaic shingle packaging shall bear a label to indicate compliance with the procedures in ASTM D3161 and the required classification from Table R905.2.4.1.~~

R905.16.4 Material standards. ~~Photovoltaic shingles shall be listed and labeled in accordance with UL 4703~~, 7103.

Add new text as follows:

TABLE R905.16.6
Classification of Photovoltaic Shingles

MAXIMUM ULTIMATE DESIGN WIND SPEED, V_{ult} , FROM FIGURE R301.2(5)A (mph)	MAXIMUM BASIC WIND SPEED, V_{ASD} FROM TABLE R301.2.1.3 (mph)	UL 7103 ^a SHINGLE CLASSIFICATION	UL 7103 SHINGLE CLASSIFICATION
110	85	D, G or H	A, D or F
116	90	D, G or H	A, D or F
129	100	G or H	A, D or F
142	110	G or H	E
155	120	G or H	E
168	130	H	E
181	140	H	E
194	150	H	E

a. The standard calculations contained in UL7103 assume Exposure Category B or C and a building height of 60 feet or less. Additional calculations are required for conditions outside of these assumptions.

Revise as follows:

R905.17.5 Material standards. ~~BIPV roof panels shall be listed and labeled in accordance with UL 4703~~, 7103.

Delete without substitution:

~~**R905.17.7 Wind resistance.** BIPV roof panels shall be tested in accordance with UL 1897. BIPV roof panel packaging shall bear a label to indicate compliance with UL 1897.~~

Add new standard(s) as follows:

UL

UL LLC
333 Pfingsten Road
Northbrook IL 60062

7103-19: Outline of Investigation for Building-Integrated Photovoltaic Roof Coverings

Reason: BIPV products are designed to directly replace roof covering, therefore a BIPV system must be evaluated not only as a PV module but also as a roof covering with additional Code required to verify performance in the following areas: testing such as:

- Fire testing (UL 790 or ASTM E108)
- Impact testing
- Wind resistance (ASTM D3161 or UL 1897)

- Wind driven rain
- Environmental conditions
- Electrical (UL 1703)
- Materials (UL 1703)

Having one standard, UL 7103, to address electrical, fire, wind resistance, impact resistance and durability of this new type of building material make's it far easier to determine compliance with all the minimum code requirements. The standard includes all the marking requirements for the ratings (fire classification, wind resistance, and electrical) and the minimum content for the installation instructions.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The requirements remain the same. This proposal is simply editorial by providing a different format in order to assist in determining code compliance.

Staff Analysis: A review of the standard proposed for inclusion in the code, UL7103-19, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 5716

S33-19 Part II

S34-19 Part I

PART I — IBC®: [BG] 1510.7.2, 1507.17.6, 1507.18.5, 3111.3.1, UL Chapter 35 (New)

PART II — IRC®: R324.3.1, R905.16.4, R905.17.5, UL Chapter 44 (New)

Proponent: Jonathan Roberts, UL LLC, representing UL LLC (jonathan.roberts@ul.com)

2018 International Building Code

Revise as follows:

[BG] 1510.7.2 **Photovoltaic panels and modules.** Rooftop-mounted *photovoltaic panels* and *modules* shall be *listed* and labeled in accordance with UL 1703, or with both UL 61730-1 and UL 61730-2, and shall be installed in accordance with the manufacturer's instructions.

1507.17.6 **Material standards.** *Photovoltaic shingles* shall be *listed* and labeled in accordance with UL 1703 or with both UL 61730-1 and UL 61730-2.

1507.18.5 **Material standards.** BIPV roof panels shall be listed and labeled in accordance with UL 1703 or with both UL 61730-1 and UL 61730-2.

3111.3.1 **Equipment.** Photovoltaic panels and modules shall be *listed* and *labeled* in accordance with UL 1703 or with both UL 61730-1 and UL 61730-2. Inverters shall be *listed* and *labeled* in accordance with UL 1741. Systems connected to the utility grid shall use inverters *listed* for utility interaction.

Add new standard(s) as follows:

UL

UL LLC
333 Pfingsten Road
Northbrook IL 60062-2096

UL 61730-1-2017: Photovoltaic (PV) Module Safety Qualification - Part 1: Requirements for Construction

UL

UL LLC
333 Pfingsten Road
Northbrook IL 60062-2096

61730-2-2017: Photovoltaic (PV) Module Safety Qualification - Part 2: Requirements for Testing

Proposal # 4265

S34-19 Part I

S34-19 Part II

IRC@: R324.3.1, R905.16.4, R905.17.5, UL Chapter 44 (New)

Proponent: Jonathan Roberts, UL LLC, representing UL LLC (jonathan.roberts@ul.com)

2018 International Residential Code

Revise as follows:

R324.3.1 Equipment listings. Photovoltaic panels and modules shall be listed and labeled in accordance with UL 1703 or with both UL 61730-1 and UL 61730-2. Inverters shall be *listed* and *labeled* in accordance with UL 1741. Systems connected to the utility grid shall use inverters *listed* for utility interaction.

R905.16.4 Material standards. *Photovoltaic shingles* shall be listed and labeled in accordance with UL 1703 or with both UL 61730-1 and UL 61730-2.

R905.17.5 Material standards. *BIPV roof panels* shall be *listed* and *labeled* in accordance with UL 1703 or with both UL 61730-1 and UL 61730-2.

Add new standard(s) as follows:

UL

UL LLC
333 Pfingsten Road
Northbrook IL 60062

61730-1-2017: Photovoltaic (PV) Module Safety Qualification - Part 1: Requirements for Construction

UL

UL LLC
333 Pfingsten Road
Northbrook IL 60062

61730-2-2017: Photovoltaic (PV) Module Safety Qualification - Part 2: Requirements for Testing

Reason: UL 61730-1 and UL 61730-2 are new standards that will eventually replace UL 1703.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
There is no cost impact because this simply provides alternative standards.

Staff Analysis: A review of the standard proposed for inclusion in the code, UL 61730-1-2017 and 61730-2-2017, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 5748

S34-19 Part II

S35-19

IBC: 1509.1 (New), 1509.2 (New), TABLE 1509.2 (New)

Proponent: Mark Graham, National Roofing Contractors Association (NRCA), representing National Roofing Contractors Association (NRCA) (mgraham@nrca.net)

2018 International Building Code

Add new text as follows:

SECTION 1509 **ROOF COATINGS**

1509.1 General. The installation of a *roof coating* on a *roof covering* shall comply with the requirements of Section 1505 and this section.

1509.2 Material standards. Roof coating materials shall comply with the standards in Table 1509.2.

TABLE 1509.2
ROOF COATING MATERIAL STANDARDS

<u>MATERIAL</u>	<u>STANDARD</u>
Acrylic coating	ASTM D6083
Asphaltic emulsion coating	ASTM D1227

Reason: This proposed code change is intended to provide specific requirements regarding the use of roof coating materials. The term "roof coating" is already defined in Chapter 2-Definitions and is used in Section 1511.3.1.4; however, the code currently provides little guidance or requirements relating to the use of roof coatings.

The new section proposed here provides a requirement that roof coatings be tested as a part of a fire-classified roof assembly/covering in accordance with Section 1505-Fire Classification and comply with applicable material standards

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This code change proposal does not increase or decrease the stringency of the code; it reformats the code's existing requirements for roof coatings.

Proposal # 4966

S35-19

S36-19

IBC: [BS] 202, 1602.1

Proponent: Jennifer Goupil, American Society of Civil Engineers (ASCE), representing American Society of Civil Engineers (ASCE) (jgoupil@asce.org)

2018 International Building Code

Revise as follows:

[BS] LIVE LOAD, ROOF. A load on a roof produced:

1. During maintenance by workers, equipment and materials; or
2. During the life of the structure by movable objects such as planters or other similar small decorative appurtenances that are not occupancy related; ~~or~~
3. ~~By the use and occupancy of the roof such as for roof gardens or assembly areas.~~

SECTION 1602 NOTATIONS

1602.1 Notations. The following notations are used in this chapter:

D = Dead load.

D_i = Weight of ice in accordance with Chapter 10 of ASCE 7.

E = Combined effect of horizontal and vertical earthquake induced forces as defined in Section 2.3.6 of ASCE 7.

F = Load due to fluids with well-defined pressures and maximum heights.

F_a = Flood load in accordance with Chapter 5 of ASCE 7.

H = Load due to lateral earth pressures, ground water pressure or pressure of bulk materials.

L = ~~Roof live load greater than 20 psf (0.96 kN/m²) and floor live~~ Live load.

L_r = ~~Roof live load of 20 psf (0.96 kN/m²) or less.~~

R = Rain load.

S = Snow load.

T = Cumulative effects of self-straining load forces and effects.

V_{asd} = Allowable stress design wind speed, miles per hour (mph) (km/hr) where applicable.

V = Basic design wind speeds, miles per hour (mph) (km/hr) determined from Figures 1609.3(1) through 1609.3(8) or ASCE 7.

W = Load due to wind pressure.

W_i = Wind-on-ice in accordance with Chapter 10 of ASCE 7.

Reason: This proposal both corrects an inconsistency within the IBC and coordinates the IBC with the referenced design load standard, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7-16).

ASCE 7-16 considers occupancy related live loads to be Live Loads, symbol L, regardless of whether they are applied to interior floors or on the roof. This distinction is important for two reasons. First, the load combinations used in structural design treat Live Loads, L, differently from Roof Live Loads, L_r. Second, the allowable reductions for Roof Live Loads, L_r, are different than the allowable reductions for Live Loads, L. In both instances, occupancy related loads are treated in the same manner, therefore it makes sense to place them under the same definition.

The IBC considers occupancy related live loads on a roof to be Roof Live Loads, not Live Loads, as indicated in the Roof Live Load definition in Chapter 2. In order to treat occupancy related roof live loads appropriately in load combinations, the IBC amends the definition of the symbols L and L_r in Section 1602 such that L_r is limited to loads of 20 psf or less. The changes to the definition of the symbols effectively modifies the definitions in Section 202. This practice is inconsistent and potentially confusing.

This proposal aligns the IBC provisions for Live Load and Roof Live Load with the ASCE 7-16 provisions.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal does not create additional design requirements.

Proposal # 4038

S36-19

S37-19

IBC: 1602.1, 1605.2, 1605.2.1, 1605.3.1, 1605.3.1.1

Proponent: Kelly Cobeen, Wiss Janney Elstner Associates, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (KCobeen@wje.com); Jennifer Goupil, representing American Society of Civil Engineers (ASCE) (jgoupil@asce.org); Michael Mahoney, representing Federal Emergency Management Agency (mike.mahoney@fema.dhs.gov)

2018 International Building Code

Revise as follows:

1602.1 Notations. D = Dead load.

D_i = Weight of ice in accordance with Chapter 10 of ASCE 7.

E = Combined effect of horizontal and vertical earthquake induced forces as defined in Chapter 12 Section 2.3.6 of ASCE 7.

E_h = Effect of horizontal seismic forces as determined in Chapter 12 of ASCE 7.

E_{mh} = Effect of horizontal seismic forces including overstrength as determined in Chapter 12 of ASCE 7.

E_v = Vertical seismic effect applied in the vertical downward direction as in determined in Chapter 12 of ASCE 7.

F = Load due to fluids with well-defined pressures and maximum heights.

F_a = Flood load in accordance with Chapter 5 of ASCE 7.

H = Load due to lateral earth pressures, ground water pressure or pressure of bulk materials.

L = Roof live load greater than 20 psf (0.96 kN/m²) and floor live load.

L_r = Roof live load of 20 psf (0.96 kN/m²) or less.

R = Rain load.

S = Snow load.

T = Cumulative effects of self-straining load forces and effects.

V_{asd} = Allowable stress design wind speed, miles per hour (mph) (km/hr) where applicable.

V = Basic design wind speeds, miles per hour (mph) (km/hr) determined from Figures 1609.3(1) through 1609.3(8) or ASCE 7.

W = Load due to wind pressure.

W_i = Wind-on-ice in accordance with Chapter 10 of ASCE 7.

1605.2 Load combinations using strength design or load and resistance factor design. Where strength design or load and resistance factor design is used, buildings and other structures, and portions thereof, shall be designed to resist the most critical effects resulting from the following combinations of factored loads:

1.4(D + F) (**Equation 16-1**)

1.2(D + F) + 1.6(L + H) + 0.5(L_r or S or R) (**Equation 16-2**)

1.2(D + F) + 1.6(L_r or S or R) + 1.6H + (f_1L or 0.5W) (**Equation 16-3**)

1.2(D + F) + 1.0W + f_1L + 1.6H + 0.5(L_r or S or R) (**Equation 16-4**)

~~1.2(D + F) + 1.0E + f_1L + 1.6H + f_2S (**Equation 16-5**)~~

0.9D + 1.0W + 1.6H (**Equation 16-~~5~~ 6**)

~~0.9(D + F) + 1.0E + 1.6H (**Equation 16-7**)~~

where:

$f_1 = 1$ for places of public assembly live loads in excess of 100 pounds per square foot (4.79 kN/m²), and parking garages; and 0.5 for other live loads.

~~$f_2 = 0.7$ for roof configurations (such as saw tooth) that do not shed snow off the structure, and 0.2 for other roof configurations.~~

Exceptions:

1. Where other factored load combinations are specifically required by other provisions of this code, such combinations shall take precedence.
2. Where the effect of H resists the primary variable *load effect*, a load factor of 0.9 shall be included with H where H is permanent and H shall be set to zero for all other conditions.

Add new text as follows:

1605.2.1 Load combinations with seismic load effects. Where a structure is subject to seismic load effects, the following load combinations shall be considered in addition to the basic combinations in Section 1605.2. The most unfavorable effects from seismic loads shall be investigated, where appropriate. The seismic loads need not be considered to act simultaneously with wind loads.

Where the prescribed seismic load effect is combined with the effects of other loads, the following seismic load combinations shall be used:

$$1.2(D + F) + 1.0E_v + 1.0E_h + f_1L + 1.6H + f_2S \text{ (Equation 16-6)}$$

$$0.9(D + F) - 1.0E_v + 1.0E_h + 1.6H \text{ (Equation 16-7)}$$

Where the seismic load effect with overstrength is combined with the effects of other loads, the following seismic load combinations shall be used:

$$1.2(D + F) + 1.0E_v + 1.0E_{mh} + f_1L + 1.6H + f_2S \text{ (Equation 16-8)}$$

$$0.9(D + F) - 1.0E_v + 1.0E_{mh} + 1.6H \text{ (Equation 16-9)}$$

where:

$f_1 = 1$ for places of public assembly live loads in excess of 100 pounds per square foot (4.79 kN/m²), and parking garages; and 0.5 for other live loads.

$f_2 = 0.7$ for roof configurations (such as saw tooth) that do not shed snow off the structure, and 0.2 for other roof configurations.

Exceptions:

1. Where other factored load combinations are specifically required by other provisions of this code, such combinations shall take precedence.
2. Where the effect of H resists the primary variable *load effect*, a load factor of 0.9 shall be included with H where H is permanent and H shall be set to zero for all other conditions.

Revise as follows:

~~1605.2.1~~ **1605.2.2 Other loads.** Where flood loads, F_a , are to be considered in the design, the load combinations of Section 2.3.2 of ASCE 7 shall be used. Where self-straining loads, T , are considered in design, their structural effects in combination with other loads shall be determined in accordance with Section 2.3.4 of ASCE 7. Where an ice-sensitive structure is subjected to loads due to atmospheric icing, the load combinations of Section 2.3.3 of ASCE 7 shall be considered.

1605.3 Load combinations using allowable stress design. Load combinations for allowable stress design shall be in accordance with Section 1605.3.1 or 1605.3.2.

1605.3.1 Basic load combinations. Where *allowable stress design* (working stress design), as permitted by this code, is used, structures and portions thereof shall resist the most critical effects resulting from the following combinations of loads:

$$D + F$$

(Equation 16-8 10)

$$D + H + F + L$$

(Equation 16-9 11)

$$D + H + F + (L_r \text{ or } S \text{ or } R)$$

(Equation 16-10 12)

$$D + H + F + 0.75(L) + 0.75(L_r \text{ or } S \text{ or } R)$$

(Equation 16-11 13)

$$D + H + F + (0.6W \text{ or } 0.7E) \text{ (Equation 16-12 14)}$$

$$D + H + F + 0.75(0.6W) + 0.75L + 0.75(L_r \text{ or } S \text{ or } R)$$

(Equation 16-13 15)

$$D + H + F + 0.75(0.7E) + 0.75L + 0.75L_r + 0.75S \text{ (Equation 16-14)}$$

$$0.6D + 0.6W + H$$

(Equation 16-15 16)

$$0.6(D + F) + 0.7E + H \text{ (Equation 16-16)}$$

Exceptions:

1. Crane hook loads need not be combined with roof live load or with more than three-fourths of the snow load or one-half of the wind load. .
2. Flat roof snow loads of 30 psf (1.44 kN/m²) or less and roof live loads of 30 psf (1.44 kN/m²) or less need not be combined with seismic loads. Where flat roof snow loads exceed 30 psf (1.44 kN/m²), 20 percent shall be combined with seismic loads. .
3. Where the effect of H resists the primary variable *load effect*, a load factor of 0.6 shall be included with H where H is permanent and H shall be set to zero for all other conditions.
4. In Equation 16-15, the wind load, W , is permitted to be reduced in accordance with Exception 2 of Section 2.4.1 of ASCE 7. .
5. In Equation 16-16, $0.6D$ is permitted to be increased to $0.9D$ for the design of special reinforced masonry shear walls complying with Chapter 21.

Add new text as follows:

1605.3.1.1 Load combinations with seismic load effects. When a structure is subject to seismic load effects, the following load combinations shall be considered in addition to the basic combinations in Section 1605.3.1. The most unfavorable effects from seismic loads shall be investigated, where appropriate, but they need not be considered to act simultaneously with wind loads.

Where the prescribed seismic load effect is combined with the effects of other loads, the following seismic load combinations shall be used:

$$D + H + F + 0.7E_v + 0.7E_h \text{ (Equation 16-17)}$$

$$D + H + F + 0.525E_v + 0.525E_h + 0.75(L) + 0.75(L_r \text{ or } S \text{ or } R) \text{ (Equation 16-18)}$$

$$0.6(D + F) + 0.7E_v + 0.7E_h + H \text{ (Equation 16-19)}$$

Where the seismic load effect with overstrength is combined with the effects of other loads, the following seismic load combinations shall be used:

$$D + H + F + 0.7E_v + 0.7E_{mh} \text{ (Equation 16-20)}$$

$$D + H + F + 0.525E_v + 0.525E_{mh} + 0.75(L) + 0.75(L_r \text{ or } S \text{ or } R) \text{ (Equation 16-21)}$$

$$0.6(D + F) + 0.7E_v + 0.7E_{mh} + H \text{ (Equation 16-22)}$$

Exceptions:

1. In Equations 16-18 and 16-21, flat roof snow loads of 30 psf (1.44 kN/m²) or less and roof live loads of 30 psf (1.44 kN/m²) or less need not be combined with seismic loads. Where flat roof snow loads exceed 30 psf (1.44 kN/m²), 20 percent shall be combined with seismic loads.
2. Where the effect of H resists the primary variable *load effect*, a load factor of 0.6 shall be included with H where H is permanent and H shall be set to zero for all other conditions.
3. In Equation 16-19 and 16-22, $0.6D$ is permitted to be increased to $0.9D$ for the design of special reinforced masonry shear walls complying with Chapter 21.

Revise as follows:

~~1605.3.1.1~~ **1605.3.1.2 Stress increases.** Increases in allowable stresses specified in the appropriate material chapter or the referenced standards shall not be used with the load combinations of Section 1605.3.1, except that increases shall be permitted in accordance with Chapter 23.

~~1605.3.1.2~~ **1605.3.1.3 Other loads.** Where flood loads, F_a , are to be considered in design, the load combinations of Section 2.4.2 of ASCE 7 shall be used. Where self-straining loads, T , are considered in design, their structural effects in combination with other loads shall be determined in accordance with Section 2.4.4 of ASCE 7. Where an ice-sensitive structure is subjected to loads due to atmospheric icing, the load combinations of Section 2.4.3 of ASCE 7 shall be considered.

Reason: This proposal modifies the load combinations of Sections 1605.2 and 1605.3.1 to more closely align with ASCE 7-16. This editorial change is intended to aid designers by incorporating the ASCE 7 change to more specifically present vertical and horizontal components of seismic loading. See Sections 1605.2.1 and 1605.3.1.1.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal is a clarification of the use of currently existing design provisions. It will not change the cost of construction. It may modestly decrease the cost of design by providing greater clarity.

Proposal # 4574

S37-19

S38-19

IBC®: 1603.1, 1603.1.4

Proponent: Vincent Sagan, Thomas Associates, Inc., representing Metal Building Manufacturers Association (vsagan@mbma.com)

2018 International Building Code

Revise as follows:

1603.1 General. *Construction documents* shall show the size, section and relative locations of structural members with floor levels, column centers and offsets dimensioned. The design loads and other information pertinent to the structural design required by Sections 1603.1.1 through 1603.1.9 shall be indicated on the *construction documents*.

Exception: *Construction documents* for buildings constructed in accordance with the *conventional light-frame construction* provisions of Section 2308 shall indicate the following structural design information:

1. Floor and roof dead and live loads.
2. Ground snow load, P_g .
3. Basic design wind speed, V , miles per hour (mph) (km/hr) and ~~allowable stress design wind speed, V_{asd} , as determined in accordance with Section 1609.3.1~~ and wind exposure.
4. *Seismic design category* and *site class*.
5. Flood design data, if located in *flood hazard areas* established in Section 1612.3.
6. Design load-bearing values of soils.
7. Rain load data.

1603.1.4 Wind design data. The following information related to wind loads shall be shown, regardless of whether wind loads govern the design of the lateral force-resisting system of the structure:

1. Basic design wind speed, V , miles per hour ~~and allowable stress design wind speed, V_{asd} , as determined in accordance with Section 1609.3.1.~~
2. *Risk category*.
3. Wind exposure. Applicable wind direction if more than one wind exposure is utilized.
4. Applicable internal pressure coefficient.
5. Design wind pressures to be used for exterior component and cladding materials not specifically designed by the *registered design professional* responsible for the design of the structure, psf (kN/m^2).

Reason: Showing V_{asd} on the construction documents is duplicative, unnecessary, and potentially allows for misapplication of a load combination reduction factor onto a wind pressure developed using an already reduced V_{asd} wind velocity. IBC 2021 will be the fourth edition of IBC that shows basic design wind speed in ultimate terms and users should by now be knowledgeable of the changes in wind formatting that took place in ASCE 7-10 and IBC 2012.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The code change proposal removes requirements for providing information on the contract documents that is unnecessary. This would not affect the design, thus it would not affect the cost of construction.

Proposal # 5061

S38-19

S39-19

IBC®: 1603.1.4

Proponent: Mark Graham, representing National Roofing Contractors Association (NRCA) (mgraham@nrca.net)

2018 International Building Code

Revise as follows:

1603.1.4 Wind design data. The following information related to wind loads shall be shown, regardless of whether wind loads govern the design of the lateral force-resisting system of the structure:

1. Basic design wind speed, V , miles per hour and allowable stress design wind speed, V_{asd} as determined in accordance with Section 1609.3.1.
2. *Risk category.*
3. Wind exposure. Applicable wind direction if more than one wind exposure is utilized.
4. Applicable internal pressure coefficient.
5. Design wind pressures to be used for exterior component and cladding materials not specifically designed by the *registered design professional* responsible for the design of the structure, psf (kN/m²).
6. Roof pressure coefficient ($G C_p$) zones locations and dimensions.

Reason: In educational sessions conducted by NRCA on IBC's 2018 roofing-related requirements, participants appear to be notably unclear on ASCE 7-16's new roof pressure coefficient zones. Adding a description of the roof pressure coefficient zones to Section 1603-Construction Document's requirements for reporting wind design data (Section 1603.1.4) will add some clarity and should assist in proper roof assembly/covering application.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The stringency of the code is not increased or decreased.

Proposal # 5418

S39-19

S40-19

IBC: 1604.3

Proponent: Jennifer Goupil, American Society of Civil Engineers (ASCE), representing American Society of Civil Engineers (ASCE) (jgoupil@asce.org)

2018 International Building Code

Revise as follows:

SECTION 1604 GENERAL DESIGN REQUIREMENTS

1604.3 Serviceability. Structural systems and members thereof shall be designed to have adequate stiffness to limit deflections as indicated in Table 1604.3. ~~Drift limits applicable to earthquake loading shall be in accordance with ASCE 7 Chapter 12, 13, 15 or 16, as applicable.~~

Reason: This sentence regarding drift limits does not belong in the section for serviceability. Serviceability and the referenced Table define requirements due to non-lateral loading. The requirements for drift from lateral loads are defined in Section 1613, along with all of the other requirements for lateral loading.

This change is not a technical change in the requirements, rather a clarification of the content of the requirements for Serviceability.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

There is no technical change from this proposal, but a clarification of the appropriate content in this section on serviceability. The drift limit requirements are already included in Section 1613 Earthquake Loading.

Proposal # 4046

S40-19

S41-19

IBC®: TABLE 1604.5

Proponent: Hoyt Jeter, City of Tacoma, representing City of Tacoma (hjeter@cityoftacoma.org)

2018 International Building Code

Revise as follows:

**TABLE 1604.5
RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES**

Portions of table not shown remain unchanged.

RISK CATEGORY	NATURE OF OCCUPANCY
III	<p>Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to:</p> <ul style="list-style-type: none"> • Spaces in buildings Buildings and other structures whose primary occupancy is cumulatively over 10 percent of the building area containing public assembly occupancies with an occupant load greater than 300. • Buildings and other structures containing Group E occupancies with an occupant load greater than 250. • Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500. • Group I-2, Condition 1 occupancies with 50 or more care recipients. • Group I-2, Condition 2 occupancies not having emergency surgery or emergency treatment facilities. • Group I-3 occupancies. • Any other occupancy with an occupant load greater than 5,000.^a • Power-generating stations, water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV. • Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the International Fire Code ; and Are sufficient to pose a threat to the public if released.^b

Reason: This will clarify confusion between a use that is accessory vs. primary for purposes of triggering Risk Level III. The term “primary occupancy” is used and it is not in the definitions; therefore, there is confusion as to how this shall apply. Some reviewers assume “primary occupancy” means that if the public assembly use does not cumulatively total to greater than 50 percent for the entire building, then you do not trigger Risk Category III; whereas, other reviewers are requiring Risk Category III if the public assembly use is over 10 percent of the building area, thereby not an accessory use. This change will clarify that the more conservative requirement of Risk Category III shall be used where public assembly uses over 300 occupants exceed 10 percent (cumulatively) in a building.

Bibliography: .

Cost Impact: The code change proposal will increase the cost of construction
The code change proposal may increase the cost of construction depending on how it has been interpreted in a jurisdiction

Proposal # 4662

S41-19

S42-19

IBC: TABLE 1604.5

Proponent: David Renn, PE, SE, City and County of Denver, representing Code Change Committee of Colorado Chapter of ICC (david.renn@denvergov.org)

2018 International Building Code

Revise as follows:

**TABLE 1604.5
RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES**

Portions of table not shown remain unchanged.

RISK CATEGORY	NATURE OF OCCUPANCY
III	<p>Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to:</p> <ul style="list-style-type: none"> •Buildings and other structures containing whose primary occupancy is a public assembly occupancy with an occupant load greater than 300. •Buildings and other structures containing Group E occupancies with an occupant load greater than 250. •Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500. •Group I-2, Condition 1 occupancies with 50 or more care recipients. •Group I-2, Condition 2 occupancies not having emergency surgery or emergency treatment facilities. •Group I-3 occupancies. •Any other occupancy with an occupant load greater than 5,000.^a •Power-generating stations, water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV. •Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the International Fire Code ; and Are sufficient to pose a threat to the public if released.^b

- a. For purposes of occupant load calculation, occupancies required by Table 1004.5 to use gross floor area calculations shall be permitted to use net floor areas to determine the total occupant load.
- b. Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities of toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided that it can be demonstrated by a hazard assessment in accordance with Section 1.5.3 of ASCE 7 that a release of the toxic, highly toxic or explosive materials is not sufficient to pose a threat to the public.

1604.5.1 Multiple occupancies. Where a building or structure is occupied by two or more occupancies not included in the same *risk category*, it shall be assigned the classification of the highest *risk category* corresponding to the various occupancies. Where buildings or structures have two or more portions that are structurally separated, each portion shall be separately classified. Where a separated portion of a building or structure provides required access to, required egress from or shares life safety components with another portion having a higher *risk category*, both portions shall be assigned to the higher *risk category*.

Exception: Where a *storm shelter* designed and constructed in accordance with ICC 500 is provided in a building, structure or portion thereof normally occupied for other purposes, the *risk category* for the normal occupancy of the building shall apply unless the *storm shelter* is a designated emergency shelter in accordance with Table 1604.5.

Reason: For a public assembly occupancy with an occupant load greater than 300, the code currently requires Risk Category III only when this is the primary occupancy of a building, which is inconsistent with Section 1604.5.1 that requires the highest risk category to be used for multiple

occupancy buildings. For example, a 350 occupant occupant convention or event center in its own building would be assigned to Risk Category III, but if this same convention or event center is located within a large hotel, the building would be assigned to Risk Category II since the convention or event center isn't the primary occupancy. However, the hazard to life associated with this high occupant assembly occupancy doesn't change by putting it in a hotel building.

This proposal revises the Risk Category III to include any building that has a high o,cupant public assembly occupancy, regardless of whether this is the primary occupancy or not. This is consistant with the hazard associated with this type of occupancy and is consistent with Section 1604.5.1 that requires the highest risk category to be used for multiple occupancies. This is also consistant with other occupancy based thresholds for Risk Category III, since none of these other thresholds require the occupancy to be the primary occupancy. Furthermore, "primary occupancy" is not defined and is unenforceable - this proposal removes this unenforceable provision.

Cost Impact: The code change proposal will increase the cost of construction

Where a high occupant public assembly occupancy is not a primary occupancy, the cost of construction will increase since the building would now be classified as Risk Category III instead of Risk Category II.

Proposal # 4841

S42-19

S43-19

IBC@: TABLE 1604.5

Proponent: Terry Kozlowski, representing Southern Nevada Chapter; Valarie Evans, representing Southern Nevada Chapter; Amanda Moss, representing SN-ICC Member; Cassidy Wilson, representing SN-ICC Member

2018 International Building Code

Revise as follows:

**TABLE 1604.5
RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES**

Portions of table not shown remain unchanged.

RISK CATEGORY	NATURE OF OCCUPANCY
III	<p>Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to:</p> <ul style="list-style-type: none"> •Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300 <u>500</u>. •Buildings and other structures containing Group E occupancies with an occupant load greater than 250. •Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500. •Group I-2, Condition 1 occupancies with 50 or more care recipients. •Group I-2, Condition 2 occupancies not having emergency surgery or emergency treatment facilities. •Group I-3 occupancies. •Any other occupancy with an occupant load greater than 5,000.^a •Power-generating stations, water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV. •Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the International Fire Code ; and Are sufficient to pose a threat to the public if released.^b

Reason: There is not technical justification for the 300 occupant load threshold. Historically, 300 was used in the 1970 UBC and prior editions at a time when most assembly buildings did not have automatic sprinklers nor seismic design requirements. 300 defined a medium assembly occupancy separating Group B (at the time) into Divisions 1, 2, and 3. Over the last 50 years, the code has gradually evolved away from the medium size assembly concept and the 300 threshold.

More protective sprinkler, fire alarm, interior finish and structural design requirements have made their way into the code over the last 50 years. Today, a 300 assembly occupant load presents no more of a risk than 300 people inside a wholesale retail store, or 300 gathering inside a hotel both of which are Risk Category II under Table 1604.5.

We looked to the life safety egress provisions where 500 is the threshold for when a 3rd exit is required as a good point to upgrade the structural threshold. 500 is also consistent with the current Risk Category III threshold for post 12th grade educational occupancies.

Bibliography: 1970 Uniform Building Code - Chapter 6 Requirements for Group A Occupancies; Chapter 7 Requirements for Group B Occupancies

Cost Impact: The code change proposal will decrease the cost of construction

This proposal will decrease the cost of construction for structures with an occupant load of less than 500 by eliminating the requirement of seismic analysis and potential additional costs associated with improvements to existing structures.

S44-19

IBC®: TABLE 1604.5

Proponent: Lee Kranz, City of Bellevue, WA, representing Washington Association of Building Officials Technical Code Development Committee (lkranz@bellevuewa.gov)

2018 International Building Code

Revise as follows:

**TABLE 1604.5
RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES**

Portions of table not shown remain unchanged.

RISK CATEGORY	NATURE OF OCCUPANCY
III	<p>Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to:</p> <ul style="list-style-type: none"> •Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300. <p><u>Buildings and other structures containing one or more public assembly spaces with an occupant load greater than 300 and a cumulative occupant load of the public assembly spaces of greater than 2,500.</u></p> <ul style="list-style-type: none"> •Buildings and other structures containing Group E occupancies with an occupant load greater than 250. •Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500. •Group I-2, Condition 1 occupancies with 50 or more care recipients. •Group I-2, Condition 2 occupancies not having emergency surgery or emergency treatment facilities. •Group I-3 occupancies. •Any other occupancy with an occupant load greater than 5,000.^a •Power-generating stations, water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV. •Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: <ul style="list-style-type: none"> Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the International Fire Code; and Are sufficient to pose a threat to the public if released.^b

- a. For purposes of occupant load calculation, occupancies required by Table 1004.5 to use gross floor area calculations shall be permitted to use net floor areas to determine the total occupant load.
- b. Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities of toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided that it can be demonstrated by a hazard assessment in accordance with Section 1.5.3 of ASCE 7 that a release of the toxic, highly toxic or explosive materials is not sufficient to pose a threat to the public.

Reason: There are examples of R-1 hotel buildings having multiple large ball rooms or other public assembly spaces but “public assembly” is not the “primary occupancy” as is currently specified in Table 1604.5 so these buildings are classified as Risk Category II. Conversely, there are smaller stand-alone buildings where the primary occupancy is “public assembly” with an occupant load just over 300 that must be designed to the higher Risk Category III even though the total occupant load is much smaller when compared with the example above.

This proposal adds a new criteria for buildings containing at least one assembly space of 300 or more and also having a cumulative occupant load of all assembly spaces of 2,500 or more. This proposal would not include buildings that have multiple assembly spaces, each with an occupant load of less than 300 (like a movie theatre), in Risk Category III unless the total occupant load of the building was greater than 5,000 people. It would also not include a building having multiple assembly spaces, each with an occupant load greater than 300 but the cumulative occupant load of the assembly spaces were less than 2,500, unless the primary occupancy was public assembly or the total occupant load of the building was greater

than 5,000 people.

If approved, buildings having one or more assembly rooms with an occupant load of 300 or more and a cumulative occupant load of public assembly spaces of 2,500 or more would be classified as Risk Category III.

Cost Impact: The code change proposal will increase the cost of construction

If approved, more buildings will fall under the Risk Category III which will add cost to construct the building due to a higher importance factor.

Proposal # 5447

S44-19

S45-19

IBC®: TABLE 1604.5

Proponent: Lee Kranz, City of Bellevue, WA, representing Washington Association of Building Officials Technical Code Development Committee (lkranz@bellevuewa.gov)

2018 International Building Code

Revise as follows:

**TABLE 1604.5
RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES**

Portions of table not shown remain unchanged.

RISK CATEGORY	NATURE OF OCCUPANCY
III	<p>Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to:</p> <ul style="list-style-type: none"> •Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300. •Buildings and other structures containing Group E or Group I-4 occupancies <u>or combination thereof</u>, with an occupant load greater than 250. •Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500. •Group I-2, Condition 1 occupancies with 50 or more care recipients. •Group I-2, Condition 2 occupancies not having emergency surgery or emergency treatment facilities. •Group I-3 occupancies. •Any other occupancy with an occupant load greater than 5,000.^a •Power-generating stations, water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV. •Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the International Fire Code ; and Are sufficient to pose a threat to the public if released.^b

- a. For purposes of occupant load calculation, occupancies required by Table 1004.5 to use gross floor area calculations shall be permitted to use net floor areas to determine the total occupant load.
- b. Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities of toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided that it can be demonstrated by a hazard assessment in accordance with Section 1.5.3 of ASCE 7 that a release of the toxic, highly toxic or explosive materials is not sufficient to pose a threat to the public.

Reason: The 2015 edition of the IBC has been changed to modify the educational and daycare uses for risk category III in Table 1604.5 to be occupancy based rather than “use” based (see S83-12 attached) as it was in the 2012 IBC. "Buildings containing elementary school, secondary school or day care facilities" has been changed to "Group E occupancies". However, day care facilities are now classified in both Group E and Group I-4 occupancies. I-4 occupancies are not currently listed in Table 1604.5 which means that occupants attributed to I-4 will be classified under risk category II (Buildings and other structures except those listed in Risk Categories I, III and IV). This occurs even though the I-4 occupancy has a higher relative hazard compared to group E (see IEBC Table 1012.4 attached). The ICC Structural Committee that approved S83-12 may not have realized the loophole that was created when they supported this code change. This code change is needed to insure the safety of children who will be occupying these facilities.

Cost Impact: The code change proposal will increase the cost of construction. Adding Group I-4 occupancies to Risk Category III in IBC Table 1604.5 may result in an increase to the environmental structural loading demands.

(seismic, wind, and snow) to buildings with day care facilities. As stated above, the proposed change is intended to correct an oversight in the 2015 edition of the IBC when the ICC Structural Committee approved the S83-12 proposal. This proposal has no economic impact when compared to the previous code cycle (2012 edition of the IBC).

Proposal # 3776

S45-19

S46-19

IBC®: TABLE 1604.5

Proponent: Lee Kranz, representing Washington Association of Building Officials Technical Code Development Committee (lkranz@bellevuewa.gov)

2018 International Building Code

Revise as follows:

**TABLE 1604.5
RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES**

Portions of table not shown remain unchanged.

RISK CATEGORY	NATURE OF OCCUPANCY
III	<p>Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to:</p> <ul style="list-style-type: none"> •Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300. •Buildings and other structures containing Group E occupancies with an occupant load greater than 250. •Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500. •Group I-2, Condition 1 occupancies with 50 or more care recipients. •Group I-2, Condition 2 occupancies not having emergency surgery or emergency treatment facilities. •Group I-3 occupancies. •Any other occupancy with an occupant load greater than 5,000.^a •Power-generating stations, water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV. •Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the International Fire Code ; and Are sufficient to pose a threat to the public if released.^b

- a. For purposes of occupant load calculation, occupancies required by Table 1004.5 to use gross floor area calculations shall be permitted to use net floor areas to determine the total occupant load. Where areas of the building are not simultaneously occupied and occupants are accounted for in other areas of the building, the occupant load shall be permitted to be reduced to 25% of the calculated occupant load for the area having the lesser calculated occupant load.
- b. Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities of toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided that it can be demonstrated by a hazard assessment in accordance with Section 1.5.3 of ASCE 7 that a release of the toxic, highly toxic or explosive materials is not sufficient to pose a threat to the public.

Reason: The current definition of NET FLOOR AREA does not provide guidance on which areas should be excluded when determining the occupant load for parking garages. This proposal includes a modification to the definition specifying that drive aisles are not considered to be part of the net floor area.

We've also seen many requests to account for non-simultaneously occupied areas so we've added to footnote "a" in the table to address this issue. For example, in an apartment building with a parking garage, it is not possible for one or more occupants to be in their vehicle and in the apartment at the same time. Another example is in an office building where employees are either in their work space or in the break room.

Table 1004.5 is designed to address the means of egress system and it is assumed that all portions of the building are occupied simultaneously. This is necessary so that all rooms and areas of the building will be provided with adequate egress design. That is not the case when it comes to more accurately determining the actual occupant load of the whole building to determine the Risk Category. Rather than considering all areas of the

building to be occupied simultaneously, this proposal allows a reduction to the occupant load for the non-simultaneous use areas where the occupants are otherwise accounted for in other areas of the building. The proponents believe that 25% is a more rational and appropriate ratio than 0% even though 0% may be closer to reality for non-simultaneously occupied areas.

If approved, this code change will reduce the number of alternative materials and methods of construction requests and improve the predictability for design engineers.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This code change will not affect the cost of construction. The purpose of this code change is to clarify how the threshold of the 5,000-person occupant load is determined.

Staff note: A question would be if this allowance conflicts with the exception in Section 1004.5.

Proposal # 5035

S46-19

S47-19

IBC: 1602.1, 1605.1, 1605.1.1, 1605.2, 1605.2.1, 1605.3, 1605.3.1, 1605.3.1.1, 1605.3.1.2, 1605.3.2, 1605.3.2.1, 1607.14

Proponent: Jennifer Goupil, American Society of Civil Engineers, representing American Society of Civil Engineers (jgoupil@asce.org)

2018 International Building Code

SECTION 1605 LOAD COMBINATIONS

Delete and substitute as follows:

~~1605.1 General.~~ Buildings and other structures and portions thereof shall be designed to resist all of the following:

- ~~1- The load combinations specified in Section 1605.2, 1605.3.1 or 1605.3.2.~~
- ~~2- The load combinations specified in Chapters 18 through 23.~~
- ~~3- The seismic *load effects* including overstrength factor in accordance with Sections 2.3.6 and 2.4.5 of ASCE 7 where required by Chapters 12, 13, and 15 of ASCE 7. With the simplified procedure of ASCE 7, Section 12.14, the seismic *load effects* including overstrength factor in accordance with Section 12.14.3.2 and Chapter 2 of ASCE 7 shall be used.~~

~~Applicable loads shall be considered, including both earthquake and wind, in accordance with the specified load combinations. Each load combination shall also be investigated with one or more of the variable loads set to zero.~~

~~Where the load combinations with overstrength factor in Sections 2.3.6 and 2.4.5 of ASCE 7 apply, they shall be used as follows:~~

- ~~1- The basic combinations for strength design with overstrength factor in lieu of Equations 16-5 and 16-7 in Section 1605.2.~~
- ~~2- The basic combinations for *allowable stress design* with overstrength factor in lieu of Equations 16-12, 16-14 and 16-16 in Section 1605.3.1.~~
- ~~3- The basic combinations for *allowable stress design* with overstrength factor in lieu of Equations 16-21 and 16-22 in Section 1605.3.2.~~

~~1605.1 General.~~ Buildings and other structures and portions thereof shall be designed to resist the Strength Load Combinations specified in ASCE 7 Section 2.3, the Allowable Stress Design Load Combinations specified in ASCE 7 Section 2.4, or the Alternative Allowable Stress Design Load Combinations of Section 1605.2.

Exceptions:

1. The modifications to Load Combinations of ASCE 7 Section 2.3, ASCE 7 Section 2.4, and Section 1605.2 specified in ASCE 7 Chapter 18 and 19 shall apply.
2. When the Allowable Stress Design Load Combinations of ASCE 7 Section 2.4 are used, flat roof snow loads of 30 psf (1.44kN/m²) and roof live loads of 30 psf (1.44 kN/m²) or less need not be combined with seismic load. Where flat roof snow loads exceed 30 psf (1.44kN/m²), 20 percent shall be combined with seismic loads.

Revise as follows:

1605.1.1 Stability. Regardless of which load combinations are used to design for strength, where overall structure stability (such as stability against overturning, sliding, or buoyancy) is being verified, use of the load combinations specified in ASCE 7 Section 1605.2 or 1605.3-2.3, ASCE 7 Section 2.4, and in Section 1605.2 shall be permitted. Where the load combinations specified in ASCE 7 Section 1605.2-2.3 are used, strength reduction factors applicable to soil resistance shall be provided by a *registered design professional*. The stability of retaining walls shall be verified in accordance with Section 1807.2.3.

Delete without substitution:

~~1605.2 Load combinations using strength design or load and resistance factor design.~~ Where strength design or load and resistance factor design is used, buildings and other structures, and portions thereof, shall be designed to resist the most critical effects resulting from the following combinations of factored loads:

- ~~$1.4(D + F)$ (Equation 16-1)~~
- ~~$1.2(D + F) + 1.6(L + I) + 0.5(L, \text{ or } S \text{ or } R)$ (Equation 16-2)~~
- ~~$1.2(D + F) + 1.6(L, \text{ or } S \text{ or } R) + 1.6H + (J_1L \text{ or } 0.5W)$ (Equation 16-3)~~
- ~~$1.2(D + F) + 1.0W + J_1L + 1.6H + 0.5(L, \text{ or } S \text{ or } R)$ (Equation 16-4)~~

~~$$1.2(D + F) + 1.0E + f_1L + 1.6H + f_2S$$~~ (Equation 16-5)

~~$$0.9D + 1.0W + 1.6H$$~~ (Equation 16-6)

~~$$0.9(D + F) + 1.0E + 1.6H$$~~ (Equation 16-7)

where:

$f_1 = 1$ for places of public assembly live loads in excess of 100 pounds per square foot (4.79 kN/m²), and parking garages; and 0.5 for other live loads.

$f_2 = 0.7$ for roof configurations (such as saw tooth) that do not shed snow off the structure, and 0.2 for other roof configurations.

Exceptions:

1. Where other factored load combinations are specifically required by other provisions of this code, such combinations shall take precedence.
2. Where the effect of *H* resists the primary variable *load effect*, a load factor of 0.9 shall be included with *H* where *H* is permanent and *H* shall be set to zero for all other conditions.

1605.2.1 Other loads. Where flood loads, F_d , are to be considered in the design, the load combinations of Section 2.3.2 of ASCE 7 shall be used. Where self-straining loads, *T*, are considered in design, their structural effects in combination with other loads shall be determined in accordance with Section 2.3.4 of ASCE 7. Where an ice-sensitive structure is subjected to loads due to atmospheric icing, the load combinations of Section 2.3.3 of ASCE 7 shall be considered.

1605.3 Load combinations using allowable stress design. Load combinations for allowable stress design shall be in accordance with Section 1605.3.1 or 1605.3.2.

1605.3.1 Basic load combinations. Where *allowable stress design* (working stress design), as permitted by this code, is used, structures and portions thereof shall resist the most critical effects resulting from the following combinations of loads:

~~$$D + F$$~~ (Equation 16-8)

~~$$D + H + F + L$$~~ (Equation 16-9)

~~$$D + H + F + (L_1 \text{ or } S \text{ or } R)$$~~ (Equation 16-10)

~~$$D + H + F + 0.75(L) + 0.75(L_1 \text{ or } S \text{ or } R)$$~~ (Equation 16-11)

~~$$D + H + F + (0.6W \text{ or } 0.7E)$$~~ (Equation 16-12)

~~$$D + H + F + 0.75(0.6W) + 0.75L + 0.75(L_1 \text{ or } S \text{ or } R)$$~~ (Equation 16-13)

~~$$D + H + F + 0.75(0.7E) + 0.75L + 0.75S$$~~ (Equation 16-14)

~~$$0.6D + 0.6W + H$$~~ (Equation 16-15)

~~$$0.6(D + F) + 0.7E + H$$~~ (Equation 16-16)

Exceptions:

1. Crane hook loads need not be combined with roof live load or with more than three-fourths of the snow load or one-half of the wind load.
2. Flat roof snow loads of 30 psf (1.44 kN/m²) or less and roof live loads of 30 psf (1.44 kN/m²) or less need not be combined with seismic loads. Where flat roof snow loads exceed 30 psf (1.44 kN/m²), 20 percent shall be combined with seismic loads.
3. Where the effect of *H* resists the primary variable *load effect*, a load factor of 0.6 shall be included with *H* where *H* is permanent and *H* shall be set to zero for all other conditions.
4. In Equation 16-15, the wind load, *W*, is permitted to be reduced in accordance with Exception 2 of Section 2.4.1 of ASCE 7.
5. In Equation 16-16, 0.6 *D* is permitted to be increased to 0.9 *D* for the design of special reinforced masonry shear walls complying with Chapter 21.

1605.3.1.1 Stress increases. Increases in allowable stresses specified in the appropriate material chapter or the referenced standards shall not be used with the load combinations of Section 1605.3.1, except that increases shall be permitted in accordance with Chapter 23.

1605.3.1.2 Other loads. Where flood loads, F_d , are to be considered in design, the load combinations of Section 2.4.2 of ASCE 7 shall be used. Where self-straining loads, *T*, are considered in design, their structural effects in combination with other loads shall be determined in accordance with Section 2.4.4 of ASCE 7. Where an ice-sensitive structure is subjected to loads due to atmospheric icing, the load combinations of Section 2.4.3

of ASCE 7 shall be considered.

Revise as follows:

~~1605.3.2~~ **1605.2 Alternative basic allowable stress design load combinations.** In lieu of the ~~basic load combinations specified in Section 1605.3.1~~ Load Combinations in ASCE 7 Section 2.4, structures and portions thereof shall be permitted to be designed for the most critical effects resulting from the following combinations. Where using these alternative ~~basic~~ allowable stress load combinations that include wind or seismic loads, allowable stresses are permitted to be increased or load combinations reduced where permitted by the material chapter of this code or the referenced standards. For load combinations that include the counteracting effects of dead and wind loads, only two-thirds of the minimum dead load likely to be in place during a design wind event shall be used. Where using allowable stresses that have been increased or load combinations that have been reduced as permitted by the material chapter of this code or the referenced standards, where wind loads are calculated in accordance with Chapters 26 through 31 of ASCE 7, the coefficient (ω) in the following equations shall be taken as 1.3. For other wind loads, (ω) shall be taken as 1. Where allowable stresses have not been increased or load combinations have not been reduced as permitted by the material chapter of this code or the referenced standards, (ω) shall be taken as 1. Where using these alternative load combinations to evaluate sliding, overturning and soil bearing at the soil-structure interface, the reduction of foundation overturning from Section 12.13.4 in ASCE 7 shall not be used. Where using these alternative basic load combinations for proportioning foundations for loadings, which include seismic loads, the vertical seismic *load effect*, E_v , in Equation 12.4-4 of ASCE 7 is permitted to be taken equal to zero.

$$D + L + (L_r \text{ or } S \text{ or } R)$$

(Equation ~~16-17~~ **16-1**)

$$D + L + 0.6 \omega W$$

(Equation ~~16-18~~ **16-2**)

$$D + L + 0.6 \omega W + S/2$$

(Equation ~~16-19~~ **16-3**)

$$D + L + S + 0.6 \omega W/2$$

(Equation ~~16-20~~ **16-4**)

$$D + L + S + E/1.4$$

(Equation ~~16-2~~ **16-5**)

$$0.9D + E/1.4$$

(Equation ~~16-22~~ **16-6**)

Exceptions:

1. Crane hook loads need not be combined with roof live loads or with more than three-fourths of the snow load or one-half of the wind load.
2. Flat roof snow loads of 30 psf (1.44 kN/m²) or less and roof live loads of 30 psf (1.44 kN/m²) or less need not be combined with seismic loads. Where flat roof snow loads exceed 30 psf (1.44 kN/m²), 20 percent shall be combined with seismic loads.
3. Where required by ASCE 7 Chapters 12, 13, and 15, the Load Combinations including overstrength of ASCE 7 Sections 2.3.6 shall be used.

Delete without substitution:

~~1605.3.2.1 Other loads.~~ Where F , H or T are to be considered in the design, each applicable load shall be added to the combinations specified in Section 1605.3.2. Where self-straining loads, T , are considered in the design, their structural effects in combination with other loads shall be determined in accordance with Section 2.4.4 of ASCE 7.

Revise as follows:

1607.14 Crane loads. The crane live load shall be the rated capacity of the crane. Design loads for the runway beams, including connections and support brackets, of moving bridge cranes and monorail cranes shall include the maximum wheel loads of the crane and the vertical impact, lateral and longitudinal forces induced by the moving crane. Crane hook loads need not be combined with roof live load or with more than three-fourths of the snow loads or one-half of the wind load.

1602.1 Notations. The following notations are used in this chapter:

D = Dead load.

D_i = Weight of ice in accordance with Chapter 10 of ASCE 7.

E = Combined effect of horizontal and vertical earthquake induced forces as defined in Section ~~2.3.6~~ 12.4 of ASCE 7.

F = Load due to fluids with well-defined pressures and maximum heights.

F_a = Flood load in accordance with Chapter 5 of ASCE 7.

H = Load due to lateral earth pressures, ground water pressure or pressure of bulk materials.

L = Roof live load greater than 20 psf (0.96 kN/m²) and floor live load.

L_r = Roof live load of 20 psf (0.96 kN/m²) or less.

R = Rain load.

S = Snow load.

T = Cumulative effects of self-straining load forces and effects.

V_{asd} = Allowable stress design wind speed, miles per hour (mph) (km/hr) where applicable.

V = Basic design wind speeds, miles per hour (mph) (km/hr) determined from Figures 1609.3(1) through 1609.3(8) or ASCE 7.

W = Load due to wind pressure.

W_i = Wind-on-ice in accordance with Chapter 10 of ASCE 7.

Reason: Since 2000, the IBC has contained three separate groups of load combinations including the following: (1) Strength Load Combinations (1605.2); (2) Basic Allowable Stress Load Combinations (1605.3.1); and (3) Alternative Allowable Stress Load Combinations (1605.3.2). Two of these, the Strength Load Combinations and Basic Allowable Stress Load Combinations are transcribed directly from an earlier edition of the ASCE 7 Standard. The third set of combinations are a legacy from the codes that predate the IBC.

This proposal is intended to remove minor discrepancies in requirements between the IBC and ASCE 7 Standard version of the Strength and Basic Allowable Stress Load Combinations by eliminating the duplication of this material from the IBC. Further, it is intended that removal of the duplicative Strength and Basic Allowable Stress Load Combinations from the IBC will reduce the likelihood of design errors that many engineers have been making when applying the Basic Allowable Stress Design Load Combinations.

The Alternative Allowable Stress Design Load Combinations permit the use of a 1/3 increase in allowable stresses when evaluating Load Combinations containing short-term transient loads including wind and seismic. The Basic Allowable Stress Combinations do not permit this, but instead apply a factor of 0.75 to the transient loads including live, snow, wind, and seismic, when more than one of these loading is considered simultaneously.

The ASCE 7 Load Combinations further permit increases in allowable stresses only when the material, such as wood, has increased available strength under short-term loading, as opposed to long-term loading. These further increases are not intended to be used for the design of masonry, concrete, or steel structures when using the Basic Allowable Stress Design Load Combinations because the strength of these materials does not have significant duration dependence. Unfortunately, and despite specific commentary within the IBC to discourage this, many engineers routinely apply the 1/3 increase to all allowable stresses when designing using the Basic Allowable Stress Design Load Combinations. This creates a potentially dangerous situation in which safety margins of structures designed in this manner are substantially reduced.

By removing the transcription of the ASCE 7 Load Combinations from the IBC, in addition to avoiding duplication of nearly identical material, we expect to reduce the likelihood that design engineers will misapply the 1/3 increase factor applicable to the Alternate Allowable Stress Design Load Combinations. With the approval of this proposal, the IBC will point to ASCE 7 for the Strength and Basic Allowable Stress Design Load Combinations where there is no mention of the 1/3 increase factor. The Alternate Allowable Stress Design Load Combinations will remain in the IBC with the permissible 1/3 increase.

It is important to note that this proposal does not result in any substantive technical change as all Load Combinations presently used by engineers will remain available to them including the exceptions for flat roof snow loads in combinations with seismic loads. The requirement that engineers reference ASCE 7 to determine the Strength and Basic Allowable Stress Design Load Combinations is not burdensome to engineers as they already must reference ASCE 7 to compute the values of the various loadings required by the load combinations for design.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposed change will not impact the cost of construction. This proposal is a reorganization of the pointers in the IBC to refer to the Load Combinations in the currently referenced loading standard *ASCE 7-16 Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7).

S48-19

IBC®: 1605.3.2

Proponent: Don Scott, representing Representing National Council of Structural Engineers Association (dscott@pcs-structural.com)

2018 International Building Code

Revise as follows:

1605.3.2 Alternative basic load combinations. In lieu of the basic load combinations specified in Section 1605.3.1, structures and portions thereof shall be permitted to be designed for the most critical effects resulting from the following combinations. Where using these alternative basic allowable stress load combinations that include wind or seismic loads, allowable stresses are permitted to be increased or load combinations reduced where permitted by the material chapter of this code or the referenced standards. For load combinations that include the counteracting effects of dead and wind loads, only two-thirds of the minimum dead load likely to be in place during a design wind event shall be used. Where using ~~allowable stresses that have been increased or load combinations that have been reduced as permitted by the material chapter of this code or the referenced standards, where wind loads are calculated in accordance with Chapters 26 through 31 of ASCE 7, the coefficient (ω) in the following equations shall be taken as 1.3. For other wind loads, (ω) shall be taken as 1. Where allowable stresses have not been increased or load combinations have not been reduced as permitted by the material chapter of this code or the referenced standards, (ω) shall be taken as 1. Where using these~~ alternative load combinations to evaluate sliding, overturning and soil bearing at the soil-structure interface, the reduction of foundation overturning from Section 12.13.4 in ASCE 7 shall not be used. Where using these alternative basic load combinations for proportioning foundations for loadings, which include seismic loads, the vertical seismic *load effect*, E_v , in Equation 12.4-4 of ASCE 7 is permitted to be taken equal to zero.

$$D + L + (L_r \text{ or } S \text{ or } R)$$

(Equation 16-17)

$$D + L + 0.6 \omega W$$

$D + L + 0.6W$ (Equation 16-18)

$$D + L + 0.6 \omega W + S/2$$

$D + L + 0.6W + S/2$ (Equation 16-19)

$$D + L + S + 0.6 \omega W/2$$

$D + L + S + 0.6W/2$ (Equation 16-20)

$$D + L + S + E/1.4$$

(Equation 16-21)

$$0.9D + E/1.4$$

(Equation 16-22)

Exceptions:

1. Crane hook loads need not be combined with roof live loads or with more than three-fourths of the snow load or one-half of the wind load.
2. Flat roof snow loads of 30 psf (1.44 kN/m²) or less and roof live loads of 30 psf (1.44 kN/m²) or less need not be combined with seismic loads. Where flat roof snow loads exceed 30 psf (1.44 kN/m²), 20 percent shall be combined with seismic loads.

Reason: The material chapters have been revised since the omega factor was introduced in the code to account for some of the material chapters allowing a one-third stress increase on the allowable stresses. This one-third stress increase has been eliminated from the material chapters. Thus, the omega factor is not longer necessary.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This code change proposal will have no effect on the cost of construction.

Proposal # 4755

S48-19

S49-19

IBC: 1606.2, 1606.3(New)

Proponent: Jennifer Goupil, American Society of Civil Engineers (ASCE), representing American Society of Civil Engineers (ASCE) (jgoupil@asce.org)

2018 International Building Code

Revise as follows:

~~1606.2 Design dead load.~~ **Weights of materials of construction.** For purposes of design, the actual weights of materials of construction ~~and fixed service equipment~~ shall be used. In the absence of definite information, values used shall be subject to the approval of the *building official*.

Add new text as follows:

1606.3 Weight of fixed service equipment. In determining dead loads for purposes of design, the weight of fixed service equipment, including the maximum weight of the contents of fixed service equipment, shall be included. The components of fixed service equipment that are variable, such as liquid contents and movable trays, shall not be used to counteract forces causing overturning, sliding, and uplift conditions in accordance with Section 1.3.6 of ASCE 7.

Exceptions:

1. Where force effects are the result of the presence of the variable components, the components are permitted to be used to counter those load effects. In such cases, the structure shall be designed for force effects with the variable components present and with them absent.
2. For the calculation of seismic force effects, the components of fixed service equipment that are variable, such as liquid contents and movable trays, need not exceed those expected during normal operation.

Reason: This proposal coordinates how the weight of fixed service equipment is considered in the IBC with how it is considered in the referenced design load standard, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7).

Dead load as defined in Section 202 has two parts, the weight of materials of construction and the weight of fixed service equipment. This proposal removes fixed service equipment from Section 1606.2 and creates a new section, Section 1606.3, to contain the provisions specific to fixed service equipment. This aligns the IBC with ASCE 7.

The weight of fixed service equipment includes both the empty weight of the equipment and the maximum weight of the contents. For example, the weight of liquids is to be included in the dead load of piping and tanks and the weight of conduit and wiring is to be included in the dead load of cable trays. The current text of the IBC does not address the dead load due to variable content weight.

In addition, the proposal clarifies that as the content weight is variable, it cannot be counted on to counteract overturning, sliding, and uplift conditions.

The exceptions address counteracting force effects and seismic force effects.

Exception 1 indicates that when the variable content weight is the source of the force causing overturning, sliding, or uplift, it can be used to counteract the force. For example, the liquid in a tank is the primary source of the seismic mass of the tank and therefore can be used to resist seismic uplift, however the liquid can not be used to resist overturning, sliding, and uplift from wind loads.

Exception 2 indicates that the maximum weight of the contents does not have to be used when calculating the seismic forces, rather the weight that exists during normal operation can be used. This is consistent with the methodology used for including variable components in the determination of the seismic weight.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal may increase the cost of construction. It is possible that some designers are not designing for the maximum weight of the contents.

Proposal # 3793

S49-19

S50-19

IBC: 1606.3 (New)

Proponent: Jennifer Goupil, American Society of Civil Engineers (ASCE), representing American Society of Civil Engineers (ASCE)
(jgoupil@asce.org)

2018 International Building Code

Add new text as follows:

1606.3 Photovoltaic panel systems. The weight of photovoltaic panel systems, their support system, and ballast shall be considered as dead load.

Reason: This proposal has two components. First it clarifies the dead load provisions applicable to photovoltaic panel systems. The new section makes it clear that the dead load of photovoltaic panels includes the weight of the support system and ballast.

In addition, this proposal coordinates the dead load provisions of the IBC with the dead load provisions contained in the referenced design load standard, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7).

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal clarifies that photovoltaic panels are dead loads; if a design engineer is accounting for these loads correctly already, it will not impact the cost of construction.

Proposal # 3836

S50-19

S51-19

IBC: 1606.3 (New), 1607.13.3.1

Proponent: Jennifer Goupil, American Society of Civil Engineers (ASCE), representing American Society of Civil Engineers (ASCE) (jgoupil@asce.org)

2018 International Building Code

Add new text as follows:

1606.3 Vegetative and landscaped roofs. The weight of all landscaping and hardscaping materials shall be considered as dead load. The weight shall be computed considering both fully saturated soil and drainage layer materials and fully dry soil and drainage layer materials to determine the most severe load effects on the structure.

Revise as follows:

1607.13.3.1 Vegetative and landscaped roofs. ~~The weight of all landscaping materials shall be considered as dead load and shall be computed on the basis of saturation of the soil as determined in accordance with Section 3.1.4 of ASCE 7.~~ The uniform design live load in unoccupied landscaped areas on roofs shall be 20 psf (0.958 kN/m²). The uniform design live load for occupied landscaped areas on roofs shall be determined in accordance with Table 1607.1.

Reason: This proposal has two components. The first component is to move a dead load provision from the live load section of the IBC to the dead load section. The second component is to revise the IBC text regarding the dead load of vegetative roofs to coordinate with the text of the referenced design load standard, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7).

Component 1: Dead load requirements should not be contained in the live load section of the IBC, Section 1607. This proposal moves text that addresses the dead load of vegetative and landscaped roofs from Section 1607.13.3.1 to a new section in Section 1606 Dead Loads. This change makes the IBC consistent with its own format as well as consistent with ASCE 7.

Component 2: The text pertaining to the dead load provisions for vegetative and landscaped roofs is revised to align with ASCE 7. This includes replacing the reference to ASCE 7 for soil saturation with the actual text from ASCE 7 and adding the term *hardscaping*. Including both terms, landscaping and hardscaping, is intended to make it clear that the weight of materials such as pavers, stones, and fences, commonly referred to as hardscaping, as well as the weight of soil and plants, commonly referred to as landscaping, is to be considered as dead load on roofs.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal relocates loads to the correct section and clarifies terminology. There is no technical or substantive change to the cost of construction.

Proposal # 3794

S51-19

S52-19

IBC: SECTION 106, 106.1, 106.2, 106.3, 111.5 (New), SECTION 1607 (New), 1607.1 (New), 1607.7.5

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Building Code

Delete without substitution:

~~SECTION 106~~ ~~FLOOR AND ROOF DESIGN LOADS~~

~~**[A] 106.1 Live loads posted.** In commercial or industrial buildings, for each floor or portion thereof designed for live loads exceeding 50 psf (2.40 kN/m²), such design live loads shall be conspicuously posted by the owner or the owner's authorized agent in that part of each story in which they apply, using durable signs. It shall be unlawful to remove or deface such notices.~~

~~**[A] 106.2 Issuance of certificate of occupancy.** A certificate of occupancy required by Section 111 shall not be issued until the floor load signs, required by Section 106.1, have been installed.~~

~~**[A] 106.3 Restrictions on loading.** It shall be unlawful to place, or cause or permit to be placed, on any floor or roof of a building, structure or portion thereof, a load greater than is permitted by this code.~~

Revise as follows:

SECTION 111 CERTIFICATE OF OCCUPANCY

Add new text as follows:

111.5 Live load posted. A certificate of occupancy required shall not be issued until floor load signs, where required by Section 1607.1.1, and maximum weight of vehicles, where required by Section 1607.7.5, have been posted.

SECTION 1607 LIVE LOADS

1607.1 General. Live loads are those loads defined in Chapter 2 of this code.

1607.1.1 Live loads posted. In commercial or industrial buildings, for each floor or portion thereof designed for live loads exceeding 50 psf (2.40 kN/m²), such design live loads shall be posted in a readily visible location by the owner or the owner's authorized agent in the portion of each story in which they apply. It shall be unlawful to remove or deface such notices.

Revise as follows:

1607.7 Heavy vehicle loads. Floors and other surfaces that are intended to support vehicle loads greater than a 10,000-pound (4536 kg) gross vehicle weight rating shall comply with Sections 1607.7.1 through 1607.7.5.

1607.7.5 Posting. The maximum weight of vehicles allowed into or on a garage or other structure shall be posted by the owner or the owner's authorized agent in accordance with Section 106.1, a readily visible location at the vehicle entrance of the building or other approved location. It shall be unlawful to remove or deface such notices.

Reason: The purpose of this code change is to restore the live load posting requirements to Chapter 16. These provisions had been moved to Section 106 by proposal S48-07/08 on the basis that they were administrative requirements rather than technical requirements. The BCAC reviewed the provisions and determined they are in fact technical construction requirements, not administrative enforcement requirements. It is noted they are tied to specific loading requirements in Chapter 16 and are the responsibility of the owner to provide, not the building department. Thus these requirements should be relocated to Chapter 16, with a note left in Section 110 for the building department to verify the loads have been posted. The terminology "commercial or industrial buildings" is existing text that has been in place for several code cycles and B-CAC decided to leave it unchanged. Further, separate provisions have been created for floor live loads and maximum vehicle weights. The reference to a "readily visible" location parallel those for stairway identification signs (Section 1023.9) and signage for public toilet facilities (Section 2902.4 and 2902.4.1). It is noted this signage is not tied to egress or accessibility requirements for the space. Therefore, it is not necessary to require the sign comply with ICC A117.1 or otherwise meet legibility requirements.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on

the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This relocation of requirements may reduce the cost of construction because all necessary requirements are located in the appropriate Chapter.

Proposal # 4052

S52-19

S53-19

IBC®: TABLE 1607.1

Proponent: Jennifer Goupil, American Society of Civil Engineers (ASCE), representing American Society of Civil Engineers (ASCE) (jgoupil@asce.org)

2018 International Building Code

Revise as follows:

TABLE 1607.1

MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L₀, AND MINIMUM CONCENTRATED LIVE LOADS^a

Portions of table not shown remain unchanged.

OCCUPANCY OR USE	UNIFORM (psf)	CONCENTRATED (pounds)
4. Assembly areas		
Fixed seats (fastened to floor)	60 ^m	
Follow spot, projections and control rooms	50	
Lobbies	100 ^m	
Movable seats	100 ^m	
Stage floors	150 ⁿ	
Platforms (assembly)	100 ^m	
<u>Reviewing stands, grandstands and bleachers</u>	<u>100^{c,m}</u>	
<u>Stadiums and arenas with fixed seats (fastened to the floor)</u>	<u>60^{c,m}</u>	
Other assembly areas	100 ^m	
24. Recreational uses:		
Bowling alleys, poolrooms and similar uses	75 ^m	
Dance halls and ballrooms	100 ^m	
Gymnasiums	100 ^m	
Ice skating rink	250 ⁿ	
Reviewing stands, grandstands and bleachers	100^{c,m}	
Roller skating rink	100 ^m	
Stadiums and arenas with fixed seats (fastened to floor)	60^{c,m}	

c. Design in accordance with ICC 300.

m. Live load reduction is not permitted.

Reason: This proposal contains two changes which align Items 4 and 24 of Table 1607.1 in the IBC with the corresponding table in the referenced design load standard, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7). The changes do not change the magnitude of the live loads nor the footnote references.

Both of the items are moved from Item 24 to Item 4 as they more closely align with the functions contained in Item 4. Reviewing stands/bleachers are similar to Movable seats and Stadiums/arenas with fixed seats are similar to Fixed seats (fastened to floors).

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal contains editorial changes and clarifications.

S54-19

IBC®: TABLE 1607.1

Proponent: Jennifer Goupil, American Society of Civil Engineers (ASCE), representing American Society of Civil Engineers (ASCE) (jgoupil@asce.org)

2018 International Building Code

Revise as follows:

TABLE 1607.1

MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L₀, AND MINIMUM CONCENTRATED LIVE LOADS^g

Portions of table not shown remain unchanged.

OCCUPANCY OR USE	UNIFORM (psf)	CONCENTRATED (pounds)
------------------	---------------	-----------------------

~~g. Where snow loads occur that are in excess of the design conditions, the structure shall be designed to support the loads due to the increased loads caused by drift buildup or a greater snow design determined by the building official (see Section 1608).~~

Reason: This proposal one of several that are intended to coordinate the live load table in the IBC with the live load table in the referenced design load standard, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7). The live load table in ASCE 7 no longer has footnotes. The footnotes were removed to make the table more user friendly. The information in the footnotes was moved to new or existing sections in the live load chapter in ASCE 7.

This proposal addresses Footnote G. Footnote G is deleted from Table 1607.1, rather than moved, because it is not needed. This footnote is unnecessary for the following reasons.

- 1) Footnote G deals with snow loads which are not addressed in Table 1607.1. Snow loads are addressed in IBC Section 1608, and by reference, ASCE 7-16 Chapter 7. ASCE 7-16 Chapter 7 addresses unbalanced snow loads, drifting snow on lower roofs, including snow drift on lower roofs of adjacent structures, drift loads due to roof projections and parapets, and snow loads on existing roofs.
- 2) Section 1607 Live Loads, contains a section on roof loads, Section 1607.13, which states that in addition to live loads, roofs shall be designed to support dead, wind, snow, and earthquake loads.
- 3) Section 1605 Load Combinations contains the requirements for combining loads, including combining live, roof live, and snow loads.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The removal of footnote G will not increase or decrease the cost of construction.

Proposal # 4313

S54-19

S55-19

IBC®: TABLE 1607.1

Proponent: Jennifer Goupil, American Society of Civil Engineers (ASCE), representing American Society of Civil Engineers (ASCE) (jgoupil@asce.org)

2018 International Building Code

Revise as follows:

TABLE 1607.1

MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L₀, AND MINIMUM CONCENTRATED LIVE LOADS^a

Portions of table not shown remain unchanged.

OCCUPANCY OR USE	UNIFORM (psf)	CONCENTRATED (pounds)
6. Catwalks <u>for maintenance access</u>	40	300
35. Yards and terraces, pedestrians <u>pedestrian</u>	100 ^m	—

Reason: This proposal is editorial. The proposal contains two changes which align Items 6 and 35 of Table 1607.1 in the IBC with the corresponding table in the referenced design load standard, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7).

The added text, for maintenance access, clarifies the use of the catwalks covered in the table. Catwalks that are part of a public space and accessible to the public are not intended to be included in this item.

The change to Item 35 simply corrects grammar.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is an editorial change and not intended to impact cost of construction.

Proposal # 4136

S55-19

S56-19

IBC: 1011.15, 1011.16, TABLE 1607.1, 1607.16 (New)

Proponent: Jennifer Goupil, American Society of Civil Engineers (ASCE), representing American Society of Civil Engineers (ASCE) (jgoupil@asce.org)

2018 International Building Code

Revise as follows:

TABLE 1607.1

MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L₀, AND MINIMUM CONCENTRATED LIVE LOADS⁹

Portions of table not shown remain unchanged.

OCCUPANCY OR USE	UNIFORM (psf)	CONCENTRATED (pounds)
14. Fixed ladders	See Section 1607.16	

Add new text as follows:

1607.16 Fixed ladders. Fixed ladders with rungs shall be designed to resist a single concentrated load of 300 lb (1.33 kN) in accordance with Section 4.5.4 of ASCE 7. Where rails of fixed ladders extend above a floor or platform at the top of the ladder, each side rail extension shall be designed to resist a single concentrated load of 100 lb (0.445 kN) in accordance with Section 4.5.4 of ASCE 7. Ships ladders shall be designed to resist the stair loads given in Table 1607.1.

Revise as follows:

1011.15 Ships ladders. Ships ladders are permitted to be used in Group I-3 as a component of a *means of egress* to and from control rooms or elevated facility observation stations not more than 250 square feet (23 m²) with not more than three occupants and for access to unoccupied roofs. The minimum clear width at and below the *handrails* shall be 20 inches (508 mm). Ships ladders shall be designed for the live loads indicated in Section 1607.16

1011.16 Ladders. Permanent ladders shall not serve as a part of the *means of egress* from occupied spaces within a building. Permanent ladders shall be constructed in accordance with Section 306.5 of the International Mechanical Code and designed for the live loads indicated in Section 1607.16. Permanent ladders shall be permitted to provide access to the following areas:

1. Spaces frequented only by personnel for maintenance, repair or monitoring of equipment.
2. Nonoccupiable spaces accessed only by catwalks, crawl spaces, freight elevators or very narrow passageways.
3. Raised areas used primarily for purposes of security, life safety or fire safety including, but not limited to, observation galleries, prison guard towers, fire towers or lifeguard stands.
4. Elevated levels in Group U not open to the general public.
5. Nonoccupied roofs that are not required to have *stairway* access in accordance with Section 1011.12.1.
6. Where permitted to access equipment and appliances in accordance with Section 306.5 of the International Mechanical Code.

Reason: This proposal coordinates requirements for fixed ladders in the IBC with the referenced design load standard, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7). Currently the IBC does not specify live loads to be used in the design of ladders. This proposal adds the ladder live loads contained in ASCE 7-16 to the IBC.

The format of the proposed text in new Section 1607.16 mirrors the format of the existing text contained in Sections 1607.8.1 and 1607.8.1.1 where the value of the specified live load is given with a reference to the appropriate section in ASCE 7. This format provides the code user the live load value but leaves the accompanying design information within the referenced standard. This format aids in keeping the two documents coordinated while still providing the fundamental requirement, the load value, within the IBC.

The pointers to Chapter 16 that have been added to Sections 1011.15 and 1011.16 are patterned after the existing structural pointers in the handrail (Section 1014) and guards (Section 1015) IBC sections.

This proposal adds one new item to Table 1607.1. The new item is placed as Item 14, with subsequent items being simply renumbered.

Cost Impact: The code change proposal will increase the cost of construction
The cost of fixed ladders may increase due to the addition of the design requirements.

S57-19

IBC: TABLE 1607.1, 1607.7, 1607.17 (New), 1607.18 (New), 1607.18.1 (New), 1607.18.2 (New), 1607.19 (New), 1607.20 (New), 1607.20.1 (New), 1607.20.2 (New), 1607.20.3 (New)

Proponent: Jennifer Goupil, American Society of Civil Engineers (ASCE), representing American Society of Civil Engineers (ASCE) (jgoupil@asce.org)

2018 International Building Code

Revise as follows:

TABLE 1607.1

MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L₀, AND MINIMUM CONCENTRATED LIVE LOADS⁹

Portions of table not shown remain unchanged.

OCCUPANCY OR USE	UNIFORM (psf)	CONCENTRATED (pounds)	ALSO SEE SECTION
14. Garages (passenger vehicles only)	40 ^o	Note a-	
Passenger vehicles only	40 ^o	See Section 1607.7	
Trucks and buses	See Section 1607.7 1607.8		
15. Handrails, guards and grab bars	See Section 1607.8 1607.9		
19. Libraries			
Corridors above first floor	80	1,000	
Reading rooms	60	1,000	
Stack rooms	150 ^{b,n}	1,000	Section 1607.17
25. Residential			
One- and two-family dwellings			
Uninhabitable attics without storage ⁺	10		
Uninhabitable attics with storage ^{+,j,k}	20		
Habitable attics and sleeping areas [*]	30		Section 1607.20
Canopies, including marquees	20		
All other areas	40		
Hotels and multifamily dwellings			
Private rooms and corridors serving them	40		
Public rooms ^m and corridors serving them	100		
26. Roofs			Section 1607.14.2
All roof surfaces subject to maintenance workers		300	
Awnings and canopies:			
Fabric construction supported by a skeleton structure	5 ^m		
All other construction, except one- and two-family dwellings	20		
Ordinary flat, pitched, and curved roofs (that are not occupiable)	20		
Primary roof members exposed to a work floor			
Single panel point of lower chord of roof trusses or any point along primary structural members supporting roofs over manufacturing, storage warehouses, and repair garages		2,000	
All other primary roof members		300	
Occupiable roofs:			
Roof gardens	100		

Assembly areas	100 ^m		
All other similar areas	Note 1	Note 1	
28. Scuttles, skylight ribs and accessible ceilings	—	200	
29. Sidewalks, vehicular driveways and yards, subject to trucking	250 ^{g,n}	8,000 ^e	Section 1607.18
30. Stairs and exits			
One- and two-family dwellings	40	300 ^f	Section 1607.19
All other	100	300 ^f	Section 1607.19
33. Vehicle barriers	See Section 1607.9 1607.10		

For SI: 1 inch = 25.4 mm, 1 square inch = 645.16 mm²,

1 square foot = 0.0929 m²,

1 pound per square foot = 0.0479 kN/m², 1 pound = 0.004448 kN,

1 pound per cubic foot = 16 kg/m³.

~~a. Floors in garages or portions of buildings used for the storage of motor vehicles shall be designed for the uniformly distributed live loads of this table or the following concentrated loads: (1) for garages restricted to passenger vehicles accommodating not more than nine passengers, 3,000 pounds acting on an area of 4¹/₂ inches by 4¹/₂ inches; (2) for mechanical parking structures without slab or deck that are used for storing passenger vehicles only, 2,250 pounds per wheel.~~

~~b. The loading applies to stack room floors that support nonmobile, double-faced library book stacks, subject to the following limitations:~~

- ~~1. The nominal book stack unit height shall not exceed 90 inches.~~
- ~~2. The nominal shelf depth shall not exceed 12 inches for each face.~~
- ~~3. Parallel rows of double-faced book stacks shall be separated by aisles not less than 36 inches wide.~~

c. Design in accordance with ICC 300.

~~d. Other uniform loads in accordance with an approved method containing provisions for truck loadings shall be considered where appropriate.~~

~~e. The concentrated wheel load shall be applied on an area of 4.5 inches by 4.5 inches.~~

~~f. The minimum concentrated load on stair treads shall be applied on an area of 2 inches by 2 inches. This load need not be assumed to act concurrently with the uniform load.~~

g. Where snow loads occur that are in excess of the design conditions, the structure shall be designed to support the loads due to the increased loads caused by drift buildup or a greater snow design determined by the building official (see Section 1608).

h. See Section 1604.8.3 for decks attached to exterior walls.

~~i. Uninhabitable attics without storage are those where the maximum clear height between the joists and rafters is less than 42 inches, or where there are not two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses. This live load need not be assumed to act concurrently with any other live load requirements.~~

~~j. Uninhabitable attics with storage are those where the maximum clear height between the joists and rafters is 42 inches or greater, or where there are two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses.~~

The live load need only be applied to those portions of the joists or truss bottom chords where both of the following conditions are met:

- i. The attic area is accessible from an opening not less than 20 inches in width by 30 inches in length that is located where the clear height in the attic is not less than 30 inches.
- ii. The slopes of the joists or truss bottom chords are not greater than two units vertical in 12 units horizontal.

The remaining portions of the joists or truss bottom chords shall be designed for a uniformly distributed concurrent live load of not less than 10 pounds per square foot.

k. Attic spaces served by stairways other than the pull-down type shall be designed to support the minimum live load specified for habitable attics and sleeping rooms.

l. Areas of occupiable roofs, other than roof gardens and assembly areas, shall be designed for appropriate loads as approved by the building official. Unoccupied landscaped areas of roofs shall be designed in accordance with Section 1607.13.3.

m. Live load reduction is not permitted.

n. Live load reduction is only permitted in accordance with Section 1607.11.1.2 or Item 1 of Section 1607.11.2.

o. Live load reduction is only permitted in accordance with Section 1607.11.1.3 or Item 2 of Section 1607.11.2.

Add new text as follows:

1607.7 Passenger vehicle garages. Floors in garages or portions of a building used for the storage of motor vehicles shall be designed for the uniformly distributed live loads indicated in Table 1607.1 or the following concentrated load:

1. For garages restricted to passenger vehicles accommodating not more than nine passengers, 3,000 pounds (13.35 kN) acting on an area of 4.5 inches by 4.5 inches (114 mm by 114 mm).

2. For mechanical parking structures without slab or deck that are used for storing passenger vehicles only, 2,250 pounds (10 kN) per wheel.

Revise as follows:

~~1607.7~~ **1607.8 Heavy vehicle loads.** Floors and other surfaces that are intended to support vehicle loads greater than a 10,000-pound (4536 kg) gross vehicle weight rating shall comply with Sections 1607.7.1 through 1607.7.5.

Add new text as follows:

1607.17 Library stack rooms. The live loading indicated in Table 1607.1 for library stack rooms applies to stack room floors that support nonmobile, double-faced library book stacks, subject to the following limitations:

1. The nominal book stack unit height shall not exceed 90 inches (2,290 mm).
2. The nominal shelf depth shall not exceed 12 inches (305 mm) for each face.
3. Parallel rows of double-faced book stacks shall be separated by aisles not less than 36 inches (914 mm) wide.

1607.18 Sidewalks, vehicular driveways, and yards subject to trucking. The live loading indicated in Table 1607.1 for sidewalks, vehicular driveways, and yards subject to trucking shall comply with the requirements of this section.

1607.18.1 Uniform loads. In addition to the loads indicated in Table 1607.1, other uniform loads in accordance with an approved method which contains provisions for truck loading, shall be considered where appropriate.

1607.18.2 Concentrated loads. The concentrated wheel load indicated in Table 1607.1 shall be applied on an area of 4.5 inches by 4.5 inches (114 mm by 114 mm).

1607.19 Stair treads. The concentrated load indicated in Table 1607.1 for stair treads shall be applied on an area of 2 inches by 2 inches (51 mm by 51 mm). This load need not be assumed to act concurrently with the uniform load.

1607.20 Residential Attics The live loads indicated in Table 1607.1 for attics in residential occupancies shall comply with the requirements of this section.

1607.20.1 Uninhabitable attics without storage. In residential occupancies, uninhabitable attic areas without storage are those where the maximum clear height between the joists and rafters is less than 42 inches (1067 mm), or where there are not two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches (1067 mm) in height by 24 inches (610 mm) in width, or greater, within the plane of the trusses. The live load in Table 1607.1 need not be assumed to act concurrently with any other live load requirement.

1607.20.2 Uninhabitable attics with storage. In residential occupancies, uninhabitable attic areas with storage are those where the maximum clear height between the joist and rafter is 42 inches (1067 mm) or greater, or where there are two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches (1067 mm) in height by 24 inches (610 mm) in width, or greater, within the plane of the trusses. The live load in Table 1607.1 need only be applied to those portions of the joists or truss bottom chords where both of the following conditions are met:

1. The attic area is accessed from an opening not less than 20 inches (508 mm) in width by 30 inches (762 mm) in length that is located where the clear height in the attic is not less than 30 inches (762 mm).
2. The slope of the joists or truss bottom chords is not greater than two units vertical in 12 units horizontal.

The remaining portions of the joists or truss bottom chords shall be designed for a uniformly distributed concurrent live load of not less than 10 pounds per square foot (0.48 kN/m²).

1607.20.3 Attics served by stairs. Attic spaces served by stairways other than the pull-down type shall be designed to support the minimum live load specified for habitable attics and sleeping rooms.

Reason: This proposal is one of several that are intended to coordinate the live load table in the IBC with the live load table in the referenced design load standard, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7). The live load table in ASCE 7 no longer has footnotes. The footnotes were removed to make the table more user friendly. The information in the footnotes was moved to new or existing sections in the live load chapter of ASCE 7.

This proposal is editorial in nature as it does not change the technical requirements, it only reorganizes them. This proposal moves the content of eight footnotes to their own sections within the live load section of the IBC. This proposal also adds a new column to the live load table where the reference to an accompanying section is provided. This change was done to the live load table in ASCE 7-16 and has resulted in a more user friendly table. Footnotes, which are in smaller font than the rest of the table, are not well-suited to contain large amounts of text or to provide technical content. In addition the footnote superscript letter within the table is even smaller and easy to miss. The proposed new column has regular size font and readily alerts the user to the additional information they need to review.

Footnote Changes in this Proposal

Footnote A moved to new Section 1607.7

Footnote B moved to new Section 1607.17

Footnote D moved to new Section 1607.18

Footnote E moved to new Section 1607.18

Footnote F moved to new Section 1607.19

Footnote I moved to new Section 1607.20.1

Footnote J moved to new Section 1607.20.2

Footnote K moved to new Section 1607.20.3

Separate proposals address the other footnotes to Table 1607.1.

Additional notes regarding Footnote A: Footnote A is moved to a new section, Section 1607.7 and the subsequent sections are renumbered. This places the Footnote A text immediately in front of the existing section on heavy live loads, therefore keeping the two sections on garages close to one another (1607.7 for passenger vehicle garages and 1607.8 for heavy vehicle garages). Also note, an editorial change for readability was made to the text, "portions of buildings" was changed to "portions of a building".

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposed changes are editorial.

Proposal # 4139

S57-19

S58-19

BC: TABLE 1607.1, 1607.16 (New), 1607.16.1 (New)

Proponent: Jennifer Goupil, American Society of Civil Engineers (ASCE), representing American Society of Civil Engineers (ASCE) (jgoupil@asce.org)

2018 International Building Code

Revise as follows:

TABLE 1607.1

MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L_0 , AND MINIMUM CONCENTRATED LIVE LOADS^a

Portions of table not shown remain unchanged.

OCCUPANCY OR USE	UNIFORM (psf)	CONCENTRATED (pounds)
24. Recreational uses:		
Bowling alleys, poolrooms and similar uses	75 ^m	
Dance halls and ballrooms	100 ^m	
Gymnasiums	100 ^m	
Ice skating rink	250 ⁿ	
Reviewing stands, Bleachers, folding and telescopic seating and grandstands and bleachers	100 ^{e,m} (see Section 1607.16)	
Roller skating rink	100 ^m	
Stadiums and arenas with fixed seats (fastened to floor)	60 ^{e,m} (see Section 1607.16)	

e. Design in accordance with ICC 300.

Add new text as follows:

1607.16 Seating for assembly uses. Bleachers, folding and telescopic seating and grandstands shall be designed for the loads specified in ICC 300. Stadiums and arenas with fixed seats shall be designed for the horizontal sway loads in Section 1607.16.1.

1607.16.1 Horizontal sway loads. The design of stadiums and arenas with fixed seats shall include horizontal swaying forces applied to each row of seats as follows:

1. 24 lb per linear foot (0.35 kN/m) of seat applied in a direction parallel to each row of seats, and
2. 10 lb per linear foot (0.15 kN/m) of seat applied in a direction perpendicular to each row of seats.

The parallel and perpendicular horizontal swaying forces are not required to be applied simultaneously.

Reason: This proposal is one of several that are intended to coordinate the live load table in the IBC with the live load table in the referenced design load standard, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7). The live load table in ASCE 7 no longer has footnotes. The footnotes were removed to make the table more user friendly. The information in the footnotes was moved to new or existing sections in the live load chapter of ASCE 7.

This proposal addresses Footnote C by doing the following:

- A) Moving Footnote C to a new section within the live load section of the IBC.
- B) Removing the reference to ICC 300 for stadiums with fixed seats, but maintaining the requirement to design fixed seats for horizontal sway forces.
- C) Revising the terms used for 'bleachers' in Table 1607.1 to match the terms used in ICC 300.

A. Footnote C is moved to a new section at the end of the live load section. Footnotes, which are in smaller font than the rest of the table, are not well-suited to contain large amounts of text or to provide technical content. In addition the footnote superscript letter within the table is even smaller and easy to miss. Moving the technical content to its own section makes the table more user friendly.

B. The scope of ICC 300 does not include fixed seats, therefore it is necessary to revise Footnote C. The proposed revision creates two parts. The first part, sentence one in 1607.16, maintains the reference to ICC 300 for 'bleachers'. The second part, sentence two in 1607.16, requires stadiums

and arenas with fixed seats to be designed for horizontal sway forces (which are the same as the ICC 300 sway forces). These forces are considered fundamental to the design of stadiums and arenas and should be required by the IBC.

C. The terminology used in Table 1607.1 is revised from "Reviewing stands, grandstands and bleachers" to "Bleachers, folding and telescopic seating, and grandstands" in order match the terms used in ICC 300. This is considered to be an editorial change as all of these terms refer to systems that are free-standing, i.e. they are not fixed to the building. However, when referring to a standard, it is preferable for the terms used in the IBC to be consistent with the terms used in the standard. The term "reviewing stand" is not used in ICC 300. If unchanged, the IBC could be interpreted as adding to, or over-riding, the scope of ICC 300, which is not the intent here.

It is noted that the existing IBC text, "Reviewing stands, grandstands and bleachers", matches the current ASCE 7 text. However the changing the text to "Bleachers, folding and telescopic seating, and grandstands" is necessary for the reasons stated above. The Dead & Live Load Committee of ASCE 7 will be reviewing this terminology and monitoring the outcome of this proposal with the intent of keeping the IBC and ASCE 7 coordinated.

This proposal stands on its own merit, but also coordinates with another ASCE 7 sponsored proposal that adds a new column to Table 1607.1 with the title "See Also Section". If that proposal is approved, ICC staff has indicated that the reference to new Section 1607.16 will be placed in that new column editorially.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal contains editorial changes and clarifications. If the design engineer is accounting for horizontal sway loads correctly already, it will not impact the cost of construction.

Proposal # 4504

S58-19

S59-19

IBC®: TABLE 1607.1, 1607.13.3.1

Proponent: Jennifer Goupil, American Society of Civil Engineers (ASCE), representing American Society of Civil Engineers (ASCE) (jgoupil@asce.org)

2018 International Building Code

Revise as follows:

TABLE 1607.1

MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L₀, AND MINIMUM CONCENTRATED LIVE LOADS^a

Portions of table not shown remain unchanged.

OCCUPANCY OR USE	UNIFORM (psf)	CONCENTRATED (pounds)
26. Roofs		
All roof surfaces subject to maintenance workers		300
Awnings and canopies:		
— Fabric construction supported by a skeleton structure	5^{ft}	
— All other construction, except one and two family dwellings	20	
Ordinary flat, pitched, and curved roofs (that are not occupiable)	20	
<u>Roof areas used for occupants</u>	<u>Same as occupancy served</u>	
<u>Roof areas used for assembly purposes</u>	<u>100</u>	
<u>Vegetative and landscaped roofs:</u>		
<u>Roof areas not intended for occupancy</u>	<u>20</u>	
<u>Roof areas used for assembly purposes</u>	<u>100</u>	
<u>Roof areas used for other occupancies</u>	<u>Same as occupancy served</u>	
Awnings and canopies:		
— Fabric construction supported by a skeleton structure	5^m	
— All other construction, except one and two-family dwellings	20	
Primary roof members exposed to a work floor:		
Single panel point of lower chord of roof trusses or any point along primary structural members supporting roofs over manufacturing, storage warehouses, and repair garages		2,000
All other primary roof members		300
All roof surfaces subject to maintenance workers		300
Occupiable roofs:		
— Roof gardens	100	
— Assembly areas	100^{ft}	
— All other similar areas	Note 1	Note 1

l. Areas of occupiable roofs, other than roof gardens and assembly areas, shall be designed for appropriate loads as approved by the building official. Unoccupied landscaped areas of roofs shall be designed in accordance with Section 1607.13.3.

m. Live load reduction is not permitted.

Delete without substitution:

1607.13.3.1 Vegetative and landscaped roofs. The weight of all landscaping materials shall be considered as dead load and shall be computed on the basis of saturation of the soil as determined in accordance with Section 3.1.4 of ASCE 7. The uniform design live load in unoccupied landscaped

~~areas on roofs shall be 20 psf (0.958 kN/m²). The uniform design live load for occupied landscaped areas on roofs shall be determined in accordance with Table 1607.1.~~

Reason: This proposal coordinates the *Roof* live load item in Table 1607.1 of the IBC with the *Roof* live load item in Table 4.3-1 in the referenced design load standard, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7). Both the content and the layout of the *Roof* item is revised for coordination, including the associated footnote, Footnote L.

The content change consists of the following:

The text contained in Footnote L is replaced with the text "Same as occupancy served", which is placed in the table itself. This change removes the vague language in the footnote, "appropriate loads", and replaces it with more specific language that references the occupancy served by the occupiable roof area. This language is used in other areas of the table and requires the load to be commensurate with occupancy served. Note, no other roof loads are changed, the base roof live load is still 20 psf, and the roof live load for assembly areas is still 100 psf (both in landscaped and non-landscaped areas).

Section 1607.13.3.1 is no longer needed as the table now clearly lists the 20 psf load for unoccupied landscaped areas on roofs, a 100 psf load for assembly areas on roofs, and "Same as occupancy served" for non-assembly occupied areas on roofs. Note, the first sentence in Section 1607.13.3.1 which relates to the dead load of landscaped roofs is moved by another proposal and doesn't belong in the live load section of Chapter 16 anyway.

The layout change consists of placing the base roof live load (20 psf) first, then the other uniform roof loads, and finally the concentrated roof loads. This layout is more logical and follows the layout in the referenced design load standard.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal does not substantially change the roof live loads.

Proposal # 4357

S59-19

S60-19

IBC@: 1603.1.1, TABLE 1607.1

Proponent: Paul Armstrong, MHI, representing MHI

2018 International Building Code

Revise as follows:

1603.1.1 Floor live load. The uniformly distributed, concentrated and impact floor live load used in the design shall be indicated for floor areas. Use of live load reduction in accordance with Section 1607.11 shall be indicated for each type of live load used in the design. For Group S storage warehouses the floor shall be designed for the maximum uniformly distributed or concentrated live load. In areas with storage rack, the concentrated live load shall be designed for a minimum concentrated load of 5,000 lbs (2268 kg) where the clear ceiling height is 15 feet (4572 mm) minimum. The concentrated load shall be increased an additional 2,500 lbs (1123 kg) for each additional 5 feet (1524 mm) clear ceiling height or portion thereof, over 15 feet (4572 mm). The concentrated loads shall be located on a 4 foot by 8 foot (1219 mm by 2438 mm) grid over the floor area with storage racks.

**TABLE 1607.1
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, *L₀*, AND MINIMUM CONCENTRATED LIVE LOADS⁹**

Portions of table not shown remain unchanged.

OCCUPANCY OR USE	UNIFORM (psf)	CONCENTRATED (pounds)
31. Storage warehouses (shall be designed for heavier loads if required for anticipated storage)		See Section 1603.1.1
Heavy	250 ⁿ	
Light	125 ⁿ	

Reason: Many warehouse structures in Use Group S have storage rack located in them resulting in localized loading on the concrete floor slab. We wish to bring this to the attention of the registered design professional of the building when they are designing the new concrete floor slab if the actual floor loads are not known. New warehouse buildings are becoming taller and the 125 psf or 250 psf floor loads are no longer adequate when designing the concrete floor slab.

Cost Impact: The code change proposal will increase the cost of construction

While this might increase the cost of construction in warehouses slightly, it will serve to decrease the cost when evaluating existing warehouse slabs.

Proposal # 5596

S60-19

S61-19

IBC®: TABLE 1607.1

Proponent: Jennifer Goupil, American Society of Civil Engineers (ASCE), representing American Society of Civil Engineers (ASCE) (jgoupil@asce.org)

2018 International Building Code

Revise as follows:

TABLE 1607.1

MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L₀, AND MINIMUM CONCENTRATED LIVE LOADS^a

Portions of table not shown remain unchanged.

OCCUPANCY OR USE	UNIFORM (psf)	CONCENTRATED (pounds)
31. <u>31.</u> Storage areas above ceilings	<u>20</u>	
31-32. Storage warehouses (shall be designed for heavier loads if required for anticipated storage)		
Heavy	250 ⁿ	—
Light	125 ⁿ	

Reason: This proposal adds a live load to align Table 1607.1 in the IBC with the corresponding table in the referenced design load standard, Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7). Table 1607.1 currently contains live load requirements for residential attic storage in Item 25, however the table does not address storage for other uses. This proposal adds a storage live load for non-residential uses.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This load exists in ASCE 7 so it is not a new load, and should not impact the cost of construction.

Proposal # 4557

S61-19

S62-19

IBC®: TABLE 1607.1

Proponent: Jennifer Goupil, American Society of Civil Engineers (ASCE), representing American Society of Civil Engineers (ASCE) (jgoupil@asce.org)

2018 International Building Code

Revise as follows:

TABLE 1607.1

MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L_0 , AND MINIMUM CONCENTRATED LIVE LOADS^a

Portions of table not shown remain unchanged.

OCCUPANCY OR USE	UNIFORM (psf)	CONCENTRATED (pounds)
5. Balconies and decks ^h	1.5 times the live load for the area served, not required to exceed 100	—

~~h. See Section 1604.8.3 for decks attached to exterior walls.~~

Reason: This proposal is one of several that are intended to coordinate the live load table in the IBC with the live load table in the referenced design load standard, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7). The live load table in ASCE 7 no longer has footnotes. The footnotes were removed to make the table more user friendly. The information in the footnotes was moved to new or existing sections in ASCE 7.

This proposal addresses Footnote H. Footnote H is deleted from Table 1607.1, rather than moved, because it is not needed. This footnote does not address balcony or deck live loads, but rather is simply a pointer to Section 1604.8.3 which contains requirements for anchoring decks to the primary structure. Section 1604.8.3 does not contain any additional live loads. Footnotes to tables are intended to provide information that clarifies the content/requirements of the table and should not be used to provide additional technical content or as pointers.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The removal of footnote H will not increase or decrease the cost of construction.

Proposal # 4314

S62-19

S63-19

IBC®: 1607.2

Proponent: Jennifer Goupil, American Society of Civil Engineers (ASCE), representing American Society of Civil Engineers (ASCE)
(jgoupil@asce.org)

2018 International Building Code

Revise as follows:

1607.2 Loads not specified. For occupancies or uses not designated in ~~Table 1607.1~~ Section 1607, the live load shall be determined in accordance with a method *approved by the building official*.

Reason: This code change is editorial. Changing the reference from the live load table to the entire live load section is more appropriate as not all of the live loads are specified in the table.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Editorial change.

Proposal # 3842

S63-19

S64-19

IBC: 1607.3.1 (New)

Proponent: Randall Dahmen, PE, Self, representing Self

2018 International Building Code

1607.3 Uniform live loads. The live loads used in the design of buildings and other structures shall be the maximum loads expected by the intended use or occupancy but shall not be less than the minimum uniformly distributed live loads given in Table 1607.1.

Add new text as follows:

1607.3.1 Live load posting. Where the live loads for which each floor or portion thereof of a commercial building is designed to exceed 100 psf (4.79 kN/m²), such design live loads shall be conspicuously posted by the owner in that part of each story in which they apply using durable signs acceptable to the authority having jurisdiction. It shall be unlawful to remove or deface such notices.

Reason: Buildings constantly undergo change throughout their existence. As changes occur, the original building plans and associated calculations are misplaced or simply lost. The intent of the proposal is to provide future ready reference for building owners, contractors, designers and code enforcement officials.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
There will be no change to the construction requirements of the building.

Proposal # 2140

S64-19

S65-19

IBC®: 1607.8, 1607.8.2

Proponent: Dawn Anderson, representing self (gonedawning@yahoo.com); Gene Boecker, representing Code Consultants, Inc. (geneb@codeconsultants.com); Dan Buuck, representing National Association of Home Builders (dbuuck@nahb.org); David Collins, representing the American Institute of Architects (dcollins@preview-group.com); Marsha Mazz, representing United Spinal Association (m.mazz@verizon.net)

2018 International Building Code

Revise as follows:

1607.8 Loads on handrails, guards, grab bars and ~~seats~~. accessible benches. Handrails and *guards* shall be designed and constructed for the structural loading conditions set forth in Section 1607.8.1. Grab bars, shower seats and accessible benches shall be designed and constructed for the structural loading conditions set forth in Section 1607.8.2.

1607.8.2 Grab bars, shower seats and ~~dressng room bench seats~~. accessible benches. Grab bars; and shower seats ~~and dressing room bench seats~~ shall be designed to resist a single concentrated load of 250 pounds (1.11 kN) applied in any direction at any point on the grab bar or seat so as to produce the maximum load effects. Benches in sauna and steam rooms, dressing, fitting and locker rooms, holding cells and housing cells, required to be accessible in ICC A117.1 shall be designed to resist a single concentrated load of 250 pounds (1.11 kN) applied in any direction at any point on the seat of the bench so as to produce the maximum load effects.

Reason: There is inconsistency between the language in two sections. Plus, it must be clear which benches that this requirement is for. The 250 lbs. is required at the dressing room bench because it is a transfer location. The 250 lbs. is in ADA and ICC A117.1 Section 903.6. Transfer benches are required in saunas (612.2), dressing rooms and locker rooms (803.4), jail cells (806.2.2). The original language probably put in 'dressing rooms' so people would not try to apply this to any bench anywhere.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is correlation with the requirements in the ICC A117.1 for benches.

Proposal # 4403

S65-19

S66-19

IBC®: 1607.8.1.1

Proponent: Jennifer Goupil, American Society of Civil Engineers (ASCE), representing American Society of Civil Engineers (ASCE)
(jgoupil@asce.org)

2018 International Building Code

Revise as follows:

1607.8.1.1 Concentrated load. Handrails and guards shall be designed to resist a concentrated load of 200 pounds (0.89 kN) in accordance with Section ~~4.5.1.1~~ of 4.5.1 of ASCE 7.

Reason: This proposal corrects a reference to the referenced design load standard, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7). Section 4.5.1 of ASCE 7 contains the requirements for concentrated loads on handrails and guards, not Section 4.5.1.1.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is an editorial correction to the section number. There is no impact on construction costs.

Proposal # 4091

S66-19

S67-19

IBC@: 1607.8.1.2

Proponent: Jennifer Goupil, American Society of Civil Engineers (ASCE), representing American Society of Civil Engineers (ASCE)
(jgoupil@asce.org)

2018 International Building Code

Revise as follows:

1607.8.1.2 ~~Intermediate rails. Guard component loads.~~ ~~Intermediate rails (all those balusters, panel fillers, and guard infill components, including all rails except the handrail), balusters and panel fillers shall and the top rail, shall~~ be designed to resist a concentrated load of 50 pounds (0.22 kN) in accordance with Section ~~4.5.1.1 of 4.5.1.2 of~~ ASCE 7.

Reason: This proposal coordinates the IBC with the referenced design load standard, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7). The 50 lb load is intended to apply to the parts of the guard below the top rail. This proposal removes the term intermediate rails and replaces it with guard infill components, as is used in ASCE 7. This proposal also corrects the reference to the section in ASCE 7.

Note, this change is editorial.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is an editorial change and will not impact the cost of construction.

Proposal # 4092

S67-19

S68-19

IBC@: 1607.8.2

Proponent: Cheryl Burwell, representing ASCE 7-22 Dead & Live Load Subcommittee (cheryl.burwell@seattle.gov); Cole Graveen, representing Self (cwgraveen@rrj.com)

2018 International Building Code

Revise as follows:

1607.8.2 Grab bars, shower seats and ~~dressing room~~ accessible bench seats. Grab bars, shower seats and ~~dressing room~~ *accessible* bench seats shall be designed to resist a single concentrated load of 250 pounds (1.11 kN) applied in any direction at any point on the grab bar or seat so as to produce the maximum load effects.

Reason: This change is intended to clarify which seats are required by the IBC to resist the specified concentrated load. This section is not intended to apply to furniture, however the current wording which uses the term dressing room bench seat, is overly broad and can be interpreted to apply to a typical furniture bench placed in a dressing room/bedroom. The intent is to apply to accessible benches. These benches are required in specific locations by ADA and/or ICC A117.1, such as saunas and dressing rooms/locker rooms.

The term dressing room is removed and replaced with accessible to clarify the intended type of bench.

Note, accessible is purposely not placed in front of grab bars or shower seats. These items are typically built-in features and need to resist the specified load even if not required for accessibility reasons.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Clarifies code intent.

Proposal # 4095

S68-19

S69-19

IBC@: 1607.10.4

Proponent: Gwenyth Searer, representing myself (gsearer@wje.com)

2018 International Building Code

Revise as follows:

1607.10.4 Fall arrest and lifeline anchorages. In addition to any other applicable live loads, fall arrest and lifeline anchorages and structural elements that support these anchorages shall be designed for a live load of not less than 3,100 pounds (13.8 kN) for each attached lifeline, in ~~every~~ any direction that a fall arrest load can be applied.

Reason: This is an editorial change. The word “any” is more grammatically appropriate than “every”. The intent is for a single load to be applied to each anchorage in the worst possible orientation(s) -- one at a time -- not for an infinite number of loads to be applied to a single anchorage at the same time.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is an editorial change. No impact on cost of construction is anticipated or intended.

Proposal # 4766

S69-19

S70-19

IBC®: 1607.10.4

Proponent: Gwenyth Searer, representing myself (gsearer@wje.com)

2018 International Building Code

Revise as follows:

1607.10.4 Fall arrest, and lifeline and rope descent system anchorages. In addition to any other applicable live loads, fall arrest ~~and lifeline, lifeline, and rope descent system~~ anchorages and structural elements that support these anchorages shall be designed for a live load of not less than 3,100 pounds (13.8 kN) for each attached ~~lifeline line~~, in every direction that ~~a fall arrest the~~ load can be applied. Anchorage of horizontal lifelines and the structural elements that support these anchorages shall be designed for the maximum tension that develops in the horizontal lifeline from these live loads.

Reason: In January 2017, after more than a decade of public comment, OSHA adopted new regulations in Section 1910.27 (https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=9719&p_table=standards) that specifically require all anchorages of rope descent systems (such as boatswain's chairs) to be able to support 5,000 pounds in any direction for each attached worker. Since OSHA has added specific language addressing rope descent systems, and since the systems and loads are basically identical to those for other fall arrest lines, it makes sense to update the current requirements in this section to include rope descent systems. If this change is not made, then ASCE 7 will provide loads for all fall arrest lines and lifelines except safety lines for rope descent systems, which would not make sense. OSHA modifies these regulations very rarely; this is the first change to these regulations since 1971, and further modifications are not expected anytime soon. The language to design horizontal lifeline anchorages and their supports for the loads that develop in the horizontal cable is required to ensure that the anchorage design correctly considers the increases in forces associated with the geometry of the horizontal lifeline.

Examples of boatswain's chairs and how they are used to wash windows and perform routine maintenance on building facades can be found here: https://en.wikipedia.org/wiki/Bosun%27s_chair

Bibliography: https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=9719&p_table=STANDARDS
https://en.wikipedia.org/wiki/Bosun%27s_chair

Cost Impact: The code change proposal will increase the cost of construction

Prior to OSHA's recent changes, it was technically possible (though unwise) to design half of the anchorages used for rope access to resist just the weight of the attached worker and to design the remainder for fall arrest loads of 3,100 pounds x 1.6 load factor. This wasn't done in practice very often, since workers often cannot tell which anchorages were intended for primary support lines and which anchorages were intended for fall arrest purposes. While there is probably some increase in cost associated with the new OSHA requirements, that increase was mandated by OSHA itself as opposed to this particular code change, which is just intended to convert OSHA loads into loads that are compatible with material design standards and can be properly understood and used by structural and mechanical engineers.

Similarly, the requirement to consider the geometry of the horizontal lifeline may result in higher costs for projects where designers had previously (and incorrectly) ignored the increased loads resulting from the geometry of the horizontal lifeline.

Proposal # 1027

S70-19

S71-19

IBC: 1607.13.2, 1607.13.3, 1607.13.3.1

Proponent: Jennifer Goupil, American Society of Civil Engineers (ASCE), representing American Society of Civil Engineers (ASCE) (jgoupil@asce.org)

2018 International Building Code

Revise as follows:

1607.13 Roof loads. The structural supports of roofs and marquees shall be designed to resist wind and, where applicable, snow and earthquake loads, in addition to the dead load of construction and the appropriate live loads as prescribed in this section, or as set forth in Table 1607.1. The live loads acting on a sloping surface shall be assumed to act vertically on the horizontal projection of that surface.

1607.13.1 Distribution of roof loads. Where uniform roof live loads are reduced to less than 20 psf (0.96 kN/m²) in accordance with Section 1607.13.2.1 and are applied to the design of structural members arranged so as to create continuity, the reduced roof live load shall be applied to adjacent spans or to alternate spans, whichever produces the most unfavorable *load effect*. See Section 1607.13.2 for reductions in minimum roof live loads and Section 7.5 of ASCE 7 for partial snow loading.

1607.13.2 General. Reduction in uniform roof live loads. The minimum uniformly distributed live loads of roofs and marquees, L_o , in Table 1607.1 are permitted to be reduced in accordance with Section 1607.13.2.1.

1607.13.2.1 Ordinary roofs, awnings and canopies. Ordinary flat, pitched and curved roofs, and awnings and canopies other than of fabric construction supported by a skeleton structure, are permitted to be designed for a reduced uniformly distributed roof live load, L_r , as specified in the following equations or other controlling combinations of loads as specified in Section 1605, whichever produces the greater *load effect*. In structures such as greenhouses, where special scaffolding is used as a work surface for workers and materials during maintenance and repair operations, a lower roof load than specified in the following equations shall not be used unless *approved* by the *building official*. Such structures shall be designed for a minimum roof live load of 12 psf (0.58 kN/m²).

$$L_r = L_o R_1 R_2 \quad \text{(Equation 16-26)}$$

where: $12 \leq L_r \leq 20$

For SI: $L_r = L_o R_1 R_2$

where: $0.58 \leq L_r \leq 0.96$

L_o = Unreduced roof live load per square foot (m²) of horizontal projection supported by the member (see Table 1607.1).

L_r = Reduced roof live load per square foot (m²) of horizontal projection supported by the member.

The reduction factors R_1 and R_2 shall be determined as follows:

$$R_1 = 1 \text{ for } A_t \leq 200 \text{ square feet (18.58 m}^2\text{)} \quad \text{(Equation 16-27)}$$

$$R_1 = 1.2 - 0.001A_t \text{ for } 200 \text{ square feet} \quad \text{(Equation 16-28)}$$

$< A_t < 600$ square feet

For SI: $1.2 - 0.011A_t$ for 18.58 square meters $< A_t <$
 55.74 square meters

$$R_1 = 0.6 \text{ for } A_t \geq 600 \text{ square feet (55.74 m}^2\text{)} \quad \text{(Equation 16-29)}$$

where:

A_t = Tributary area (span length multiplied by effective width) in square feet (m²) supported by the member, and

$$R_2 = 1 \text{ for } F \leq 4 \quad \text{(Equation 16-30)}$$

$$R_2 = 1.2 - 0.05 F \text{ for } 4 < F < 12 \quad \text{(Equation 16-31)}$$

$$R_2 = 0.6 \text{ for } F \geq 12 \quad \text{(Equation 16-32)}$$

where:

F = For a sloped roof, the number of inches of rise per foot (for SI: $F = 0.12 \times$ slope, with slope expressed as a percentage), or for an arch or dome, the rise-to-span ratio multiplied by 32.

~~1607.13.3~~ **1607.13.2.2 Occupiable roofs.** Areas of roofs that are occupiable, such as *vegetative roofs*, roof gardens or for assembly or other similar purposes, and marquees are permitted to have their uniformly distributed live loads reduced in accordance with Section 1607.11.

~~1607.13.3.1~~ **1607.13.3 Vegetative and landscaped roofs.** The weight of all landscaping materials shall be considered as dead load and shall be computed on the basis of saturation of the soil as determined in accordance with Section 3.1.4 of ASCE 7. The uniform design live load in unoccupied landscaped areas on roofs shall be 20 psf (0.958 kN/m²). The uniform design live load for occupied landscaped areas on roofs shall be determined in accordance with Table ~~1607.1-1607.1~~.

Reason: This proposal is editorial. It is intended to make the outline format of Section 1607.13, which contains requirements related to roof loads, more clear. This proposal also more closely aligns the format of the roof load provisions in the IBC with the format of the referenced design load standard, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7).

The change to the title of Section 1607.13.2 better reflects the content of this section. The title, General, is appropriate for a section when it is the first numbered item after a primary section title, see Sections 1604, 1605, and 1606. It is not well suited as a title when the section is further down the outline list.

Section 1607.13.3 is renumbered to place it as a subsection under the roof live load reduction section as this section only deals with live load reduction.

Section 1607.13.3.1 is renumbered to make it its own subsection under the roof load section. This section is currently placed as a subsection to occupiable roofs, however it contains provisions not related to occupiable roofs (for unoccupied areas on roofs). This section is better suited as a separate subsection under roof loads.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal is editorial to reorganize and clarify the provisions. There is no impact on construction costs.

Proposal # 4121

S71-19

S72-19

IBC@: 1607.13.5.2.1, 1607.13.5.3, 1607.13.5.4

Proponent: Joseph H. Cain, Solar Energy Industries Association (SEIA), representing Solar Energy Industries Association (SEIA)
(JoeCainPE@gmail.com)

2018 International Building Code

Revise as follows:

~~1607.13.5.2.1~~ **1607.13.5.3 Photovoltaic panels installed on open grid roof structures.** Structures with open grid framing and without a roof deck or sheathing supporting photovoltaic panel systems shall be designed to support the uniform and concentrated roof live loads specified in Section 1607.13.5.1, except that the uniform roof live load shall be permitted to be reduced to 12 psf (0.57 kN/m²).

~~1607.13.5.3~~ ~~1607.13.5.4 Photovoltaic panels or modules installed as an independent structure.~~ **Ground-mounted photovoltaic (PV) panel systems.** Solar photovoltaic panels or modules Ground-mounted photovoltaic (PV) panel systems that are independent structures and do not have accessible/occupied space underneath are not required to accommodate a roof photovoltaic live load, provided that the area under the structure is restricted to keep the public away. Other loads and combinations in accordance with Section 1605 shall be accommodated. Solar photovoltaic panels or modules that are designed to be the roof, span to structural supports and have accessible/occupied space underneath shall have the panels or modules and all supporting structures designed to support a roof photovoltaic live load, as defined in Section 1607.13.5.1 in combination with other applicable loads. Solar photovoltaic panels or modules in this application are not permitted to be classified as “not accessible” in accordance with Section 1607.13.5.1.

~~1607.13.5.4~~ **1607.13.5.5 Ballasted photovoltaic panel systems.** Roof structures that provide support for ballasted *photovoltaic panel systems* shall be designed, or analyzed, in accordance with Section 1604.4; checked in accordance with Section 1604.3.6 for deflections; and checked in accordance with Section 1611 for ponding.

Reason: In development of the 2018 IBC, new Section 1607.13.5.2.1 was created to use language similar to ASCE 7-16. As the second paragraph of Section 1607.13.5.3 was intended to state the requirements for the same type of structure, Section 1607.13.5.3 is now redundant and outdated in the 2018 IBC. This proposal strikes out the redundancy second paragraph.

The first paragraph of Section 1607.13.5.3 is intended to state the requirements for ground-mounted PV systems, so is now updated to use that term.

Sections are re-numbered for better flow, such that:

1607.13.5.2 is for rooftop-mounted PV systems

1607.13.5.3 is for overhead structures with open-grid framing (renumbered from 1607.13.5.2.1)

1607.13.5.4 is for ground-mounted PV systems (renumbered from 1607.13.5.3)

1607.13.5.5 is for ballasted rooftop PV systems (renumbered from 1607.13.5.4)

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal clarifies the language, and will not increase or decrease cost of construction.

Proposal # 5679

S72-19

S73-19

IBC®: 1607.14.2

Proponent: Jennifer Goupil, American Society of Civil Engineers (ASCE), representing American Society of Civil Engineers (ASCE) (jgoupil@asce.org)

2018 International Building Code

Revise as follows:

1607.14.2 Vertical impact force. The maximum wheel loads of the crane shall be increased by the following percentages to ~~determine account for the induced effects of vertical impact or vibration force:~~

Monorail cranes (powered)	25 percent
Cab-operated or remotely operated bridge cranes (powered)	25 percent
Pendant-operated bridge cranes (powered)	10 percent
Bridge cranes or monorail cranes with hand-gearred bridge, trolley and hoist	0 percent

Reason: This proposal coordinates the text of the crane vertical impact force requirements in the IBC with the referenced design load standard, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7). This proposal is editorial. It is intended to make the intent of Section 1607.14.2 more clear.

The existing text states that increasing the wheel loads by the given percentage determines the vertical impact or vibration force. However increasing the wheel loads determines the total load, not just the increase. The proposed text, which is taken from ASCE 7, more clearly indicates the purpose and application of this section.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This change is editorial and not intended impact the cost of construction.

Proposal # 4122

S73-19

S74-19

IBC: FIGURE 1608.2

Proponent: Jennifer Goupil, American Society of Civil Engineers (ASCE), representing American Society of Civil Engineers (ASCE) (jgoupil@asce.org)

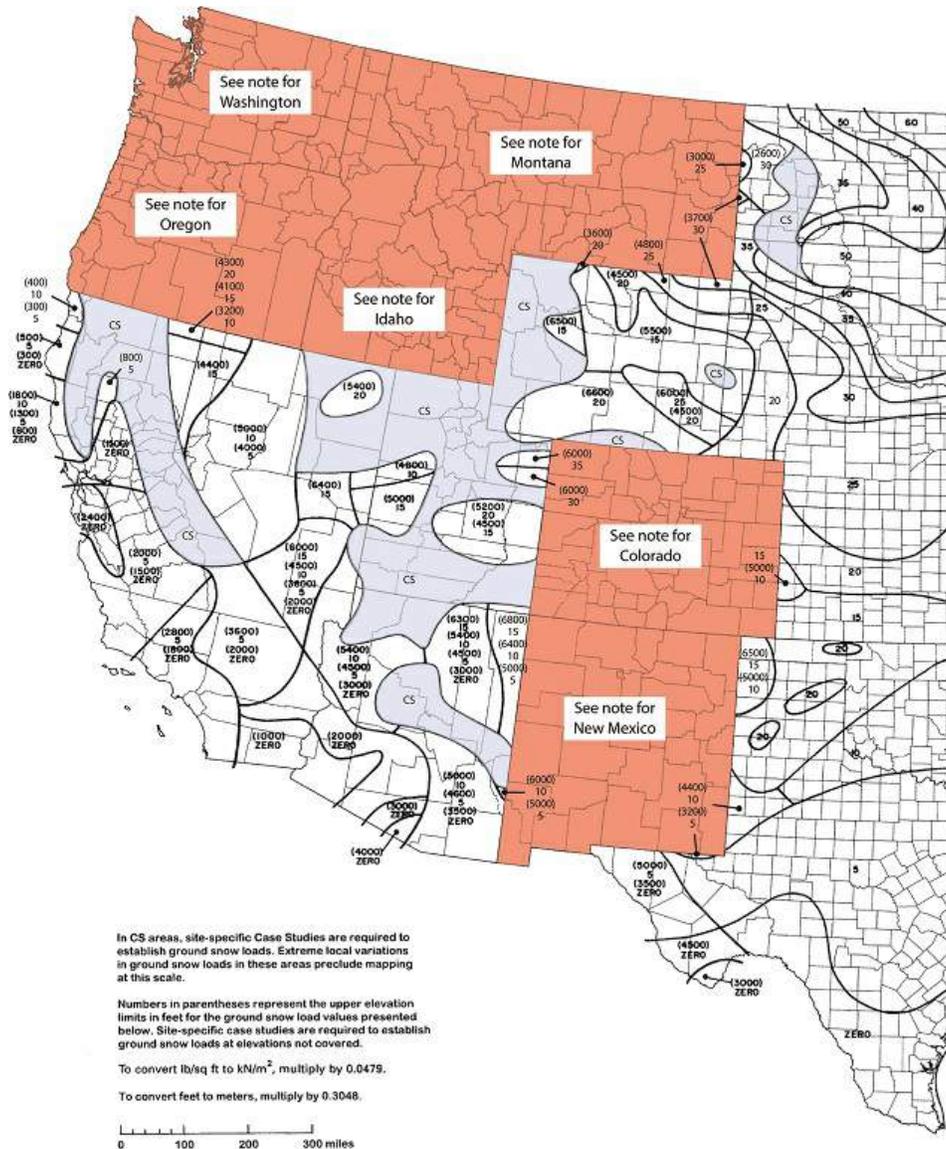
2018 International Building Code

Revise as follows:

SECTION 1608 SNOW LOADS

1608.2 Ground snow loads. The ground snow loads to be used in determining the design snow loads for roofs shall be determined in accordance with ASCE 7 or Figure 1608.2 for the contiguous United States and Table 1608.2 for Alaska. Site-specific case studies shall be made in areas designated "CS" in Figure 1608.2. Ground snow loads for sites at elevations above the limits indicated in Figure 1608.2 and for all sites within the CS areas shall be *approved*. Ground snow load determination for such sites shall be based on an extreme value statistical analysis of data available in the vicinity of the site using a value with a 2-percent annual probability of being exceeded (50-year mean recurrence interval). Snow loads are zero for Hawaii, except in mountainous regions as *approved* by the *building official*.

Delete and substitute as follows:



NOTE: See ASCE 7 Tables 7.2-2 for Colorado; see Table 7.2-3 for Idaho; see Table 7.2-4 for Montana; see Table 7.2-5 for Washington; see Table 7.2-6 for New Mexico; see Table 7.2-7 for Oregon; see Table 7.2-8 for New Hampshire.

FIGURE 1608.2
GROUND SNOW LOADS, p_g, FOR THE UNITED STATES (psf)



In areas, site-specific Case Studies are required to establish ground snow loads. Extreme local variations in ground snow loads in these areas preclude mapping at this scale.

Numbers in parentheses represent the upper elevation limits in feet for the ground snow load values presented below. Site-specific case studies are required to establish ground snow loads at elevations not covered.

To convert lb/sq ft to kNm², multiply by 0.0479.

To convert feet to meters, multiply by 0.3048.

FIGURE 1608.2
GROUND-SNOW LOADS, p_g, FOR THE UNITED STATES (psf)

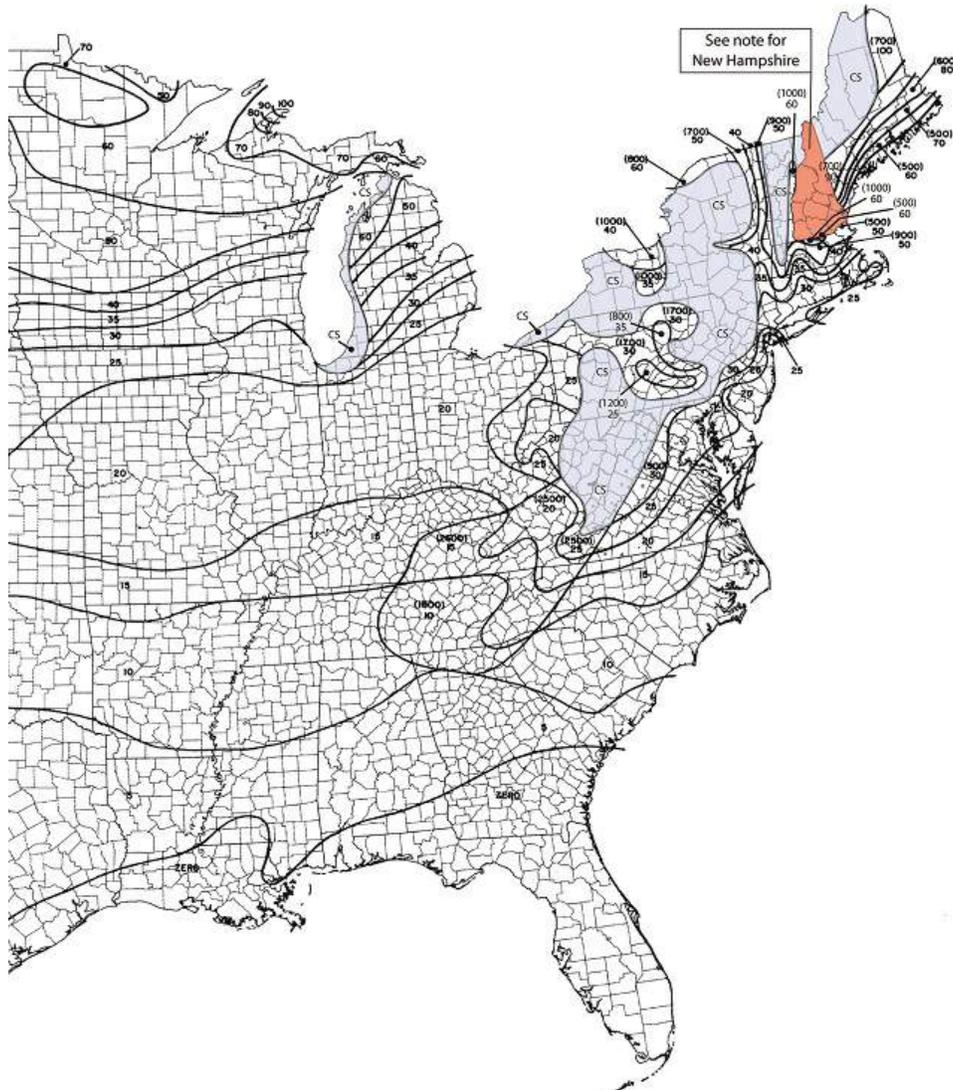


FIGURE 1608.2
GROUND SNOW LOADS, p_g , FOR THE UNITED STATES (psf)

Reason: This proposed change to Section 1608 Snow Loads will harmonize the provision in the IBC with the 2016 edition of the referenced loading standard *ASCE 7 Minimum Design Loads and Associated Criteria For Buildings and Other Structures (ASCE 7-16)*, which is currently the adopted reference standard. This proposal replaces the current Figure 1608.2 with shown map from ASCE 7-16. The 2016 edition of ASCE 7 has included the basic ground snow map that is unchanged from previous editions, with the exception of seven new state ground snow load tables (Colorado, Idaho, Montana, Washington, New Mexico, Oregon and New Hampshire). The new state tables list the ground snow load and elevation for a number of cities or towns in each state. The tables are based on state ground snow reports by regional experts and state structural engineering associations with specialized knowledge in local climatic conditions. The reports were vetted by the ASCE 7 Snow Loads Subcommittee as having been developed followed appropriate and consistent procedures. The revised map indicates which states have supplemental data within the ASCE 7-16 standard.

The new note added in the figure reads. "NOTES: For state tables, see Chapter 7 of ASCE 7; See Table 7.2-2 for Colorado; See Table 7.2-3 for Idaho; See Table 7.2-4 for Montana; See Table 7.2-5 for Washington; See Table 7.2-6 for New Mexico; See Table 7.2-7 for Oregon; See Table 7.2-8 for New Hampshire."

These maps shown are low-resolution per file size limits in cdpAccess; high-resolution images are provided to ICC for printing purposes.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The new ground snow loads included in ASCE 7-16 is the same snow design data currently required by the states. ASCE 7-16 has added it to the standard to become consistent with vetted state requirements. Therefore this data will govern at the state level already and will therefore not impact construction costs.

S75-19

IBC: 1609.1.1, Chapter 35 AASHTO (New)

Proponent: Ray Minor, representing Self (ray.minor@hapco.com); Jay Baumgartner, Valmont Industries, representing Valmont Industries (jay.baumgartner@valmont.com)

2018 International Building Code

Revise as follows:

1609.1.1 Determination of wind loads. Wind loads on every building or structure shall be determined in accordance with Chapters 26 to 30 of ASCE 7. The type of opening protection required, the basic design wind speed, V , and the exposure category for a site is permitted to be determined in accordance with Section 1609 or ASCE 7-7. Wind shall be assumed to come from any horizontal direction and wind pressures shall be assumed to act normal to the surface considered.

Exceptions:

1. Subject to the limitations of Section 1609.1.1.1, the provisions of ICC 600 shall be permitted for applicable Group R-2 and R-3 buildings.
2. Subject to the limitations of Section 1609.1.1.1, residential structures using the provisions of AWC WFCM.
3. Subject to the limitations of Section 1609.1.1.1, residential structures using the provisions of AISI S230.
4. Designs using NAAMM FP 1001.
5. Designs using TIA-222 for antenna-supporting structures and antennas, provided that the horizontal extent of Topographic Category 2 escarpments in Section 2.6.6.2 of TIA-222 shall be 16 times the height of the escarpment.
6. Wind tunnel tests in accordance with ASCE 49 and Sections 31.4 and 31.5 of ASCE 7.
7. Luminaire support structures designed in accordance with AASHTO LTS-6. Athletic field lighting structures taller than 55' shall be designed to meet the 50 year design life wind load and the Fatigue Importance Category I Natural Wind Gust requirements of AASHTO LTS-6.

The wind speeds in Figures 1609.3(1) through 1609.3(8) are basic design wind speeds, V , and shall be converted in accordance with Section 1609.3.1 to *allowable stress design* wind speeds, V_{asdf} , when the provisions of the standards referenced in Exceptions 4, 5 and 7 are used.

Add new standard(s) as follows:

AASHTO

Association of State Highway and
Transportation Officials
4444 North Capitol Street, NW Suite 249
Washington DC 20001
US

LTS-6-2013: Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals

Reason: The AASHTO LTS-6 specification is based on much research and many years of experience in using primarily pole type structures to support signs, luminaires and traffic signals along roadways. These types of structures are also used for many non-roadway applications such as sports lighting and parking lot lighting which may come under the jurisdiction of the IBC. The AASHTO LTS-6 wind pressure calculations are based on ASCE 7. ASCE 7-16 C29.4 states "For the design of structural supports for highway signs, luminaires and traffic signals, see AASHTO LTS-6 (AASHTO 2013)". The AASHTO LTS-6 contains provisions for the fatigue design of structural supports for signs, luminaires and traffic signals that are exclusive to AASHTO. Several athletic field lighting structures that would not meet these fatigue requirements have failed (See Consumer Product Safety Commission link in Bibliography and Stadium Pole Failures file in Attachments). These failures most likely would not have occurred if the poles had been designed to meet the natural wind gust fatigue requirements of the AASHTO LTS-6 specification.

Bibliography: United States Consumer Product Safety Commission report "Recall to Repair: Whitco Company LP Stadium Light Poles Can Fall Over, Posing Risk of Serious Injury and Death" link:

<https://www.cpsc.gov/Recalls/2010/recall-to-repair-whitco-company-lp-stadium-light-poles-can-fall-over-posing-risk-of>

Cost Impact: The code change proposal will increase the cost of construction

The sports lighting poles that failed would not meet the transverse plate minimum thickness requirement of AASHTO LTS-6 Paragraph 5.14.3 which likely contributed to the failures. These poles would be identified as high level luminaire supports in LTS-6 Paragraph 1.4.2 which would require them to be designed for fatigue according to LTS-6 Paragraph 11.3. Fatigue design specifications of LTS-6 Section 11 generally requires heavier poles than designing for maximum wind speed alone.

Staff Analysis: A review of the standard proposed for inclusion in the code, AASHTO LTS-6-2013, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

S76-19

IBC: SECTION 1610, 1610.1, 1610.2(New)

Proponent: Jennifer Goupil, American Society of Civil Engineers (ASCE), representing American Society of Civil Engineers (ASCE) (jgoupil@asce.org)

2018 International Building Code

Revise as follows:

SECTION 1610 SOIL ~~LATERAL~~ LOADS AND HYDROSTATIC PRESSURE

1610.1 ~~General. Lateral pressures.~~ Foundation walls and retaining walls shall be designed to resist lateral soil loads. Soil loads specified in Table 1610.1 shall be used as the minimum design lateral soil loads unless determined otherwise by a geotechnical investigation in accordance with Section 1803. Foundation walls and other walls in which horizontal movement is restricted at the top shall be designed for at-rest pressure. Retaining walls free to move and rotate at the top shall be permitted to be designed for active pressure. Design lateral pressure from surcharge loads shall be added to the lateral earth pressure load. Design lateral pressure shall be increased if soils at the site are expansive. Foundation walls shall be designed to support the weight of the full hydrostatic pressure of undrained backfill unless a drainage system is installed in accordance with Sections 1805.4.2 and 1805.4.3.

Exception: Foundation walls extending not more than 8 feet (2438 mm) below grade and laterally supported at the top by flexible diaphragms shall be permitted to be designed for active pressure.

Add new text as follows:

1610.2 Uplift loads on floor and foundations. Basement floors, slabs on ground, foundations, and similar approximately horizontal elements below grade shall be designed to resist uplift loads where applicable. The upward pressure of water shall be taken as the full hydrostatic pressure applied over the entire area. The hydrostatic load shall be measured from the underside of the construction. The design for upward loads caused by expansive soils shall comply with Section 1808.6.

Reason: This proposal coordinates the IBC with the referenced design load standard, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7) by adding requirements from ASCE 7 to the IBC.

Currently Chapter 16 of the IBC does not address uplift loads, either from hydrostatic pressure or from expansive soils. The addition of these provisions makes it clear that when applicable, the uplift forces shall be included in the design. The text proposed here is taken from Section 3.2.2 of ASCE 7-16 with revisions to account for the fact that the IBC already addresses expansive soil loads in Section 1808.6.

The hydrostatic pressure provision includes the requirement to determine the load based on measuring to the underside of the construction per ASCE 7-16 Section 3.2.2. While this is a relatively basic provision of fluid mechanics, $\text{pressure} = \text{Specific Weight} \times \text{the height of the fluid}$, including this text is intended to prevent the use of floor elevations, top of construction, which are commonly shown on construction drawings.

Cost Impact: The code change proposal will increase the cost of construction. The cost of construction will only increase for those designs which did not previously consider uplift forces.

Proposal # 3841

S76-19

S77-19

IBC®: 1610.1

Proponent: Jennifer Goupil, American Society of Civil Engineers (ASCE), representing American Society of Civil Engineers (ASCE)
(jgoupil@asce.org)

2018 International Building Code

Revise as follows:

1610.1 General. Foundation walls and retaining walls shall be designed to resist lateral soil loads from adjacent soil. Soil loads specified in Table 1610.1 shall be used as the minimum design lateral soil loads unless determined otherwise by a geotechnical investigation in accordance with Section 1803. Foundation walls and other walls in which horizontal movement is restricted at the top shall be designed for at-rest pressure. Retaining walls free to move and rotate at the top shall be permitted to be designed for active pressure. ~~Design lateral~~ Lateral pressure from surcharge loads shall be added to the lateral ~~earth pressure~~ soil load. ~~Design lateral~~ Lateral pressure shall be increased if expansive soils are present at the site ~~are expansive~~. Foundation walls shall be designed to support the weight of the full hydrostatic pressure of undrained backfill unless a drainage system is installed in accordance with Sections 1805.4.2 and 1805.4.3.

Exception: Foundation walls extending not more than 8 feet (2438 mm) below grade and laterally supported at the top by flexible diaphragms shall be permitted to be designed for active pressure.

Reason: This proposal contains editorial changes to the soil lateral load section in the IBC to coordinate the text of the IBC with the referenced design load standard, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7). The proposed changes are editorial and do not change the technical requirements in the IBC. This proposal replaces the word earth with the word soil to be consistent with the term used throughout the section. It also changes the term design lateral pressure to lateral pressure where appropriate, such as when the pressure is being referred to in a general sense.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal contains editorial changes and clarifications.

Proposal # 4952

S77-19

S78-19

IBC: 1610.1.1 (New)

Proponent: Terry Kozlowski, representing Southern Nevada Chapter (kozlowskit@cityofnorthlasvegas.com); Valarie Evans, representing Southern Nevada Chapter; Nenad Mirkovic, representing City of Las Vegas; Amanda Moss, representing SN-ICC Member; Cassidy Wilson, representing SN-ICC Member

2018 International Building Code

1610.1 General. Foundation walls and retaining walls shall be designed to resist lateral soil loads. Soil loads specified in Table 1610.1 shall be used as the minimum design lateral soil loads unless determined otherwise by a geotechnical investigation in accordance with Section 1803. Foundation walls and other walls in which horizontal movement is restricted at the top shall be designed for at-rest pressure. Retaining walls free to move and rotate at the top shall be permitted to be designed for active pressure. Design lateral pressure from surcharge loads shall be added to the lateral earth pressure load. Design lateral pressure shall be increased if soils at the site are expansive. Foundation walls shall be designed to support the weight of the full hydrostatic pressure of undrained backfill unless a drainage system is installed in accordance with Sections 1805.4.2 and 1805.4.3.

Exception: Foundation walls extending not more than 8 feet (2438 mm) below grade and laterally supported at the top by flexible diaphragms shall be permitted to be designed for active pressure.

Add new text as follows:

1610.1.1 Seismic load due to lateral earth pressure. All basement, foundation, and retaining walls shall be designed to resist the seismic load due to the lateral earth pressure based on the following equations.

For yielding walls: $F_{eq} = 3/8 (k_H)$ (backfill soil unit weight) $(H)^2$ (Equation 16-35)

For nonyielding walls: $F_{eq} = (k_H)$ (backfill soil unit weight) $(H)^2$ (Equation 16-36)

Where k_H (peak ground acceleration) = $S_{DS} / 2.5$

H = the height of the backfill behind the wall

F_{eq} = the minimum seismic inducing force

These equations represent the dynamic (seismic) lateral thrust. The point of application of the resultant dynamic thrust is taken at a height of 0.6H above the base of the wall. This is represented as an inverted trapezoidal pressure distribution. These equations apply to level backfill and walls that retain no more than 15 feet.

Reason: An owner/builder or contractor should not make the determination of soil seismic load. Rather than utilizing soil classification, the seismic load due to lateral earth pressure is required to clarify the retaining wall earthquake loading necessary to determine the factor of safety required in section 1807.2.3. Section 1807.2.2 refers to Section 1610 for the design lateral soil loads. This proposal is necessary to determine the soil seismic load when a geotechnical report is not required given Table 1610.1 is not adequate and doesn't address soil seismic load.

There are several theories with respect to seismic accelerations on a retaining wall and the Seed-Whitman method is frequently used. The geotechnical engineer should be allowed to specify the appropriate pressure to be used in the design of the retaining wall based on the site investigation rather than the assumption of at-rest pressure.

Cost Impact: The code change proposal will decrease the cost of construction
By using the equations provided, a geotechnical report may not be required.

Proposal # 4387

S78-19

S79-19

IBC: 1611.1, 1611.2

Proponent: Jennifer Goupil, American Society of Civil Engineers (ASCE), representing American Society of Civil Engineers (ASCE) (jgoupil@asce.org)

2018 International Building Code

SECTION 1611 RAIN LOADS

Revise as follows:

1611.1 Design rain loads. Each portion of a roof shall be designed to sustain the load of rainwater ~~that will accumulate on it if the primary drainage system for that portion is blocked plus the uniform load caused by water that rises above the inlet of the secondary drainage system at its design flow~~ as per the requirements of Chapter 8 of ASCE 7. The design rainfall shall be based on the 100-year hourly rainfall rate indicated in Figure ~~1611.1~~ 15-minute duration event, or on other rainfall rates determined from *approved* local weather data. Alternatively, a design rainfall of twice the 100-year hourly rainfall rate indicated in Figure 1611.1 shall be permitted.

$$R = 5.2(d_s + d_h)$$

(Equation 16-35)

For SI: $R = 0.0098(d_s + d_h)$

where:

d_h = Additional depth of water on the undeflected roof above the inlet of secondary drainage system at its design flow (in other words, the hydraulic head), in inches (mm).

d_s = Depth of water on the undeflected roof up to the inlet of secondary drainage system when the primary drainage system is blocked (in other words, the static head), in inches (mm).

R = Rain load on the undeflected roof, in psf (kN/m²). Where the phrase "undeflected roof" is used, deflections from loads (including dead loads) shall not be considered when determining the amount of rain on the roof.

1611.2 Ponding instability. Susceptible bays of roofs shall be evaluated for ponding instability in accordance with ~~Section 6.4~~ Chapter 7 and Chapter 8 of ASCE 7.

Reason: This proposed changes to Section 1611 will harmonize the provision in the IBC with the currently referenced loading standard ASCE 7-16 Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7).

The proposed changes to secondary (overflow) system design harmonized the roof load design for the structure with the expectations for the design of the roof drainage system. This proposal coordinates the IBC with ASCE 7, which was updated to be consistent with the International Plumbing Code (IPC) provisions. The changes provide a basis for the design mean reoccurrence interval and duration for determining the Hydraulic Head (dh). Currently the IBC requires the calculation of dh; however, the code does not state the design storm (mean reoccurrence interval and duration) for determining the design rain load (depth of water on the undeflected roof) and it has led to some confusion. Typical design values for plumbing systems have been between 15 minute and 60 minutes; the 1995 IPC first used the 100-year/60-minute duration for the design of the primary drainage system and twice the flow rate from the 100-year/60-minute duration storm for the secondary drainage system.

Note that the use of twice the flow rate of the 60-minute duration is close to the design intensity for the 15-minute duration storm. The IPC also used a 15-minute duration rainfall event for the design of roof drainage systems. Therefore, by adding this as an alternative the data within Figure 1611.1 is permitted to be used.

The basis for the use of a 60-minute duration storm is unclear - the critical duration for most roof geometries is closer to 15 minutes. Graber (2009) provides guidance for determining the critical duration and the paper advises against the use of the 60-minute storm for the design of the primary and secondary drainage systems in hopes of handling the critical short-duration rainfall event.

NOTE that ASCE 7 does not provide rainfall data or maps for determining the rainfall rate. The best source currently is the National Oceanic and Atmospheric Administration (NOAA) National Weather Service Precipitation Frequency Data Server - Hydrometeorological Design Studies Center (<http://hdsc.nws.noaa.gov/hdsc/pfds/index.html>) for precipitation intensity (inches per hour) based on the 100-year mean reoccurrence interval.

Graber, S.D. (2009). "Rain loads and flow attenuation on roofs." J. Architectural Eng., 15(3), 91-101.

Cost Impact: The code change proposal will increase the cost of construction

The proposed changes may impact the design of roofs where the secondary (overflow) system was previously based on an unconservative hydraulic head from a lower rainfall intensity. The changes harmonizes the roof load design for the structure with the expectations for the design of the roof drainage system. This proposal coordinates the IBC with the referenced loading standard ASCE 7, which was updated in the 2016 edition to be consistent with the International Plumbing Code provisions for secondary drainage systems.

Proposal # 5170

S79-19

S80-19

IBC®: 1612.4

Proponent: Gregory Wilson, representing Federal Emergency Management Agency (gregory.wilson2@fema.dhs.gov); Rebecca Quinn, RCQuinn Consulting, on behalf of Federal Emergency Management Agency, RCQuinn Consulting, Inc., representing Federal Emergency Management Agency (rcquinn@earthlink.net)

2018 International Building Code

Revise as follows:

1612.4 Flood hazard documentation. The following documentation shall be prepared and sealed by a *registered design professional* and submitted to the *building official*:

1. For construction in *flood hazard areas* other than *coastal high hazard areas* or *coastal A zones*:
 - 1.1. The elevation of the lowest floor, including the basement, as required by the lowest floor elevation inspection in Section 110.3.3 and for the final inspection in Section 110.3.11.1.
 - 1.2. For fully enclosed areas below the design flood elevation where provisions to allow for the automatic entry and exit of floodwaters do not meet the minimum requirements in Section 2.7.2.1 of ASCE 24, *construction documents* shall include a statement that the design will provide for equalization of hydrostatic flood forces in accordance with Section 2.7.2.2 of ASCE 24.
 - 1.3. For dry floodproofed nonresidential buildings, *construction documents* shall include a statement that the dry floodproofing is designed in accordance with ASCE 24 and shall include the flood emergency plan specified in Chapter 6 of ASCE 24.
2. For construction in *coastal high hazard areas* and *coastal A zones*:
 - 2.1. The elevation of the bottom of the lowest horizontal structural member as required by the lowest floor elevation inspection in Section 110.3.3 and for the final inspection in Section 110.3.11.1.
 - 2.2. *Construction documents* shall include a statement that the building is designed in accordance with ASCE 24, including that the pile or column foundation and building or structure to be attached thereto is designed to be anchored to resist flotation, collapse and lateral movement due to the effects of wind and flood loads acting simultaneously on all building components, and other load requirements of Chapter 16.
 - 2.3. For breakaway walls designed to have a resistance of more than 20 psf (0.96 kN/m²) determined using *allowable stress design*, *construction documents* shall include a statement that the breakaway wall is designed in accordance with ASCE 24.

Reason: This proposal emphasizes the requirement for a flood emergency plan consistent with ASCE 24 and makes clear that such a plan, when indicated, is to be submitted with other flood hazard documentation. ASCE 24 requires the submittal and approval of a flood emergency plan where dry floodproofing measures requiring human intervention are used. ASCE 24 requires flood emergency plans to specify the storage location of the shields, the method of installation, conditions activating installation, maintenance of shields and attachment devices, periodic practice of installing shields, testing sump pumps and other drainage measures, and inspecting necessary material and equipment to activate or implement floodproofing. The design professional developing dry floodproofing measures that require human intervention should take into consideration the effort needed to effectively deploy such measures. Preparation of a flood emergency plan ensures that the methods specified by the design professional can be installed and implemented within the given warning time. If a design requires more warning time than reasonably available before the onset of flooding, then the designer should interpret that to mean the contemplated dry floodproofing measures must be redesigned, or that dry floodproofing may not be appropriate for the building. Additionally, maintenance, testing, and inspection are critical to ensuring system performance. The possible inability of owners or occupants to implement dry floodproofing due to lack of preparation or maintenance is regarded as an unacceptable risk.

After Hurricanes Harvey and Irma, FEMA Mitigation Assessment Teams (MATs) observed dry floodproofing measures that failed for a variety of reasons directly related to inadequate deployment or improper maintenance, validating the ASCE 24 requirement. Challenges included systems that required sizeable crews with heavy and specialized equipment to mobilize over a period of several days in advance of the storm to properly install the system. Lack of maintenance of gaskets around doors and flood shields contributed to water intrusion. Lack of inspection and owner/manager awareness of components integral to dry floodproofing meant inadvertent alterations (in one case, a large opening had been cut into a concrete wall to install new utility lines and was not restored to watertight condition). The MATs observed failures and difficulties related to storage (e.g., storage outside where ultraviolet radiation and temperature extremes degrade rubber seals, gaskets, and component identification labels; unsecured storage locations vulnerable to theft and vandalism).

Cost Impact: The code change proposal will not increase or decrease the cost of construction
No additional cost. Flood emergency plans are already required by ASCE 24 when designs for dry floodproofing are prepared.

Proposal # 4330

S80-19

S81-19

IBC®: 1612.4

Proponent: Gregory Wilson, representing Federal Emergency Management Agency (gregory.wilson2@fema.dhs.gov); Rebecca Quinn, RCQuinn Consulting, on behalf of Federal Emergency Management Agency, representing Federal Emergency Management Agency (rcquinn@earthlink.net)

2018 International Building Code

Revise as follows:

1612.4 Flood hazard documentation. The following documentation shall be prepared and sealed by a *registered design professional* and submitted to the *building official*:

1. For construction in *flood hazard areas* other than *coastal high hazard areas* or *coastal A zones*:
 - 1.1. The elevation of the lowest floor, including the basement, as required by the lowest floor elevation inspection in Section 110.3.3 and for the final inspection in Section 110.3.11.1.
 - 1.2. For fully enclosed areas below the design flood elevation where provisions to allow for the automatic entry and exit of floodwaters do not meet the minimum requirements in Section 2.7.2.1 of ASCE 24, *construction documents* shall include a statement that the design will provide for equalization of hydrostatic flood forces in accordance with Section 2.7.2.2 of ASCE 24.
 - 1.3. For dry floodproofed nonresidential buildings, *construction documents* shall include a statement that the dry floodproofing is designed in accordance with ASCE 24.
2. For construction in *coastal high hazard areas* and *coastal A zones*:
 - 2.1. The elevation of the bottom of the lowest horizontal structural member as required by the lowest floor elevation inspection in Section 110.3.3 and for the final inspection in Section 110.3.11.1.
 - 2.2. *Construction documents* shall include a statement that the building is designed in accordance with ASCE 24, including that the pile or column foundation and building or structure to be attached thereto is designed to be anchored to resist flotation, collapse and lateral movement due to the effects of wind and flood loads acting simultaneously on all building components, and other load requirements of Chapter 16.
 - 2.3. For breakaway walls designed to have a resistance of more than 20 psf (0.96 kN/m²) determined using *allowable stress design*, *construction documents* shall include a statement that the breakaway wall is designed in accordance with ASCE 24.
 - 2.4. For breakaway walls where provisions to allow for the automatic entry and exit of floodwaters do not meet the minimum requirements in Section 2.7.2.1 of ASCE 24, *construction documents* shall include a statement that the design will provide for equalization of hydrostatic flood forces in accordance with Section 2.7.2.2 of ASCE 24.

Reason: For construction in flood hazard areas, the 2018 IBC refers to the 2014 edition of ASCE 24, *Flood Resistant Design and Construction*. ASCE 24 requires openings in breakaway walls in all flood hazard areas (as does the IRC, in Section R322.2.2 and R322.3.6). Flood openings may be non-engineered (providing 1 square inch of net open area for each square foot of enclosure area) or engineered. Certification of engineered openings is a requirement of the NFIP (and IRC Section R322.2.2). Currently, Section 1612.4 only requires certification of engineered openings in flood hazard areas other than coastal high hazard areas or coastal A Zones (Item 1 of Section 1612.4).

This proposal specifies that construction documents include certification of engineered openings when used in breakaway walls in coastal high hazard areas and coastal A zones.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
No additional cost because certification of engineered openings has always been required by the NFIP.

Proposal # 4331

S81-19

S82-19

IBC: 1702.1, 1703.1.2, 1703.1.3

Proponent: Gregory Robinson, representing National Council of Structural Engineers Associations (NCSEA) (grobinson@lbyd.com)

2018 International Building Code

Revise as follows:

1702.1 General. New building materials, equipment, appliances, systems or methods of construction not provided for in this code, and any material of questioned suitability proposed for use in the construction of a building or structure, shall be subjected to the tests prescribed in this chapter and in ~~the approved rules~~ Section 104.11 to determine character, quality and limitations of use.

1703.1.2 Equipment. An *approved agency* shall have adequate equipment to perform required tests. The equipment shall be periodically calibrated with a frequency as appropriate to the equipment type and associated industry standard as defined by the building official.

1703.1.3 Personnel. An *approved agency* shall employ experienced personnel educated in conducting, supervising and evaluating tests ~~and special inspections~~ or furnishing inspections services or both.

Reason: The phrase “approved rules” is not defined in Chapter 2 of the IBC; however, the word “approved” is defined. This proposal would utilize the existing code language of Chapter 1 to better define the necessary test for new building materials, equipment, appliances, systems, or methods no currently provided for in the code.

The word “periodically” as used in 1703.1.2 may lead to confusion as that word is most commonly associated with periodic special inspections as used in Chapter 17. Since the intent of 1703.1.2 is to broadly cover various types of equipment, all of which may require calibration at different frequency intervals, the above language is proposed to clarify the code requirements.

Approved agency is defined in Chapter 2 of the IBC, and the definition makes clear that this agency may conduct tests or furnish inspection services. The current version of the code text in 1703.1.3 implies that an approved agency must employ personnel that both perform tests and furnish inspection services, although testing agencies come in various forms, with some performing tests, some furnishing inspection services, and some doing both. With this clarification, the discrepancy between the Chapter 2 definition and the Chapter 17 code language can be resolved.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is a clarification to the code.

Proposal # 4208

S82-19

S83-19

IBC: 1703.1.3.1 (New)

Proponent: Stephen Szoke, American Concrete Institute, representing American Concrete Institute (steve.szoke@concrete.org); Scott Campbell, National Ready Mixed Concrete Association, representing National Ready Mixed Concrete Association (scampbell@nrmca.org)

2018 International Building Code

1703.1.3 Personnel. *An approved agency shall employ experienced personnel educated in conducting, supervising and evaluating tests and special inspections.*

Add new text as follows:

1703.1.3.1 Structural concrete special inspector. Individuals with current credentials demonstrating that the requirements of ACI Concrete Construction Special Inspector or ICC Reinforced Concrete Special Inspector have been satisfied shall be permitted to act as special inspectors for structural concrete construction.

Reason: This code change proposal provides the criteria for personnel to be considered qualified to conduct special inspections of structural concrete. The American Concrete Institute Committee C630 - Construction Inspector Certification has developed a rigorous program to certify individuals as qualified to perform special inspection of concrete construction. This code change proposal does not alter any existing criteria of other individuals qualified as special inspectors, but adds provisions for individuals who are ACI or ICC certified concrete construction special inspectors to be permitted to satisfy the code criteria as special inspectors for concrete construction. This proposal provides the criteria, but does not require individuals to be certified as an ACI Concrete Construction Special Inspector. The ACI requirements are provided in the attached file, cpp-6301-15.pdf, or may be found at: https://www.concrete.org/Portals/0/Files/PDF/cpp_6301-15.pdf.

Jurisdictions are adding these requirements to their codes. As a model code, this requirement should be included in the IBC to assist the jurisdictions in having the language properly incorporated into their respective codes. For example, the Georgia Building Code now includes certified inspectors. See pages 12 through 15 of the attached file, 2014-ibcamendments.pdf.

The American Concrete Institute, as a professional society whose mission includes working to facilitate the use and adoption of current concrete technology to assure the desired performance for the benefit of the public, encourages the committee to approve of this code change as submitted.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The code change allows current practice for selection of individuals or entities to perform special inspection. The change adds qualifications for individuals to assist the building code official in approving such individuals and provides a degree of confidence that special inspections will be properly conducted.

Proposal # 4548

S83-19

S84-19

IBC: 1704.2, 1704.3.1

Proponent: Gregory Robinson, representing National Council of Structural Engineers Associations (NCSEA) (grobins@lbyd.com)

2018 International Building Code

Revise as follows:

1704.2 Special inspections and tests. Where application is made to the *building official* for construction as specified in Section 105, the owner or the owner's authorized agent, other than the contractor, shall employ one or more *approved agencies* to provide *special inspections* and tests during construction on the types of work specified in Section 1705 ~~and identify the *approved agencies* to the *building official*.~~ These *special inspections* and tests are in addition to the inspections by the *building official* that are identified in Section 110.

Exceptions:

1. *Special inspections* and tests are not required for construction of a minor nature or as warranted by conditions in the jurisdiction as *approved* by the *building official*.
2. Unless otherwise required by the *building official*, *special inspections* and tests are not required for Group U occupancies that are accessory to a residential occupancy including, but not limited to, those listed in Section 312.1.
3. *Special inspections* and tests are not required for portions of structures designed and constructed in accordance with the cold-formed steel light-frame construction provisions of Section 2211.1.2 or the conventional light-frame construction provisions of Section 2308.
4. The contractor is permitted to employ the *approved agencies* where the contractor is also the owner.

1704.3.1 Content of statement of special inspections. The statement of *special inspections* shall identify the following:

1. The materials, systems, components and work required to have *special inspections* or tests by the *building official* or by the *registered design professional* responsible for each portion of the work..
2. The type and extent of each *special inspection*..
3. The type and extent of each test..
4. Additional requirements for *special inspections* or tests for seismic or wind resistance as specified in Sections 1705.11, 1705.12 and 1705.13..
5. For each type of *special inspection*, identification as to whether it will be continuous *special inspection*, periodic *special inspection* or performed in accordance with the notation used in the referenced standard where the inspections are defined..
6. The *approved agency* responsible for performing each test and *special inspection*

Reason: This proposal requires that agencies responsible for each test and special inspection be identified within the Statement of Special Inspections documentation.

Identifying the agencies on the Statement of Special Inspections ensures that the registered design professional(s) who prepares the Statement, the permit applicant who submits the Statement, the special inspectors and contractors who refer to the Statement for extent of inspections, the owner who identifies the agencies to be employed, and the building official to whom the Statement is submitted for approval; are all aware of who the inspection agencies will be.

Identifying which agency is responsible for each test or special inspection also makes it easier for the contractor to identify what agency needs to be contacted when work is ready for inspection.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is only a clarification.

Proposal # 4310

S84-19

S85-19

IBC: SECTION 202 (New), 1704.2.1 (New), 1704.2.2 (New), 1704.2.5.1 (New), 1704.2.7.1, 1704.3.1, 1704.4, 1704.5, 1704.6

Proponent: Gregory Robinson, representing National Council of Structural Engineers Associations (NCSEA) (grobins@lbyd.com)

2018 International Building Code

SECTION 202 DEFINITIONS

Add new definition as follows:

QUALITY ASSURANCE COORDINATOR. An agency or individual responsible for coordinating tests, special inspections, approval records, reports and submittals related to the requirements of chapter 17.

1704.2 Special inspections and tests. Where application is made to the *building official* for construction as specified in Section 105, the owner or the owner's authorized agent, other than the contractor, shall employ one or more *approved agencies* to provide *special inspections* and tests during construction on the types of work specified in Section 1705 and identify the *approved agencies* to the *building official*. These *special inspections* and tests are in addition to the inspections by the *building official* that are identified in Section 110.

Exceptions:

1. *Special inspections* and tests are not required for construction of a minor nature or as warranted by conditions in the jurisdiction as *approved by the building official*.
2. Unless otherwise required by the *building official*, *special inspections* and tests are not required for Group U occupancies that are accessory to a residential occupancy including, but not limited to, those listed in Section 312.1.
3. *Special inspections* and tests are not required for portions of structures designed and constructed in accordance with the cold-formed steel light-frame construction provisions of Section 2211.1.2 or the conventional light-frame construction provisions of Section 2308.
4. The contractor is permitted to employ the *approved agencies* where the contractor is also the owner.

Add new text as follows:

1704.2.1 Quality Assurance Coordinator. The owner or the owner's authorized agent shall employ a *Quality Assurance Coordinator* to perform the following administrative tasks:

1. Verify that each of the tests and *special inspections* identified in the statement of special inspections have been completed and that reports identify status of compliance with the construction documents..
2. Verify qualifications of *special inspectors*..
3. Collect approval records per Sections 1703.2 and 1703.3 and reports of tests and special inspections. Submit those records and reports to the building official, the registered design professional responsible for the design, the contractor, and the owner..
4. Maintain a log of discrepancies discovered, including dates that the discrepancy was corrected or otherwise resolved..
5. Report uncorrected discrepancies to the building official and the registered design professional responsible for the design prior to the completion of the applicable phase of work..
6. Coordinate status of approved fabricators with the building official and notify the contractor, the registered design professional responsible for the design, testing agencies, and special inspectors of applicable exemptions from tests and special inspections..
7. Collect contractor's statements of responsibility per Section 1704.4 and submit to the building official..
8. Collect submittals identified in Section 1704.5 and submit to the building official for approval..
9. Collect reports of structural observations and submit those records to the building official..
10. Notify the contractor, the registered design professional responsible for the design, testing agencies, and special inspectors of any submittals that are not approved by the building official..
11. Administer supplemental statements of special inspections prepared by registered design professionals responsible for the design of deferred submittal items per the tasks listed above.

1704.2.2 Quality Assurance Coordinator qualification. The *Quality Assurance Coordinator* shall be independent from the contractor unless the contractor is also the *owner*. The *Quality Assurance Coordinator* is not required to be a registered design professional. The *building official* is permitted to perform the tasks listed in 1704.2.1 and waive the requirement for a *Quality Assurance Coordinator*.

Revise as follows:

~~1704.2.5.1~~ **1704.2.7.1 Fabricator approval.** *Special inspections* during fabrication are not required where the work is done on the premises of a fabricator *approved* to perform such work without *special inspection*. Approval shall be based on review of the fabricator's written fabrication procedures and quality control manuals that provide a basis for control of materials and workmanship, with periodic auditing of fabrication and quality

control practices by an *approved agency* or the *building official*. At completion of fabrication, the *approved fabricator* shall submit a *certificate of compliance* to the ~~owner or the owner's authorized agent~~ Quality Assurance Coordinator for submittal to the *building official* as specified in Section 1704.5 stating that the work was performed in accordance with the *approved construction documents*.

1704.3.1 Content of statement of special inspections. The statement of *special inspections* shall identify the following:

1. The materials, systems, components and work required to have *special inspections* or tests by the *building official* or by the *registered design professional* responsible for each portion of the work.
2. The type and extent of each *special inspection*.
3. The type and extent of each test.
4. Additional requirements for *special inspections* or tests for seismic or wind resistance as specified in Sections 1705.11, 1705.12 and 1705.13.
5. For each type of *special inspection*, identification as to whether it will be continuous *special inspection*, periodic *special inspection* or performed in accordance with the notation used in the referenced standard where the inspections are defined.
6. The Quality Assurance Coordinator.

1704.4 Contractor responsibility. Each contractor responsible for the construction of a main wind- or seismic force-resisting system, designated seismic system or a wind- or seismic force-resisting component listed in the statement of *special inspections* shall submit a written statement of responsibility to the Quality Assurance Coordinator for submittal to the building official ~~and the owner or the owner's authorized agent~~ prior to the commencement of work on the system or component. The contractor's statement of responsibility shall contain acknowledgement of awareness of the special requirements contained in the statement of *special inspections*.

1704.5 Submittals to the building official. In addition to the submittal of reports of *special inspections* and tests in accordance with Section ~~1704.2.4~~, reports and certificates shall be submitted by ~~the owner or the owner's authorized agent~~ Quality Assurance Coordinator to the *building official* for each of the following:

1. *Certificates of compliance* for the fabrication of structural, load-bearing or lateral load-resisting members or assemblies on the premises of an *approved fabricator* in accordance with Section 1704.2.5.1.
2. *Certificates of compliance* for the seismic qualification of nonstructural components, supports and attachments in accordance with Section 1705.13.2.
3. *Certificates of compliance* for *designated seismic systems* in accordance with Section 1705.13.3.
4. Reports of preconstruction tests for shotcrete in accordance with Section 1908.5.
5. *Certificates of compliance* for open web steel joists and joist girders in accordance with Section 2207.5.
6. Reports of material properties verifying compliance with the requirements of AWS D1.4 for weldability as specified in Section 26.6.4 of ACI 318 for reinforcing bars in concrete complying with a standard other than ASTM A706 that are to be welded.
7. Reports of mill tests in accordance with Section 20.2.2.5 of ACI 318 for reinforcing bars complying with ASTM A615 and used to resist earthquake-induced flexural or axial forces in the special moment frames, special structural walls or coupling beams connecting special structural walls of *seismic force-resisting systems* in structures assigned to *Seismic Design Category B, C, D, E or F*.

1704.6 Structural observations. Where required by the provisions of Section 1704.6.1, 1704.6.2 or 1704.6.3, the owner or the owner's authorized agent shall employ a *registered design professional* to perform structural observations. Structural observation does not include or waive the responsibility for the inspections in Section 110 or the *special inspections* in Section 1705 or other sections of this code.

Prior to the commencement of observations, the structural observer shall submit to the Quality Assurance Coordinator for submittal to the building official a written statement identifying the frequency and extent of structural observations.

At the conclusion of the work included in the permit, the structural observer shall submit to the Quality Assurance Coordinator for submittal to the *building official* a written statement that the site visits have been made and identify any reported deficiencies that, to the best of the structural observer's knowledge, have not been resolved.

Reason: This proposal adds a requirement that there be one central point of contact for construction quality assurance related items, similar to the role of the "Registered Design Professional in Responsible Charge" for design related items.

Chapter 17 currently directs submittals to either the building official or the owner. It does not limit the number of statements of special inspection, special inspection agencies, or structural observers. Records and reports can come from numerous sources and it is unlikely that the building official and/or owner will have regular contact with all of those sources. It is logistically difficult for the building official to keep track of all the submittals required by Chapter 17. Defining a role for one agency or individual to track the completion of the specified testing and special inspections, distribute records, and communicate important issues to other project roles ensures that the complete program of tests and inspections is implemented as Chapter 17 intends.

The defined role is purely administrative. It can be performed by any number of entities and doesn't have to be filled by someone who isn't already working on the job. The important thing is that someone is clearly responsible for looking at the whole program, making sure it is completed, and acting as a central point of contact for the approvals, testing, and special inspection scope of Chapter 17.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

An increase in cost of construction should not occur because all of these activities are being performed. This proposal only identifies that person should the Building Official desire.

Proposal # 4312

S85-19

S86-19

IBC®: 1704.2

Proponent: Terry Kozlowski, representing Southern Nevada Chapter; Valarie Evans, representing Southern Nevada Chapter; Nenad Mirkovic, representing City of Las Vegas; Amanda Moss, representing SN-ICC Member; Cassidy Wilson, representing SN-ICC Member

2018 International Building Code

Revise as follows:

1704.2 Special inspections and tests. Where application is made to the *building official* for construction as specified in Section 105, the owner or the owner's authorized agent, other than the contractor, shall employ one or more *approved agencies* to provide *special inspections* and tests during construction on the types of work specified in Section 1705 and identify the *approved agencies* to the *building official*. These *special inspections* and tests are in addition to the inspections by the *building official* that are identified in Section 110.

Exceptions:

1. *Special inspections* and tests are not required for construction of a minor nature or as warranted by conditions in the jurisdiction as *approved* by the *building official*.
2. Unless otherwise required by the *building official*, *special inspections* and tests are not required for detached 1 & 2 family dwellings and Group U occupancies that are accessory to a residential occupancy including occupancy accessory structures, including but not limited to, those listed in Section 312.1.
3. *Special inspections* and tests are not required for portions of structures designed and constructed in accordance with the cold-formed steel light-frame construction provisions of Section 2211.1.2 or the conventional light-frame construction provisions of Section 2308.
4. The contractor is permitted to employ the *approved agencies* where the contractor is also the owner.

Reason: Local inspectors have previously been required to inspect the shear walls and other details needed to resist lateral forces. This proposal will provide the building official with discretion in the application of special inspection requirements for residential construction and would allow the local building inspector to inspect detached 1 & 2 family dwellings and accessory structures.

Cost Impact: The code change proposal will decrease the cost of construction
This proposal will decrease the cost of construction by eliminating the requirement for special inspection.

Proposal # 4390

S86-19

S87-19

BC: 1704.2.6 (New), ACI Chapter 35 (New)

Proponent: Stephen Szoke, American Concrete Institute, representing American Concrete Institute (steve.szoke@concrete.org); Scott Campbell, National Ready Mixed Concrete Association, representing National Ready Mixed Concrete Association (scampbell@nrmca.org)

2018 International Building Code

Add new text as follows:

1704.2.6 Concrete tests. Field and laboratory technicians qualifications shall comply with ACI 311.6.

Add new standard(s) as follows:

ACI

American Concrete Institute
38800 Country Club Drive
Farmington Hills MI 48331

ACI 311.6-18: Specification for Ready Mixed Concrete Testing Services

Reason: Proper sampling, specimen preparation and acceptance testing of concrete delivered to construction projects is crucial for assuring proper performance of structural concrete. Inaccurate test results and the negative implications on the performance of concrete occur far too frequently. When field testing, preparation of samples and laboratory testing are not conducted properly there may be significant expenses and delays added to the cost of construction, such as extracting cores of hardened concrete to verify concrete strength. Improper sampling, preparation and testing often cause project delays, further increasing costs.

On many projects the qualifications for technicians are included in the construction documents. There is a need to assure cast-in-place concrete is properly sampled, prepared and tested. Cast-in-place concrete is one of the few building materials provided to the construction site in a condition other than its final state. Verification of properties should only be performed by qualified individuals.

Local jurisdictions have already begun to address this concern. In 2014 the Georgia Building Code included an amendment to the IBC which added ACI Concrete Field Testing Technician with Grade 1 certification: https://dca.ga.gov/sites/default/files/2014_ibcamendments.pdf. In 2018 the Georgia Building Code included another amendment to the IBC which added American Concrete Institute (ACI) Strength Testing Technician: https://dca.ga.gov/sites/default/files/2018_ibcamendments.pdf. This demonstrates the need to more clearly communicate the necessary qualifications for technicians conduction sampling, specimen preparation and testing of concrete.

ACI, a technical professional society, recommends that the committee approve this code change proposal as submitted to 1) improve the quality assurance processes for structural concrete, 2) reduce project cost increases due to inappropriate sampling, preparation and testing, 3) reduce the frequency of related construction delays, and 4) help assure that the concrete being used in structural elements will provide the life safety and property protection necessary to satisfy the intent of the code.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

There is no cost increase for this code change proposals, as for most projects these requirements are included in the contract documents between the owners, designers, and contractors. This code change proposal helps to assure that these requirements are included for structural concrete.

Staff Analysis: A review of the standard proposed for inclusion in the code, ACI 311.7-18, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 4550

S87-19

S88-19

IBC@: 1704.3.1

Proponent: Gregory Robinson, representing National Council of Structural Engineers Associations (NCSEA) (grobinson@lbyd.com)

2018 International Building Code

Revise as follows:

1704.3.1 Content of statement of special inspections. The statement of *special inspections* shall identify the following:

1. The materials, systems, components and work required to have *special inspections* or tests by the *building official* or by the *registered design professional* responsible for each portion of the work.
2. The type and extent of each *special inspection*.
3. The type and extent of each test.
4. Additional requirements for *special inspections* or tests for seismic or wind resistance as specified in Sections 1705.11, 1705.12 and 1705.13.
5. For each type of *special inspection*, identification as to whether it will be continuous *special inspection*, periodic *special inspection* or performed in accordance with the notation used in the referenced standard where the inspections are defined.
6. Deferred submittals in accordance with section 107.3.4.1 that require a supplemental statement of special inspections to be prepared, including identification of the *registered design professional* to be responsible for the supplemental statement.

Reason: There is often confusion regarding responsibility for preparing a statement of special inspections when the design for a particular scope of design work is deferred to construction. It can lead to portions of the structure not receiving special inspection and arguments about "signing off" on a project because the scope doesn't get identified. This proposal requires that the statement of special inspections that is submitted as a condition for permit approval clearly identifies scope of work which requires a supplemental specification of tests and special inspections, and identifies who is responsible for providing it so that the Building Official (or other party) can follow-up, where necessary.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
No change in work or cost of work is anticipated. This clarifies responsibilities already in the code.

Proposal # 4378

S88-19

S89-19

IBC®: 1704.6

Proponent: Gregory Robinson, representing National Council of Structural Engineers Associations (NCSEA) (grobenson@lbyd.com)

2018 International Building Code

Revise as follows:

1704.6 Structural observations. Where required by the provisions of Section 1704.6.1, 1704.6.2 or 1704.6.3, the ~~owner or the owner's authorized agent shall employ a registered design professional to~~ responsible for structural design, or their designated agent, shall perform structural observations. Structural observation does not include or waive the responsibility for the inspections in Section 110 or the *special inspections* in Section 1705 or other sections of this code.

Prior to the commencement of observations, the structural observer shall submit to the *building official* a written statement identifying the frequency and extent of structural observations.

At the conclusion of the work included in the permit, the structural observer shall submit to the *building official* a written statement that the site visits have been made and identify any reported deficiencies that, to the best of the structural observer's knowledge, have not been resolved.

Reason: The structural observer reviews as-built construction for general conformance to the project design intent. It is best that the registered design professional responsible for the structural design perform structural observations because that professional, usually referred to as the structural Engineer of Record (EOR), is most familiar with the design intent. In the event that the EOR is not able to perform the observations, then the EOR should designate a qualified individual/agency with experience designing projects of similar type and complexity to perform that work in their place.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
For the vast majority of projects, there will be no increase in the cost of construction as structural engineers already perform this task.

Proposal # 4375

S89-19

S90-19

IBC®: 1704.6

Proponent: Gregory Robinson, representing National Council of Structural Engineers Associations (NCSEA) (grobinson@lbyd.com)

2018 International Building Code

Revise as follows:

1704.6 Structural observations. Where required by the provisions of Section 1704.6.1, 1704.6.2 or 1704.6.3, the owner or the owner's authorized agent shall employ a *registered design professional* to perform structural observations. The structural observer shall visually observe representative locations of structural systems, details, and load paths for general conformance to the design intent as defined in the approved construction documents. Structural observation does not include or waive the responsibility for the inspections in Section 110 or the *special inspections* in Section 1705 or other sections of this code.

Prior to the commencement of observations, the structural observer shall submit to the *building official* a written statement identifying the frequency and extent of structural observations.

At the conclusion of the work included in the permit, the structural observer shall submit to the *building official* a written statement that the site visits have been made and identify any reported deficiencies that, to the best of the structural observer's knowledge, have not been resolved.

Reason: The definition of structural observations in Chapter 2 is vague and disconnected from the requirements in Chapter 17. As a result, the various roles that form a comprehensive program of tests and inspections often get confused, and application is inconsistent. Including the proposed description in Chapter 17 provides a clearer understanding of what an observer is expected to "visually" observe - systems, details, and load paths. It is also intended to help address a widespread perception of overlap between special inspections and structural observation. Special inspections are very detailed inspections of smaller components. They require certification and specialized training to perform, but they don't necessarily require an understanding of how systems are designed to function as part of the overall building.

On the other hand, structural observations are broad, general, visual overviews of a bigger picture. Broad knowledge of structural design issues and specific knowledge of their application to the project is necessary, but observations do not strictly adhere to a standard written procedure like special inspections do.

The distinct levels of oversight are complimentary, but intended to address different aspects of quality assurance.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Clarification only. No additional cost is anticipated.

Proposal # 4371

S90-19

S91-19

IBC: 1704.6, 1704.7 (New)

Proponent: Gregory Robinson, representing National Council of Structural Engineers Associations (NCSEA) (grobinson@lbyd.com)

2018 International Building Code

Revise as follows:

1704.6 Structural observations. Where required by the provisions of Section 1704.6.1, 1704.6.2 or 1704.6.3, the owner or the owner's authorized agent shall employ a *registered design professional* to perform structural observations. Structural observation does not include or waive the responsibility for the inspections in Section 110 or the *special inspections* in Section 1705 or other sections of this code.

~~Prior to the commencement of observations, the structural observer shall submit to the *building official* a written statement identifying the frequency and extent of structural observations.~~

~~At the conclusion of the work included in the permit, the structural observer shall submit to the *building official* a written statement that the site visits have been made and identify any reported deficiencies that, to the best of the structural observer's knowledge, have not been resolved.~~

Add new text as follows:

1704.7 Statement of structural observations Where *structural observations* are required by Section 1706, the structural observer shall prepare a statement of structural observations for submittal to the *building official* as a condition for permit issuance. The statement of structural observations shall include the following:

1. Contact information for the structural observer
2. Qualification data for the structural observer if the structural observer is not the *registered design professional* responsible for the structural design
3. The extent of *structural observations*
4. The frequency of *structural observations*

Reason: The proposal requires that when applicable, a plan for structural observations is completed at the same time as the plan for special inspections and submitted simultaneously as a comprehensive program and a condition for a permit. It requires that the observer be identified, and that if the observer is not the RDP responsible for the structural design, that qualification data be submitted to ensure that the observer is familiar with the design of similar projects.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

No tasks are added or eliminated, the overall program of construction quality assurance (tests, inspections, and observations) is just more clearly defined at time of permitting.

Proposal # 4374

S91-19

S92-19

IBC: 1704.6.1, 1704.6.2, 1704.6.3

Proponent: Gregory Robinson, representing National Council of Structural Engineers Associations (NCSEA) (grobinsn@lbyd.com)

2018 International Building Code

Revise as follows:

1704.6.1 Structural observations for structures. Structural observations shall be provided for those structures where one or more of the following conditions exist:

1. The structure is classified as *Risk Category III or IV*.
2. The structure is a *high-rise building*.
3. The structure is assigned to Seismic Design Category E, and is greater than two stories above the grade plane.
- ~~4.~~ Such observation is required by the *registered design professional* responsible for the structural design.
- ~~5.~~ Such observation is specifically required by the *building official*.

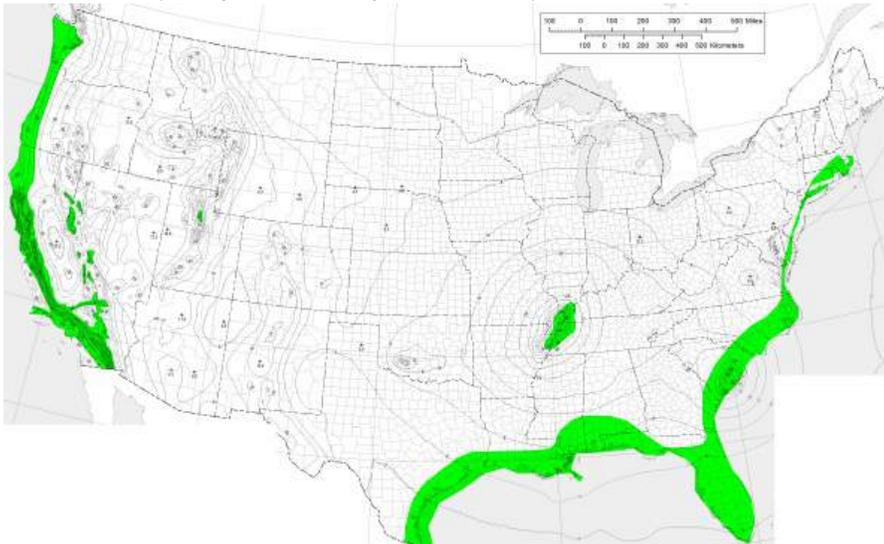
Delete without substitution:

~~**1704.6.2 Structural observations for seismic resistance.** Structural observations shall be provided for those structures assigned to *Seismic Design Category D, E or F* where one or more of the following conditions exist:~~

- ~~1.~~ The structure is classified as *Risk Category III or IV*.
- ~~2.~~ The structure is assigned to *Seismic Design Category E*, is classified as *Risk Category I or II*, and is greater than two stories above the grade plane.

~~**1704.6.3 Structural observations for wind resistance.** Structural observations shall be provided for those structures sited where *V* is 130 mph (58 m/sec) or greater and the structure is classified as *Risk Category III or IV*:~~

Reason: Construction site observations by a structural engineer to verify that as-built construction generally conforms to the structural design intent are currently not required for facilities such as schools, colleges, stadia, arenas, health care facilities, power stations, structures that store hazardous materials, and water treatment facilities in Seismic Design Categories A, B, or C, or with design wind speeds less than 130 mph. In the conterminous United States, structural observations for these types of structures are only typically required in the green shaded areas of the sketch attached below (not adjusted for site-specific site class).



Risk Category III Occupancy is defined in Table 1604.5 and provides several examples of buildings or other structures that represent a substantial hazard to human life in the event of failure. Given the relative risk and hazard, it is appropriate to require that a structural engineer conduct site visits to verify general conformance to the design intent for these types of structures.

Structural Observations are general, visual overviews of structural systems and load paths. Observations for seismic or wind resisting systems and load paths are performed by the same RDP that observes gravity systems and load paths. Lateral force resisting systems and load paths are integrated with gravity force resisting systems, components, and cladding so it makes no sense to differentiate “wind or seismic resistance observations” from “Structural Observations.” The removal of sections 1704.6.2 and 1704.6.3 is a result of lumping the additional scope for SDC E

buildings into 1704.6.1, as those portions then become redundant.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

There will be no increase in construction cost from this proposal. In areas where it is common practice not to pay a registered design professional to make construction site visits, there may be an increase in the cost of associated construction administration services for Risk Category III buildings that aren't in SDC D,E, or F, or a region where Vult = 130mph. The site visit portion of engineering design fees are generally on the order of 0.1% of construction cost. The assurance greatly outweighs the potential cost.

Proposal # 4215

S92-19

S93-19

IBC: 110.7 (New), [BS] 202, 1705.1.1

Proponent: Dennis Richardson, American Wood Council, representing American Wood Council (drichardson@awc.org)

2018 International Building Code

Add new text as follows:

110.7 Pre-fabricated components or assemblies. Construction designed to be fabricated off site shall be permitted by the building official, to be inspected, covered and concealed in accordance with Section 1705.1.1, item 4 and other applicable provisions of Chapter 17.

Revise as follows:

[BS] FABRICATED ITEM. Structural, load-bearing or lateral load-resisting members or assemblies consisting of materials assembled prior to installation in a building or structure, or subjected to operations such as heat treatment, thermal cutting, cold working or reforming after manufacture and prior to installation in a building or structure including appurtenant and enclosing materials. Materials produced in accordance with standards referenced by this code, such as rolled structural steel shapes, steel reinforcing bars, *masonry units* and *wood structural panels*, or in accordance with a referenced standard that provides requirements for quality control done under the supervision of a third-party quality control agency, are not “fabricated items.”

1705.1 General. *Special inspections* and tests of elements and nonstructural components of buildings and structures shall meet the applicable requirements of this section.

1705.1.1 Special cases. *Special inspections* and tests shall be required for proposed work that is, in the opinion of the *building official*, unusual in its nature, such as, but not limited to, the following examples:

1. Construction materials and systems that are alternatives to materials and systems prescribed by this code.
2. Unusual design applications of materials described in this code.
3. Materials and systems required to be installed in accordance with additional manufacturer's instructions that prescribe requirements not contained in this code or in standards referenced by this code.
4. Components and assemblies of building elements fabricated off site where materials or finishes cover, conceal or interfere with required inspections including structural, plumbing, mechanical, electrical, and fire resistance inspections.

Reason: An evolution is occurring where building elements are pre-fabricated in factories and assembled on site in order to improve quality and minimize construction time and site labor. Typically in the past, prefabricated construction takes the form of commercial coaches or modular construction. Many states already have provisions and approval processes to address modular construction.

In addition to modular construction of buildings, individual building elements such as walls, roofs and floors are being prefabricated in off-site factories and incorporated into the construction of the completed building on site. When prefabricated elements contains no finish or other enclosing materials they can be incorporated into the normal rough framing inspection described in IBC Section 110.3.4. That section reads:

A) 110.3.4 Frame inspection. Framing inspections shall be made after the roof deck or sheathing, all framing, fire blocking and bracing are in place and pipes, chimneys and vents to be concealed are complete and the rough electrical, plumbing, heating wires, pipes and ducts are approved.

This on-site framing inspection provision can be applied to both modular construction and pre-fabricated panelized building elements if they are left open such that electrical, plumbing, heating and framing is visible. The proposed provisions would allow components and elements to be inspected, finished, and covered in the factory through the use of special inspections.

Since Chapter 17 already creates the framework whereby an approved agency is qualified and managed in the permit process, this proposal utilizes that successful framework to allow building elements and components to be constructed and finished in the factory.

Cost Impact: The code change proposal will decrease the cost of construction

Because this proposal provides another inspection pathway as an option to the typical practice of leaving all areas open for inspection in the field this change does not increase the cost of construction.

Proposal # 5531

S93-19

S94-19

IBC: 1705.2.4, 1705.5.1, 1705.5.2

Proponent: Gregory Robinson, representing National Council of Structural Engineers Associations (NCSEA) (grobinson@lbyd.com)

2018 International Building Code

Revise as follows:

1705.2.4 Cold-formed steel trusses spanning 60 feet or greater. Where a cold-formed steel truss clear span is 60 feet (18 288 mm) or greater, the special inspector shall periodically inspect to verify that the temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with the *approved* truss submittal package.

1705.5.1 High-load diaphragms. High-load diaphragms designed in accordance with Section 2306.2 shall be installed with *special inspections* as indicated in Section 1704.2. The special inspector shall periodically inspect the wood structural panel sheathing to ascertain whether it is of the grade and thickness shown on the *approved* construction documents. Additionally, the special inspector must periodically verify the nominal size of framing members at adjoining panel edges, the nail or staple diameter and length, the number of fastener lines and that the spacing between fasteners in each line and at edge margins agrees with the *approved construction documents*.

1705.5.2 Metal-plate-connected wood trusses. *Special inspections* of wood trusses with overall heights of 60 inches (1524 mm) or greater shall be performed to periodically inspect and verify that the installation of the permanent individual truss member restraint/bracing has been installed in accordance with the approved truss submittal package. For wood trusses with a clear span of 60 feet (18 288 mm) or greater, the special inspector shall periodically inspect to verify during construction that the temporary installation restraint/bracing is installed in accordance with the approved truss submittal package.

Reason: Special Inspections in Chapter 17 are defined on either a periodic or continuous frequency basis. The above three sections define the required special inspections for cold-formed steel, high-load diaphragms, and wood trusses; however, they do not define a frequency of special inspections. This proposal would correct that missing information to provide greater clarity.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is just a clarification.

Proposal # 4219

S94-19

S95-19

IBC: 1705.3, 1705.3.1, 1705.3.3 (New), TABLE 1705.3, ACI Chapter 35 (New)

Proponent: Stephen Szoke, American Concrete Institute, representing American Concrete Institute (steve.szoke@concrete.org); Scott Campbell, National Ready Mixed Concrete Association, representing National Ready Mixed Concrete Association (scampbell@nrmca.org)

2018 International Building Code

Revise as follows:

1705.3 Concrete construction. *Special inspections* and tests of concrete construction shall be performed in accordance with this section and ~~Table 1705.3~~ ACI 311.7.

Exceptions Exceptions:

1. *Special inspections* and tests shall not be required for:
 - 1.1 ~~1.~~ Isolated spread concrete footings of buildings three stories or less above *grade plane* that are fully supported on earth or rock.
 - 1.2 ~~2.~~ Continuous concrete footings supporting walls of buildings three stories or less above *grade plane* that are fully supported on earth or rock where:
 - 1.2.1 ~~2.1.~~ The footings support walls of light-frame construction.
 - 1.2.2 ~~2.2.~~ The footings are designed in accordance with Table 1809.7.
 - 1.2.3 ~~2.3.~~ The structural design of the footing is based on a specified compressive strength, f'_c , not more than 2,500 pounds per square inch (psi) (17.2 MPa), regardless of the compressive strength specified in the *approved construction documents* or used in the footing construction.
 - 1.3 ~~3.~~ Nonstructural concrete slabs supported directly on the ground, including prestressed slabs on grade, where the effective prestress in the concrete is less than 150 psi (1.03 MPa).
 - 1.4 ~~4.~~ Concrete foundation walls constructed in accordance with Table 1807.1.6.2.
 - 1.5 ~~5.~~ Concrete patios, driveways and sidewalks, on grade. /p>
2. Special inspection for welding reinforcing bars shall be in accordance with section 1705.3.1.
3. Continuous special inspection is required for placement of reinforcing steel for special moment frames, boundary elements of special structural walls, and coupling beams.

1705.3.1 Welding of reinforcing bars. *Special inspection of welding of reinforcing bars* shall be as follows:

1. *Special inspections* of welding and qualifications of special inspectors for reinforcing bars shall be in accordance with the requirements of AWS D1.4 for *special inspection* and of AWS D1.4 for special inspector qualification.
2. Perform continuous special inspection for welding of reinforcing steel for special moment frames, boundary elements of special structural walls, and coupling beams.
3. Perform periodic inspection for all other welds.
4. Verify weldability of reinforcing bars other than ASTM A706

1705.3.2 Material tests. In the absence of sufficient data or documentation providing evidence of conformance to quality standards for materials in Chapters 19 and 20 of ACI 318, the *building official* shall require testing of materials in accordance with the appropriate standards and criteria for the material in Chapters 19 and 20 of ACI 318.

Add new text as follows:

1705.3.3 Post-installed anchors installation. Specific requirements for special inspection of post-installed anchors shall be included in the research report for the anchor issued by an approved source in accordance with Section 5.1 in ACI 311.7, or other qualification procedures. Where specific requirements are not provided, special inspection requirements shall be specified by the registered design professional and shall be approved by the building official prior to the commencement of the work.

Delete without substitution:

**TABLE 1705.3
REQUIRED SPECIAL INSPECTIONS AND TESTS OF CONCRETE CONSTRUCTION**

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION	REFERENCED STANDARD ^a	IBC REFERENCE
1. Inspect reinforcement, including prestressing tendons, and verify placement.	—	×	ACI 318: Ch. 20, 25.2, 25.3, 26.6.1-26.6.3	1908.4

2. Reinforcing bar welding: a. Verify weldability of reinforcing bars other than ASTM A706; b. Inspect single pass fillet welds, maximum $\frac{5}{16}$ " and c. Inspect all other welds.	—	✖ ✖	AWS D1.4 ACI 318: 26.6.4	—
3. Inspect anchors cast in concrete.	—	✖	ACI 318: 17.8.2	—
4. Inspect anchors post installed in hardened concrete members. ^b a. Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads. b. Mechanical anchors and adhesive anchors not defined in 4.a.	✖	✖	ACI 318: 17.8.2.4 ACI 318: 17.8.2	—
5. Verify use of required design mix.	—	✖	ACI 318: Ch. 19, 26.4.3, 26.4.4	1904.1, 1904.2, 1908.2, 1908.3
6. Prior to concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	✖	—	ASTM C172 ASTM C31 ACI 318: 26.5, 26.12	1908.10
7. Inspect concrete and shotcrete placement for proper application techniques.	✖	—	ACI 318: 26.5	1908.6, 1908.7, 1908.8
8. Verify maintenance of specified curing temperature and techniques.	—	✖	ACI 318: 26.5.3-26.5.5	1908.9
9. Inspect prestressed concrete for: a. Application of prestressing forces; and b. Grouting of bonded prestressing tendons.	✖ ✖	—	ACI 318: 26.10	—
10. Inspect erection of precast concrete members.	—	✖	ACI 318: 26.9	—
11. Verify in-situ concrete strength, prior to stressing of tendons in post tensioned concrete and prior to removal of shores and forms from beams and structural slabs.	—	✖	ACI 318: 26.11.2	—
12. Inspect formwork for shape, location and dimensions of the concrete member being formed.	—	✖	ACI 318: 26.11.1.2(b)	—

For SI: 1 inch = 25.4 mm.

- a. Where applicable, see Section 1705.12, Special inspections for seismic resistance.
- b. Specific requirements for special inspection shall be included in the research report for the anchor issued by an approved source in accordance with 17.8.2 in ACI 318, or other qualification procedures. Where specific requirements are not provided, special inspection requirements shall be specified by the registered design professional and shall be approved by the building official prior to the commencement of the work.

Add new standard(s) as follows:

ACI

American Concrete Institute
38800 Country Club Drive
Farmington Hills MI 48331

311.7-18: Specification for Inspection of Concrete Construction

Reason: The list of criteria in the current Code is not as comprehensive as the list required by ACI 318. ACI 311.7 is written to the inspector and complies with the requirements of ACI 318. This code change simplifies this code, references ACI 311.7 on special inspection and removes conflicts with the requirements of ACI 318.

1) ACI 311.7 is added as a reference with modification to language to align 2018 IBC, ACI 318-19, and ACI 311.7 language.

2) Table 1705.3 is deleted to avoid conflicts between Table 1705.3 and ACI 318.

3) As not to lose pertinent information provided in footnote b to the Table 1705.3, new section 1705.3.3 Anchor installation is added and more appropriately references the applicable section of ACI 311.7.

The criteria in the IBC is not as accurate, complete, and extensive as the criteria in ACI 311.7. ACI 311.7 is aligned with ACI 318 more than Table 1705.3. Further Table 1705.3 does not include all the special inspection requirements of ACI 318. The omissions of criteria in ACI 318 suggest that the additional special inspections required by ACI 318 are not necessary. The result is that the lack of the special inspections as identified in ACI 318 could pose life safety issues. Coordinating and maintaining duplicate lists is always challenging and tends to lead to omissions and errors. The solution, as recommended by this code change proposal, is to comply with the requirements of ACI 311.7. If for some reason it is important for the building code officials to have a partial list of the inspection criteria, such as that in the 2018 edition of the IBC, then this abridged list would be more appropriate as commentary to the IBC.

Differences between IBC Table 1705.3 and ACI 311.7 are:

- Item 1 – exception 2 is added to comply with ACI 318-19 for special moment frame, boundary elements of special structural walls, and coupling beams
- Item 2 – necessary language is retained in Section 1705.3.1 for reinforcing steel and to modify provisions of the IBC and ACI 311.7 to comply with ACI 318-19 for special moment frames, boundary elements of special structural walls and coupling beams.
- Item 3 – no difference
- Item 4 – ACI 311.7 includes a reference to ACI 355.4 *Qualification of Post-Installed Adhesive Anchors in Concrete*, a standard that prescribes the qualifications for adhesive anchors. This standard was developed by ACI to fill a void that exists due to the absence of an ASTM Standard on adhesive anchor qualifications. Without this reference there are no requirements for qualifying adhesive anchors. ACI 311.7 also requires compliance with both Sections 17.1.2 and 17.8.2 for mechanical anchors whereas the IBC only requires compliance with 17.8.2. ACI 318 Section 17.1.2 prescribes the minimum age of the concrete for anchoring adhesive anchors to concrete. This is crucial criteria necessary to achieve the performance of the adhesive anchors.
- Item 5 - IBC requires compliance with 26.4.3 of ACI 318, but this section does not provide compliance criteria. Chapter 19 of the IBC requires concrete comply with ACI 318 so this specific reference is not required in the table; and IBC requires compliance with 26.4.4 of ACI 318, however ACI 311.7 provides more specific direction to the use. The compliance requirement appropriate for special inspections are specifically included in ACI 318 Section 26.4.4.1, as cited in ACI 311.7.
- Item 6 - Where the IBC only cites compliance with ASTM C31 and C172, ACI 311.6 Specification for Ready Mixed Concrete Testing Services, referenced in ACI 311.7, also provides for compliance with:
 - C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens,
 - C138 Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete,
 - C143 Standard Test Method for Slump of Hydraulic-Cement Concrete,
 - C173 Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method,
 - C231 Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method,
 - C511 Standard Specification for Mixing Rooms, Moist Cabinets, Moist Rooms, and Water Storage Tanks Used in the Testing of Hydraulic Cements and Concretes, and
 - C1064 Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
- Item 7 – no difference, ACI 311.7 reference more precise.
- Item 8 – no difference.
- Item 9 – ACI 311.7 more precisely identifies the ACI 318 Section for compliance requirements. ACI 311.7, consistent with ACI 318 also includes compliance with ACI 318 Section 26.13.2:
 - (a) Placement of concrete.
 - (b) Tensioning of prestressing steel and grouting of bonded tendons.

(c) Installation of adhesive anchors in horizontal or upwardly inclined orientations to resist sustained tension loads in accordance with 17.8.2.4 and where required as a condition of the anchor assessment in accordance with ACI 355.4.

(d) Reinforcement for special moment frames.

· Item 10 – no difference.

· Item 11 – § ACI 311.7 more precisely identifies the ACI 318 Section for compliance requirements. ACI 311.7, consistent with ACI 318 also includes compliance with ACI 318 Section 26.13.3.3(e): “*Verification of in-place concrete strength before stressing post-tensioned reinforcement and before removal of shores and formwork from beams and structural slabs.*”

· Item 12 – no difference

In addition, ACI 311.7 is written specifically for special inspectors and provides the necessary direction to aid special inspectors determining compliance. ACI 311.7 also includes references to specifications necessary to properly conduct special inspections for specific elements, ACI 355.4 for post-installed anchors and ACI 311.6 for testing of ready-mixed concrete.

This code change avoids confusion for compliance with the intent of both the IBC and ACI 318. It also addresses items omitted from the IBC but required in ACI 318. Proper special inspection should be in accordance with ACI 311.7 and not only the truncated list in the IBC. Without this code change items crucial for life safety could be omitted from special inspection as the IBC criteria supersede the criteria of referenced standards. The omissions in the IBC suggest to the user that the additional criteria of ACI documents are not required.

ACI, a technical professional society, recommends approval of this code change proposal as submitted to avoid confusion and conflicts between the IBC and ACI 318 and to help assure that all items identified as warranting special inspection in ACI 318 are addressed as compliance criteria where special inspection of concrete is required in the IBC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

There is no increase in the initial cost of construction. Design and construction professionals adhering to the requirements of ACI 318, would be complying with these special inspections requirements as proposed herein and required by Chapter 19 of the IBC. Code change avoids confusion for compliance with both the IBC and ACI documents.

Staff Analysis: A review of the standard proposed for inclusion in the code, ACI 311.7-18], with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 4546

S95-19

S96-19

IBC®: TABLE 1705.3

Proponent: Jason Krohn, representing Precast/Prestressed Concrete Institute (jkrohn@pci.org)

2018 International Building Code

Revise as follows:

**TABLE 1705.3
REQUIRED SPECIAL INSPECTIONS AND TESTS OF CONCRETE CONSTRUCTION**

Portions of table not shown remain unchanged.

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION	REFERENCED STANDARD ^a	IBC REFERENCE
1. Inspect reinforcement, including prestressing tendons, and verify placement.	—	X	ACI 318: Ch. 20, 25.2, 25.3, 26.6.1- 26.6.3	1908.4
2. Reinforcing bar welding: a. Verify weldability of reinforcing bars other than ASTM A706; b. Inspect single pass fillet welds, maximum $\frac{5}{16}$" welding of reinforcement for special moment frames, boundary elements of special structural walls, and coupling beams; c. <u>Inspect welded reinforcement splices; and</u> d. <u>Inspect all other welds.</u>	— <u>X</u> <u>X</u> <u>X</u>	X X — = X	AWS D1.4 ACI 318: 26.6.4 <u>13.3</u>	—

For SI: 1 inch = 25.4 mm.

- a. Where applicable, see Section 1705.12, Special inspections for seismic resistance.
- b. Specific requirements for special inspection shall be included in the research report for the anchor issued by an approved source in accordance with 17.8.2 in ACI 318, or other qualification procedures. Where specific requirements are not provided, special inspection requirements shall be specified by the registered design professional and shall be approved by the building official prior to the commencement of the work.

Reason: This proposal seeks to reverse a substantive change made as part of an organizational change in the 2015 IBC by Code Change S148-12. The change is shown below.

**TABLE 1705.2.2
REQUIRED VERIFICATION AND INSPECTION OF STEEL CONSTRUCTION OTHER THAN
STRUCTURAL STEEL**

VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC	REFERENCED STANDARD ^a
1. Material verification of cold-formed steel deck:			
a. Identification markings to conform to ASTM standards specified in the approved construction documents.	—	X	Applicable ASTM material standards
b. Manufacturers' certified test reports.	—	X	
2. Inspection of welding:			
a. Cold-formed steel deck			
1. Floor and roof deck welds		X	AWS D1.3
b. Reinforcing steel bars:			
1. Verification of weldability of reinforcing steel bars other than ASTM A 706.	—	X	AWS D1.4 ACI 318 Section 3.5.2
2. Reinforcing steel resisting flexural and axial forces in intermediate and special moment frames, and boundary elements of special structural walls of concrete and shear reinforcement.	X	—	
3. Shear reinforcement.	X	—	
4. Other reinforcing steel.	—	X	
2. Single-pass fillet welds, maximum 5/16"		X	
3. All other welds	X		

For SI: 1 inch = 25.4 mm.

a. Where applicable, see also Section 1705.11, Special inspection for seismic resistance.

The Committee's reason for approving this code change as submitted was: "This code change simplifies the special inspections for steel by removing requirements for reinforcing bars that don't belong under steel." This reason obviously is strictly organizational.

We believe that tying the extent of special inspection of reinforcing bars (continuous or periodic) to the function of those bars (reinforcement for special moment frames, boundary elements of special structural walls, and coupling beams) is logical. Continuous special inspection can then be mandated for welds, the failure of which is liable to have serious, even catastrophic, consequences. The logic behind mandating special inspection for all welds other than those of a particular type (and even there only up to a maximum size) is, on the other hand, difficult to see. The exception provided almost never applies. Fillet welds are used only at the ends of reinforcing bars, to connect them to plates; those welds are done at the shop using an automated welding process. Otherwise, the welds used on reinforcing bars are flare bevel groove welds or full penetration butt welds. Thus the 2015 IBC change represented an unnecessary expansion of special inspection requirements that did not result in any apparent benefit.

Modifications to the items requiring inspection have been made in ACI 318-19 Section 26.13.3. ACI 318 has determined that continuous special inspection of welding of reinforcement for intermediate moment frames is unnecessary. It has also determined that continuous special inspection of shear reinforcement is necessary only for special moment frames, boundary elements of special structural walls, and coupling beams. These determinations are reflected in this submitted code change.

Cost Impact: The code change proposal will decrease the cost of construction

The cost of precast concrete construction, where welding of reinforcing bars is not uncommon, should decrease modestly through elimination of unnecessary continuous special inspection in many cases.

Proposal # 5041

S96-19

S97-19

IBC®: TABLE 1705.3, ACI Chapter 35 (New)

Proponent: Jason Krohn, representing Precast/Prestressed Concrete Institute (jkrohn@pci.org)

2018 International Building Code

Revise as follows:

**TABLE 1705.3
REQUIRED SPECIAL INSPECTIONS AND TESTS OF CONCRETE CONSTRUCTION**

Portions of table not shown remain unchanged.

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION	REFERENCED STANDARD ^a	IBC REFERENCE
10. Inspect erection of precast concrete members.	—	X	ACI 318: 26.9	—
11. For precast concrete diaphragm connections or reinforcement at joints classified as moderate or high deformability elements (MDE or HDE) in structures assigned to Seismic Design Category C, D, E, or F, inspect such connections and reinforcement in the field for: a. Installation of the embedded parts b. Completion of the continuity of reinforcement across joints. c. Completion of connections in the field.	X	=	ACI 318: 26.13.1.3 ACI 550.5	=
12. Inspect installation tolerances of precast concrete diaphragm connections for compliance with ACI 550.5.	=	X	ACI 318:26.13.1.3	=
11-13. 13. Verify in-situ concrete strength, prior to stress-ing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs.	—	X	ACI 318: 26.11.2	—
12-14. 14. Inspect formwork for shape, location and dimensions of the concrete member being formed.	—	X	ACI 318: 26.11.1.2(b)	—

For SI: 1 inch = 25.4 mm.

- a. Where applicable, see Section 1705.12, Special inspections for seismic resistance.
- b. Specific requirements for special inspection shall be included in the research report for the anchor issued by an approved source in accordance with 17.8.2 in ACI 318, or other qualification procedures. Where specific requirements are not provided, special inspection requirements shall be specified by the registered design professional and shall be approved by the building official prior to the commencement of the work.

Add new standard(s) as follows:

ACI

American Concrete Institute
38800 Country Club Drive
Farmington Hills MI 48331

550.5-18: Code Requirements for the Design of Precast Concrete Diaphragms for Earthquake Motions

Reason: ACI 318-19 has new provisions for the design of precast concrete diaphragms in Section 18.12.11. Such diaphragms are required to comply with the requirements of ACI 550.5. ACI 550.5 has special inspection requirements for “precast concrete diaphragm connections or reinforcement at joints classified as high deformability elements (HDE), installation of the embedded parts and completion of the continuity of reinforcement across joints, and completion of connections in the field” ... in structures assigned to SDC C, D, E and F. ACI 318-19 Section 26.13.1.3 has special inspection requirements for “concrete placement and reinforcement for ... precast concrete diaphragms assigned to SDC C, D, E, or F using moderate or high-deformability connections.” The proposed Item 11 added to Table 1705.3 is a conservative synthesis of the two requirements. ACI 318-19 Section 26.13.1.3 also requires that “Installation tolerances of precast concrete diaphragm connections shall be inspected for compliance with ACI 550.5.” The proposed Item 12 added to Table 1705.3 mirrors this requirement.

Cost Impact: The code change proposal will increase the cost of construction
The proposed inspection requirements will slightly increase the cost of construction but are needed for safety.

Staff Analysis: A review of the standard proposed for inclusion in the code, ACI 550.5-18, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 5044

S97-19

S98-19

IBC®: 1705.4

Proponent: Terry Kozlowski, representing Southern Nevada Chapter; Amanda Moss, representing SN-ICC Member; Cassidy Wilson, representing SN-ICC Member; Valarie Evans

2018 International Building Code

Revise as follows:

1705.4 Masonry construction. *Special inspections* and tests of masonry construction shall be performed in accordance with the quality assurance program requirements of TMS 402 and TMS 602.

Exception: Special inspections and tests shall not be required for:

1. Empirically designed masonry, glass unit masonry or masonry veneer designed in accordance with Section 2109, 2110 or Chapter 14, respectively, where they are part of a structure classified as *Risk Category* I, II or III.
2. Masonry foundation walls constructed in accordance with Table 1807.1.6.3(1), 1807.1.6.3(2), 1807.1.6.3(3) or 1807.1.6.3(4).
3. Masonry fireplaces, masonry heaters or masonry chimneys installed or constructed in accordance with Section 2111, 2112 or 2113, respectively.
4. Masonry fences less than or equal to 8'-0" in height, retaining walls less than or equal to 6'-0" in height and combined masonry fences and retaining walls less than or equal to 14'-0" in overall height with the fence portion less than or equal to 8'-0" in height provided that the walls are designed in accordance with Chapter 2 of TMS 402-16 with allowable stresses for masonry reduced by one-half and f'm does not exceed 1500 psi. Wall heights shall be measured from the top of footing to the top of wall.

Reason: This proposal, eliminating the need for an additional inspection, has been utilized and evaluated in Southern Nevada for several years without any adverse structural and/or safety-related issues.

Cost Impact: The code change proposal will decrease the cost of construction Regionally, this has resulted in reduced design, permitting, construction and inspection time frames and reduced construction costs.

Proposal # 4393

S98-19

S99-19

IBC®: 1705.4.1

Proponent: Phillip Samblanet, The Masonry Society, representing The Masonry Society (psamblanet@masonrysociety.org); Jason Thompson, National Concrete Masonry Association, representing National Concrete Masonry Association (jthompson@ncma.org)

2018 International Building Code

Revise as follows:

1705.4.1 ~~Empirically designed masonry, glass~~ Glass unit masonry and masonry veneer in Risk Category IV. *Special inspections* and tests for ~~empirically designed masonry~~, glass unit masonry or masonry veneer designed in accordance with Section ~~2109~~, 2110 or Chapter 14, respectively, where they are part of a structure classified as *Risk Category IV* shall be performed in accordance with TMS 402, Level B Quality Assurance.

Reason: This is an editorial clean-up item. TMS 402, Section A.1.2.4 (empirical design of masonry) specifically prohibits the use of empirical design in structures assigned to Risk Category IV. IBC Section 2019 addresses empirically designed adobe and imposed the limits of TMS 402, Section A.1.2 on adobe systems. As such, via TMS 402 Section A.1.2.4 adobe systems are prohibited in Risk Category IV structures. Therefore, including empirically designed masonry in Section 1705.4.1 is not needed, because it cannot be used for Risk Category IV.

Bibliography: None

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is an editorial change to coordinate the requirements between IBC Chapter 17 and IBC Chapter 21.

Proposal # 4384

S99-19

S100-19

IBC: 1705.5.3 (New), TABLE 1705.5.3 (New)

Proponent: Stephen DiGiovanni, representing ICC Ad Hoc Committee on Tall Wood Buildings (TWB) (TWB@iccsafe.org)

2018 International Building Code

Add new text as follows:

1705.5.3 Mass timber construction. Special inspections of Mass Timber elements in Types IV-A, IV-B and IV-C construction shall be in accordance with Table 1705.5.3.

TABLE 1705.5.3
REQUIRED SPECIAL INSPECTIONS OF MASS TIMBER CONSTRUCTION

<u>Type</u>	<u>Continuous Special Inspection</u>	<u>Periodic Special Inspection</u>
<u>1. Inspection of anchorage and connections of mass timber construction to timber deep foundation systems.</u>		X
<u>2. Inspect erection of mass timber construction</u>		X
<u>3. Inspection of connections where installation methods are required to meet design loads</u>		
<u>3.1. Threaded fasteners</u>		
<u>3.1.1. Verify use of proper installation equipment.</u>		X
<u>3.1.2. Verify use of pre-drilled holes where required.</u>		X
<u>3.1.3. Inspect screws, including diameter, length, head type, spacing, installation angle, and depth.</u>		X
<u>3.2. Adhesive anchors installed in horizontal or upwardly inclined orientation to resist sustained tension loads</u>	X	
<u>3.3. Adhesive anchors not defined in 3.2.</u>		X
<u>3.4. Bolted connections</u>		X
<u>3.5. Concealed connections</u>		X

Reason: This proposal adds special inspection provisions to Section 1705 for mass timber. This new and unique type of construction requires a level of inspection consistent with other large buildings and unique applications where milestone inspections by the jurisdictional inspectors are not rigorous enough to ensure a level of quality control or quality assurance of the construction process. The proposed special inspections are similar to what is required for other prefabricated systems such as pre-cast concrete and structural steel.

Special Inspection is the monitoring of materials, installation, fabrication, erection and placement of components and connections that require special expertise that are critical to the integrity of the building structure. The special inspectors are required to ensure compliance with the approved construction documents and referenced standards. The program allows jurisdictions to have access to highly specialized and trained inspectors. Some special inspection activities require construction activities to be continuously inspected; which would be logistically difficult for a typical building inspection program. Special inspection is a vital part of the compliance path for successful and compliant building projects constructed under the International Building Code.

The specific elements requiring special inspection are:

1. Periodic inspection of the connection of mass timber elements to wood foundation elements. These connections are critical to transfer loads from the mass timber elements to the piles, particularly for lateral loading. The connections to concrete foundations are addressed in Table 1705.3, Item #3.
2. Periodic inspection of erection of mass timber elements. Similar to pre-cast concrete (Table 1705.3, Item #10), tall wood buildings utilizing pre-fabricated elements needs to have verification that the correct elements are placed in the right location in accordance with the design drawings.
3. Inspection of specialized connections.

Connections between mass timber products that utilized threaded, bolted, or concealed connections are considered periodic in a similar manner that concrete special inspections are required in Table 1705.3. The strength of many connection designs is predicated on specific screw lengths and installation angles. Bolted connections require specific diameters, and for lag bolts, specific lengths. Concealed connectors, many of which are proprietary, must be installed correctly for structural performance. Most of these cannot be verified by the jurisdictional inspector, so special inspections are required.

Adhesive anchorage installed in horizontal or upwardly inclined positions resisting tension loads shall be continuously inspected, again similar to Table 1705.3, Item 4a. This is required because of issues with creep of the adhesives under long-term tension loading discussed in previous code change cycles. However, once again similar to the requirements for precast concrete, all other adhesive anchors need only be inspected periodically (ref. Table 1705.3, Item 4b).

If there are other unusual items not covered in the proposed table, the existing text in Section 1705.1.1 gives the building official the authority to require special inspections for those unusual items. The same section also says the building official can require special inspections where manufacturers' installation instructions prescribe requirements not contained in the code. For example, field-glued mass timber beam or panel splices, while currently rare in North America, may become more prevalent in the future. This is not an item that is covered in the proposed Table 1705.5. While the AHC-TWB is not aware of any of those types of splices that are not currently proprietary, Section 1705.1.1 would allow the building official to require special inspections for either proprietary or non-proprietary field-glued splices. Note that many design engineers will also specify the need for special inspections for unusual conditions in their structural notes in the construction documents, or in the statement of special inspections (see Sections 1704.2.3 and 1704.3).

No changes are being proposed to address fabrication of mass timber structural elements. Mass timber structural assembled in a fabricator shop should be addressed by sections 1704.2.5 and 1704.2.5.1 of the current codes regarding fabrication

The Ad Hoc Committee for Tall Wood Buildings (AHC-TWB) was created by the ICC Board of Directors to explore the building science of tall wood buildings with the scope to investigate the feasibility of and take action on developing code changes for these buildings. Members of the AHC-TWB were appointed by the ICC Board of Directors. Since its creation in January, 2016, the AHC-TWB has held 8 open meetings and numerous Work Group conference calls. Four Work Groups were established to address over 80 issues and concerns and review over 60 code proposals for consideration by the AHC-TWB. Members of the Work Groups included AHC-TWB members and other interested parties. Related documentation and reports are posted on the AHC-TWB website at <https://www.iccsafe.org/codes-tech-support/cs/icc-ad-hoc-committee-on-tall-wood-buildings/>.

Cost Impact: The code change proposal will increase the cost of construction

Since all the code proposals related to Mass Timber products are to address new types of building construction, in theory this will not increase the cost of construction, but rather provides design options not currently provided for in the code. The committee took great care to not change the requirements of the pre-existing construction types, and our changes do not increase the cost of construction using those pre-existing construction types. However, based on a typically residential or office building of typical floor plates an estimate of Special Inspection costs would range from \$1,000 to \$2,000 per floor. Another approach to the cost of special inspection is a percentage of total construction costs; for typical pre-fabricated construction elements the cost of special inspection can range between 0.15% to 0.30%, depending on labor cost and complexities of the construction in the building. These estimates are based on responses to surveys of special inspection agencies in the Seattle and Las Vegas areas.

Proposal # 4364

S100-19

S101-19

IBC: 1705.5, 1705.5.1 (New), TABLE 1705.5.1 (New), 1705.5.2 (New), 1705.5.3.1, 1705.5.3.2, 2304.10.1 (New)

Proponent: Stephen Skalko, representing self (svskalko@svskalko-pe.com); Jason Thompson, representing National Concrete Masonry Association (jthompson@ncma.org); Jason Krohn, Precast/Prestressed Concrete Institute, representing Precast/Prestressed Concrete Institute (jkrohn@pci.org); Amy Trygestad, representing Concrete Reinforcing Steel Institute (atrygestad@crsi.org); Jonathan Humble, American Iron and Steel Institute, representing American Iron and Steel Institute (jhumble@steel.org); Scott Campbell, representing National Ready Mixed Concrete Association (scampbell@nrmca.org); Larry Williams, Steel Framing Industry Association, representing Steel Framing Industry Association (williams@steelframingassociation.org)

2018 International Building Code

SECTION 1705 REQUIRED SPECIAL INSPECTIONS AND TESTS

Revise as follows:

1705.5 Wood construction. *Special inspections* of prefabricated wood structural elements and assemblies shall be in accordance with Section 1704.2.5. Sections 1705.5.1 and 1705.5.2 or 1705.5.3. ~~*Special inspections* of site-built assemblies shall be in accordance with this section~~

Add new text as follows:

1705.5.1 Mass Timber Construction. *Special Inspections* of mass timber elements in Types IV-A, IV-B and IV-C construction shall be in accordance with Table 1705.5.1

**TABLE 1705.5.1
Required Special Inspection of Mass Timber Construction**

<u>Type</u>	<u>Continuous</u>	<u>Periodic</u>
	<u>Special</u> <u>Inspection</u>	<u>Special</u> <u>Inspection</u>
1. Inspection of anchorage and connections of mass timber construction to timber deep foundation systems		X
2. Inspect erection of mass timber construction		X
3. Inspection of connections where installation methods are required to meet design loads		
a) Threaded fasteners		
1. Verify use of proper installation equipment.		X
2. Verify use of pre-drilled holes where required.	X	
3. Inspect screws, including diameter, length, head type, spacing, installation angle, and depth.	X	
b). Adhesive anchors installed in horizontal or upwardly inclined orientation to resist sustained tension loads	X	
c). Adhesive anchors not defined in 3.b.	X	
d). Bolted connections		X
e. Concealed connections	X	
4. Inspection of connections where installation methods are required to meet the fire resistance design in 2304.10.1.	X	

1705.5.2 Prefabricated wood construction *Special inspections* of prefabricated wood structural elements and assemblies shall be in accordance with Section 1704.2.5.

1705.5.3 Sitebuilt wood construction *Special inspections* of sitebuilt assemblies shall be in accordance with this section.

Revise as follows:

~~1705.5.4~~ **1705.5.3.1 High-load diaphragms.** High-load diaphragms designed in accordance with Section 2306.2 shall be installed with *special inspections* as indicated in Section 1704.2. The special inspector shall inspect the wood structural panel sheathing to ascertain whether it is of the grade and thickness shown on the *approved* construction documents. Additionally, the special inspector must verify the nominal size of framing members at adjoining panel edges, the nail or staple diameter and length, the number of fastener lines and that the spacing between fasteners in

each line and at edge margins agrees with the *approved construction documents*.

~~1705.5.2~~ **1705.5.3.2 Metal-plate-connected wood trusses.** *Special inspections* of wood trusses with overall heights of 60 inches (1524 mm) or greater shall be performed to verify that the installation of the permanent individual truss member restraint/bracing has been installed in accordance with the approved truss submittal package. For wood trusses with a clear span of 60 feet (18 288 mm) or greater, the special inspector shall verify during construction that the temporary installation restraint/bracing is installed in accordance with the approved truss submittal package.

SECTION 2304 GENERAL CONSTRUCTION REQUIREMENTS

2304.10 Connectors and fasteners. Connectors and fasteners shall comply with the applicable provisions of Sections 2304.10.1 through 2304.10.7.

Add new text as follows:

2304.10.1 Connection fire resistance. Fire resistance ratings for connections in Type IV-A, IV-B, or IV-C construction shall be determined by one of the following.

1. Testing in accordance with Section 703.2 where the connection is part of the fire resistance test.
2. Engineering analysis that demonstrates that the temperature rise at any portion of the connection is limited to an average temperature rise of 250°F (139°C), and a maximum temperature rise of 325°F (181°C), for a time corresponding to the required fire resistance rating of the structural element being connected. For the purposes of this analysis, the connection includes connectors, fasteners, and portions of wood members included in the structural design of the connection.

Reason: This proposal adds special inspection provisions to Section 1705 for mass timber. Mass timber is a new construction type, and contractors and inspectors have no experience working with this system. Due to the importance of connections in the performance of mass timber systems, and the inexperience of all involved parties, a level of inspection beyond that required of other construction methods is required, until such a time as both contractors and inspectors have gained the necessary practical knowledge of the systems and their construction. Thus, the special inspections proposed are greater than what is required for similar systems such as pre-cast concrete and structural steel in certain critical areas. This is consistent with the intentions of Section 1705.5.1 where special inspections are intended for unusual design applications of materials included in the code, or where adherence to manufacturer's instructions not specified in the code is required.

The specific elements requiring special inspection are:

(1) Periodic inspection of the connection of mass timber elements to wood foundation elements. These connections are critical to transfer loads from the mass timber elements to the piles, particularly for lateral loading. The connections to concrete foundations are addressed in Table 1705.3, Item #3.

(2) Periodic inspection of erection of mass timber elements. Tall wood buildings utilizing pre-fabricated elements need to have verification that the correct elements are placed in the right location in accordance with the design drawings.

(3) Inspection of specialized connections.

- Connections between mass timber products that utilized threaded, adhesive, or concealed connections are considered continuous. The strength of many connection designs is predicated on pre-drilling, specific screw lengths and installation angles. Most of these cannot be verified by the jurisdictional inspector, or after installation, so continuous special inspections are required. Similarly, use of the correct materials and installation procedures cannot be verified for concealed connections, and proper installation is required for structural performance, requiring continuous special inspection. Adhesive anchorage installed in horizontal or upwardly inclined positions resisting tension loads shall be continuously inspected, similar to Table 1705.3, Item 4a. This is required because of issues with creep of the adhesives under long-term tension loading discussed in previous code change cycles.
- Bolted connections require specific diameters, and for lag bolts, specific lengths. Correct bolt usage and installation are required for structural performance, and hence periodic special inspection is required.

(4) Inspection of fire-resistant design connections. During fire testing connections have proven to be critical to the behavior of mass timber assemblies. Since the fire rated connection designs in mass timber often require specific applications of cover material, embedded depth of connectors, etc., to perform adequately, continuous special inspection is indicated to preserve the integrity of the system. This is especially important where engineered design analysis may be the method used for determining the fire resistance of the mass timber connections.

The CLT Handbook available for designers raises some of these concerns [CLT Cross-Laminated Timber Handbook US Edition, 2013]. In Chapter 8, Fire, Section 5 Connections the handbook states:

Due to the high thermal conductivity of steel, metallic fasteners and plates directly exposed to fire may heat up and conduct heat into the wood members. The wood components may then experience charring on the exposed surface and around the fastener. As a result, the capacity of the metallic connection is reduced to the strength reduction of the steel fasteners at elevated temperatures and

the charring of the wood members. Therefore, where a fire resistance rating is required by the IBC, connections and fasteners are required to be protected from fire exposure by wood, gypsum board or other protection approved for the required rating.

While the protection cited may increase the fire endurance of the metallic portions of the connections, the connection elements will still be subjected to elevated temperatures during a fire event.

A technical research report on connections for tall wood buildings prepared for the National Research Council of Canada reported that the fire resistance for concealed connections may be on the order of 1 to 1-1/2 hours [Canadian Commission on Building and Fire Codes, Standing Committee on Fire Protection, *Review of Fire Resistant Design of Connections*, January 2017, page 8]. The report conclusion suggests that some extra overlay of wood may be necessary for the 2-hour and 3-hour fire resistance of mass timber provisions proposed by the ICC TWB Committee. This is not to suggest that 2-hour fire or 3-hour resistances of connections cannot be achieved, but that connections must be given extra attention and standard methods for the industry may not be sufficient. This extra attention is what is intended through the requirement for continuous special inspection being proposed.

Besides adding the special inspection table this proposed change also modifies Section 1705.5 to clarify that prefabricated wood structural members and sitebuilt wood members assembled in the field are not exempt from the requirements for special inspection. The original wording in the code to refer the user to Section 1704.2.5 for prefabricated wood assemblies and to Sections 1705.5.1 & 1705.5.2 for sitebuilt wood assemblies is still maintained but these sections have been renumbered based on new 1705.5.1.

Finally, this proposal adds Section 2304.10.1 to specify how the fire resistance rating of connections for the Types IV-A, IV-B and IV-C construction is to be determined. This language is consistent with the language proposed by the Tall Wood Ad-Hoc Committee. It is included in this proposal because it is referenced in Table 1705.5.1 and should not be considered as a separate code proposal.

Cost Impact: The code change proposal will increase the cost of construction

The code proposals for mass timber address a new types of construction in the IBC. In theory this will not increase the cost of construction instead providing design alternatives in the code. However, because of the newness of mass timber as a method of construction there will be some additional costs to provide special inspections to insure the code is met.

Proposal # 5577

S101-19

S102-19

IBC: 1705.6, TABLE 1705.6, TABLE 1705.7, TABLE 1705.8

Proponent: Gregory Robinson, representing National Council of Structural Engineers Associations (NCSEA) (grobinson@lbyd.com)

2018 International Building Code

Revise as follows:

1705.6 Soils. *Special inspections* and tests of existing site soil conditions, fill placement and load-bearing requirements shall be performed in accordance with this section and Table 1705.6. The *approved* geotechnical report and the *construction documents* prepared by the *registered design professionals* shall be used to determine compliance. ~~During fill placement, the special inspector shall verify that proper materials and procedures are used in accordance with the provisions of the approved geotechnical report.~~

Exception: Where Section 1803 does not require reporting of materials and procedures for fill placement, the special inspector shall verify that the in-place dry density of the compacted fill is not less than 90 percent of the maximum dry density at optimum moisture content determined in accordance with ASTM D1557.

**TABLE 1705.6
REQUIRED SPECIAL INSPECTIONS AND TESTS OF SOILS**

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION
1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	—	X
2. Verify excavations are extended to proper depth and have reached proper material.	—	X
3. Perform classification and testing of compacted fill materials.	—	X
4. During fill placement, verify use of proper materials and procedures in accordance with the provisions of the approved geotechnical report. Verify densities and lift thicknesses during placement and compaction of compacted fill.	X	—
5. Prior to placement of compacted fill, inspect subgrade and verify that site has been pre-prepared properly.	—	X

**TABLE 1705.7
REQUIRED SPECIAL INSPECTIONS AND TESTS OF DRIVEN DEEP FOUNDATION ELEMENTS**

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION
1. Verify element materials, sizes and lengths comply with the requirements.	X	—
2. Determine capacities of test elements and conduct additional load tests, as required.	X	—
3. Inspect driving operations and maintain complete and accurate records for each element.	X	—
4. Verify placement locations and plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and butt elevations and document any damage to foundation element.	X	—
5. For steel elements, perform additional special inspections in accordance with Section 1705.2.	<u>In accordance with 1705.2</u>	
6. For concrete elements and concrete-filled elements, perform tests and additional special inspections in accordance with Section 1705.3.	<u>In accordance with 1705.3</u>	
7. For specialty elements, perform additional inspections as defined in the statement of special inspections.	<u>In accordance with Statement of Special Inspections</u>	

Revise as follows:

**TABLE 1705.8
REQUIRED SPECIAL INSPECTIONS AND TESTS OF CAST-IN-PLACE DEEP FOUNDATION ELEMENTS**

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION
1. Inspect drilling operations and maintain complete and accurate records for each element.	X	—
2. Verify placement locations and plumbness, confirm element diameters, bell diameters (if applicable), lengths, embedment into bedrock (if applicable) and adequate end-bearing strata capacity. Record concrete or grout volumes.	X	—
3. For concrete elements, perform tests and additional special inspections in accordance with Section 1705.3.	<u>In accordance with 1705.3</u>	

Reason: The last sentence of Section 1705.6 overlaps with item 4 of Table 1705.6. For clarity, relocating this provision to Table 1705.6 is proposed so that all required inspections and tests can be contained in one table location.

Items 5 to 7 of Table 1705.7 contain only hyphens under the headings of Continuous or Periodic Special Inspection, which may mislead users to feel that no special inspections are required for these items. By making the proposed change herein, it becomes clear that for these three items the user must refer to other code Sections or project team members to define the required special inspections. Similar proposal for Item 3 of Table 1705.8.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal is for clarification.

Proposal # 4210

S102-19

S103-19

IBC: 1705.10 (New), ASTM Chapter 35 (New)

Proponent: Dale Biggers, P.E. GeoCoalition, representing GeoCoalition (dbiggers@bohbro.com); Daniel Stevenson, P.E., representing GeoCoalition (dstevenson@berkelapg.com); Lori Simpson, Langan, representing GeoCoalition (lsimpson@langan.com)

2018 International Building Code

Add new text as follows:

1705.10 Structural Integrity of Deep Foundation Elements. When directed by the registered design professional in responsible charge or by the building official, an engineering assessment for structural integrity shall be conducted a deep foundation element. The engineering assessment shall include tests for defects performed in accordance with ASTM D4945, ASTM D5882, ASTM D6760, or ASTM D7949 or other approved method.

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken PA 19428-2959

D5882-16: Standard Test Method for Low Strain Impact Integrity Testing of Deep Foundations

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken PA 19428-2959

D6760-16: Standard Test Method for Integrity Testing of Concrete Deep Foundations by Ultrasonic Crosshole Testing

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken PA 19428-2959

D7949-14: Standard Test Methods for Thermal Integrity Profiling of Concrete Deep Foundations

Reason: Significant defects affect the structural strength of the deep foundation elements, and therefore need to be detected and corrected prior to further construction to prevent foundation failures.

· When the integrity of a deep foundation element is in doubt (e.g. due to the installation records, due to difficult soil conditions, or to approve the construction procedures) the deep foundation element should be tested during installation to assure no material defects.

· Sections 1705.7, 1705.8 and 1705.9 already address visual inspections. The tests in this new proposed section provide a means to assess portions of deep foundation elements that cannot be visually inspected.

· Most foundation failures are caused by inadequate geotechnical capacity. This proposed section addresses the other possible failure mode – namely lack of structural integrity.

· Use of “other approved method” allows for possible methods not yet known or standardized which the building official has confidence in.

ASTM D4945 is “Standard Test Method for High-Strain Dynamic Testing of Deep Foundations”

ASTM D5882 is “Standard Test Method for Low Strain Impact Integrity Testing of Deep Foundations”

ASTM D6760 is “Standard Test Method for Integrity Testing of Concrete Deep Foundations by Ultrasonic Crosshole Testing”

ASTM D7949 is “Standard Test Methods for Thermal Integrity Profiling of Concrete Deep Foundations”

(all methods above are non-destructive tests used to assess the integrity of deep foundations)

This proposal is presented for your consideration by the GeoCoalition .

The GeoCoalition is a consortium of of eight trade and professional associations and our active group includes 37 geotechnical engineers, structural engineers, and specialty contractors from across the country.

To access the GeoCoalition roster,

please see : <http://piledrivers.org/geocoalition-members/>

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposal may increase or decrease the cost of construction, depending on whether the tests disprove or prove the ability of the questionable foundation element to withstand the required loads. Assuring the foundation element has no structural defects will avoid subsequent substantial remediation costs for foundations that would have failed due to undetected defects, and thus produce overall savings to the project.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM D5882-16, D6760-16 and D7949-14, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 4978

S103-19

S104-19

IBC®: 1705.11

Proponent: Don Scott, representing Representing National Council of Structural Engineers Association (dscott@pcs-structural.com)

2018 International Building Code

Revise as follows:

1705.11 Special inspections for wind resistance. *Special inspections* for wind resistance specified in Sections 1705.11.1 through 1705.11.3, unless exempted by the exceptions to Section 1704.2, are required for buildings and structures constructed in the following areas:

1. In wind Exposure Category B, where V_{ref} ~~as determined in accordance with Section 1609.3.1 is 120~~ is 150 miles per hour (~~52.8~~ 67 m/sec) or greater.
2. In wind Exposure Category C or D, where V_{ref} ~~as determined in accordance with Section 1609.3.1 is 110~~ is 140 mph (~~49~~ 62.6 m/sec) or greater.

Reason: This is an editorial change to reference the wind speed triggers to the Chapter 16 mapped basic design wind speed, V for consistency with other section of this chapter. Currently the user would be required to convert the mapped basic design wind speed to V_{asd} . Thus the change in wind speed indicated is a conversion from the previous V_{asd} values to V .

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This is an editorial change to reference the wind speed triggers to the Chapter 16 mapped basic design wind speed, V for consistency with other section of this chapter. Currently the user would be required to convert the mapped basic design wind speed to V_{asd} . Thus the change in wind speed indicated is a conversion from the previous V_{asd} values to V .

Proposal # 4756

S104-19

S105-19

IBC@: 1705.11.1, 1705.11.2, 1705.12.2, 1705.12.3

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Building Code

Revise as follows:

1705.11.1 Structural wood. *Continuous special inspection* is required during field gluing operations of elements of the main windforce-resisting system. *Periodic special inspection* is required for nailing, bolting, anchoring and other fastening of elements of the main windforce-resisting system, including wood shear walls, wood diaphragms, drag struts, braces and hold-downs.

Exception: *Special inspections* are not required for wood shear walls, shear panels and diaphragms, including nailing, bolting, anchoring and other fastening to other elements of the main windforce-resisting system, where the lateral resistance is provided by structural sheathing and the specified fastener spacing at panel edges is more than 4 inches (102 mm) on center.

1705.11.2 Cold-formed steel light-frame construction. *Periodic special inspection* is required for welding operations of elements of the main windforce-resisting system. *Periodic special inspection* is required for screw attachment, bolting, anchoring and other fastening of elements of the main windforce-resisting system, including shear walls, braces, diaphragms, collectors (drag struts) and hold-downs.

Exception: *Special inspections* are not required for cold-formed steel light-frame shear walls and diaphragms, including screwing, bolting, anchoring and other fastening to components of the windforce resisting system, where either of the following applies:

1. The sheathing is gypsum board or fiberboard.
2. The sheathing is wood structural panel or steel sheets on only one side of the shear wall, shear panel or diaphragm assembly and the specified fastener spacing of at the sheathing panel or sheet edges is more than 4 inches (102 mm) on center (o.c.).

1705.12.2 Structural wood. For the *seismic force-resisting systems* of structures assigned to *Seismic Design Category C, D, E or F*:

1. *Continuous special inspection* shall be required during field gluing operations of elements of the seismic force-resisting system.
2. *Periodic special inspection* shall be required for nailing, bolting, anchoring and other fastening of elements of the seismic force-resisting system, including wood shear walls, wood diaphragms, drag struts, braces, shear panels and hold-downs.

Exception: *Special inspections* are not required for wood shear walls, shear panels and diaphragms, including nailing, bolting, anchoring and other fastening to other elements of the seismic force-resisting system, where the lateral resistance is provided by structural sheathing, and the fastener spacing of at the sheathing panel edges is more than 4 inches (102 mm) on center.

1705.12.3 Cold-formed steel light-frame construction. For the *seismic force-resisting systems* of structures assigned to *Seismic Design Category C, D, E or F*, periodic special inspection shall be required for both:

1. Welding operations of elements of the seismic force-resisting system.
2. Screw attachment, bolting, anchoring and other fastening of elements of the seismic force-resisting system, including shear walls, braces, diaphragms, collectors (drag struts) and hold-downs.

Exception: *Special inspections* are not required for cold-formed steel light-frame shear walls and diaphragms, including screw installation, bolting, anchoring and other fastening to components of the seismic force-resisting system, where either of the following applies:

1. The sheathing is gypsum board or fiberboard.
2. The sheathing is wood structural panel or steel sheets on only one side of the shear wall, shear panel or diaphragm assembly and the specified fastener spacing of the sheathing at the panel or sheet edge is more than 4 inches (102 mm) on center.

Reason: The primary purpose of this proposal is to clarify the intent of the exceptions from special inspection of wood diaphragms and shear walls in high-seismic and high wind areas. The original exception was intended to apply to buildings of light-frame construction where wood studs or joists are sheathed with a variety of structural sheathing materials (e.g. oriented-strand board, plywood, or gypsum board) to form the diaphragm, and where the capacity of shear walls, panels, and diaphragms for resisting wind and seismic loads is defined in the American Wood Council's Special Design Provisions for Wind and Seismic (AWC SDPWS). The exceptions should apply to shear walls, shear panels and diaphragms constructed with traditional 2x dimensional lumber or equivalent products (e.g. I-joists or LVL's) and structural sheathing, or nail-laminated or dowel laminated diaphragms with sheathing, but not to lateral force-resisting systems relying solely on mass timber products for lateral resistance.

In evaluating special inspection requirements for mass timber buildings, the ICC Ad-Hoc Committee on Tall Wood Buildings did not feel the exception should apply unless a mass timber building relied on a separate layer of wood structural panel sheathing or other sheathing to provide lateral load resistance. However, since this issue is not specific to tall mass timber buildings, the TWB determined that proposing changes to the exception was out of its scope, and referred the issue to the BCAC for review and modification as needed.

Similar exceptions to those for special inspection of wood diaphragms and wood shear walls on wood buildings are provided for wood structural panel or steel sheet diaphragms on cold-formed steel buildings. The same clarifications that the fastener spacing is the specified fastener spacing based on the structural engineer's design and tabulated diaphragm and shear wall capacities in the material design standards and that the fastening in question is that at panel edges (or sheet edges for diaphragms and shear walls sheathed with steel sheet) are made for the corresponding wind and seismic special inspections for cold-formed steel buildings.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/building-code-action-committee-bcac/>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The code change does not change the application of the two exceptions to diaphragms and shear walls using sheathing materials currently permitted by the code via the reference to the AWC SDPWS. Thus, there is no cost increase for light-frame buildings that currently qualify for the exception. Mass timber buildings not already permitted under existing limits on Type IV construction must go through an alternate means and methods process to gain approval. The work of the AHC-TWB to gain code recognition for tall wood buildings will reduce the cost of construction for such buildings as they will not require special approval procedures. The corresponding clarifications for cold-formed steel buildings do not change the intended application of those exceptions.

Proposal # 4126

S105-19

S106-19

IBC@: 1705.11.1, 1705.12.2

Proponent: Stephen Skalko, self, representing self (svskalko@svskalko-pe.com)

2018 International Building Code

Revise as follows:

1705.11.1 Structural wood. *Continuous special inspection* is required during field gluing operations of elements of the main windforce-resisting system. *Periodic special inspection* is required for nailing, bolting, anchoring and other fastening of elements of the main windforce-resisting system, including wood shear walls, wood diaphragms, drag struts, braces and hold-downs.

Exception: *Special inspections* are not required for light-frame wood shear walls, shear panels and diaphragms, including nailing, bolting, anchoring and other fastening to other elements of the main windforce-resisting system, where the specified fastener spacing at panel edges is more than 4 inches (102 mm) on center.

1705.12.2 Structural wood. For the *seismic force-resisting systems* of structures assigned to *Seismic Design Category C, D, E or F*:

1. *Continuous special inspection* shall be required during field gluing operations of elements of the seismic force-resisting system.
2. *Periodic special inspection* shall be required for nailing, bolting, anchoring and other fastening of elements of the seismic force-resisting system, including wood shear walls, wood diaphragms, drag struts, braces, shear panels and hold-downs.

Exception: *Special inspections* are not required for light-frame wood shear walls, shear panels and diaphragms, including nailing, bolting, anchoring and other fastening to other elements of the seismic force-resisting system, where the fastener spacing of the sheathing is more than 4 inches (102 mm) on center.

Reason: The term "light-frame" is added to the exceptions in Sections 1705.11.1 and 1705.12.2 to make clear the special inspection exemption only applies to light wood frame assemblies and not assemblies of mass timber such as CLT panels that may be serving as shear walls, shear panels or diaphragms.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The code change is a clarification of the code and should not have an impact on construction costs.

Proposal # 5654

S106-19

S107-19

IBC: 1705.12.7, TABLE 1705.12.7 (New), 2209.3 (New), MHI Chapter 35(New)

Proponent: Paul Douglas Armstrong, PACCS, representing MHI

2018 International Building Code

Delete and substitute as follows:

~~**1705.12.7 Storage racks.** *Periodic special inspection* is required for the anchorage of storage racks that are 8 feet (2438 mm) or greater in height in structures assigned to *Seismic Design Category D, E or F.*~~

1705.12.7 Storage racks. If required by the Engineer of Record storage racks that are 8 feet in height or greater and assigned to Seismic Design Category D, E, or F shall be inspected by an inspector designated by the Engineer of Record as detailed in Table 1705.12.7 for adherence with the approved construction documents.

Add new text as follows:

TABLE 1705.12.7
Required Inspections of Storage Rack Systems

Type	Continuous Inspection	Periodic Inspection	Referenced Standard	IBC Reference
<u>Verify materials used comply with one or more of the material test reports in accordance with the approved construction documents</u>	—	X	—	—
<u>Fabricated storage rack elements</u>	—	X	—	1704.2.5
<u>Installation of storage rack anchorage</u>	—	X	MH16.1 Section 7.3.2	—
<u>If required by the Engineer of Record, a final inspection of the completed storage rack system for compliance with the Load Application and Rack Configuration documents</u>	—	X	—	—

2209.3 Certification For Storage Structures 8 feet in height or greater to the top load level and assigned to Seismic Design Category D, E, or F, if required by the Engineer of Record, at completion of the storage rack installation, the Engineer of Record shall submit a *certificate of compliance* to the owner or the owner's authorized agent stating that the work was performed in accordance with *approved construction documents* and with specifications listed in this section.

MHI

Material Handling Institute
8720 Red Oak Blvd. Suite 201
Charlotte NC 28217

MH16.1: 2012: Specification for the Design, Testing and Utilization of Industrial Steel Storage Racks

Reason: The design of the components that go into the storage rack are based upon minimum thickness, minimum yield strength, etc. and it is imperative that these minimum properties are complied with in the fabrication of the components and included in storage rack installations. Storage rack systems can be complex and it is important that they how they are installed complies with the permitted drawings on file with the local building department, which is why they may need to be monitored.

Cost Impact: The code change proposal will increase the cost of construction
In high seismic areas budgets will need to include this required set of inspections for installations of storage rack structures.

Staff Analysis: A review of the standard proposed for inclusion in the code, MHI MH16.1: 2012, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 5144

S107-19

S108-19

IBC@: 1709.5, AAMA Chapter 35 (New)

Proponent: Jennifer Hatfield, representing American Architectural Manufacturers Association (jen@jhatfieldandassociates.com)

2018 International Building Code

Revise as follows:

1709.5 Exterior window and door assemblies. The design pressure rating of exterior windows and doors in buildings shall be determined in accordance with Section 1709.5.1 or 1709.5.2. For exterior windows and doors tested in accordance with Sections 1709.5.1 or 1709.5.2, required design wind pressures determined from ASCE 7 shall be permitted to be converted to allowable stress design by multiplying by 0.6.

Exception: Structural wind load design pressures for window ~~units smaller or door assemblies other~~ than the size tested in accordance with Section 1709.5.1 or 1709.5.2 shall be permitted to be ~~higher different~~ than the design value of the tested ~~unit assembly~~ provided such ~~higher~~ pressures are determined by accepted engineering ~~analysis analysis~~ or validated by an additional test of the window or door assembly to the alternative allowable design pressure in accordance with Section 1709.5.2. Components of the ~~small unit alternate size assembly~~ shall be the same as the tested ~~unit~~. ~~Where such calculated design pressures are or labeled assembly. Where engineering analysis is used, they it shall be validated by an additional test of the window unit having the highest allowable design pressure. performed in accordance with the analysis procedures of AAMA 2502.~~

Add new standard(s) as follows:

AAMA

American Architectural Manufacturers
Association
1827 Waldon Office Square, Suite 550
Schaumburg IL 60173

2502--2019: Comparative Analysis Procedure for Window and Door Products

Reason: The current exception limits the use of comparative analysis to window units smaller than the size originally tested. If comparative analysis is used to provide a higher design pressure rating of the smaller unit, it must be verified by testing of the unit as well. Additional testing should not be required if accepted engineering analysis is used.

It is also appropriate to use comparative analysis to rate window units larger than the size originally tested to lower design pressures. Testing should not be required to verify this level of performance since a higher pressure level has already been determined by testing of the same components in a smaller window unit and accepted engineering analysis is used.

This proposal revises this section as appropriate to permit the use of comparative analysis for larger as well as smaller window units than those tested. The last sentence of the section is also revised to define accepted engineering analysis as that which is specified and performed in accordance with the analysis procedures of AAMA 2502, a reference standard being added by this proposal that provides a standardized comparative analysis procedure for determining the structural integrity of window and door products.

The proposal also replaces the term "unit" with the word "assembly," as the term "assemblies" is used in the title of section 1709.5 and is the appropriate terminology that is reflected in AAMA 2502.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The code change will not increase the cost of construction but rather it simply permits the use of comparative analysis for larger assemblies.

Staff Analysis: A review of the standard proposed for inclusion in the code, AAMA 2502-2019, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 4486

S108-19

S109-19

IBC: 1709.5.2, 1709.5.2.1 (New)

Proponent: T. Eric Stafford, representing Insurance Institute for Business and Home Safety (testafford@charter.net)

2018 International Building Code

Revise as follows:

1709.5.2 Exterior windows and door assemblies not provided for in Section 1709.5.1. Exterior window and door assemblies shall be tested in accordance with ASTM E330. ~~Structural performance of garage doors and rolling doors shall be determined in accordance with either ASTM E330 or ANSI/DASMA 108, and shall meet the acceptance criteria of ANSI/DASMA 108.~~ Exterior window and door assemblies containing glass shall comply with Section 2403. The design pressure for testing shall be calculated in accordance with Chapter 16. Each assembly shall be tested for 10 seconds at a load equal to 1.5 times the design pressure.

Add new text as follows:

1709.5.2.1 Garage doors and rolling doors. Garage doors and rolling doors shall be tested in accordance with either ASTM E 330 or ANSI/DASMA 108, and shall meet the acceptance criteria of ANSI/DASMA 108. Garage doors and rolling doors shall have a permanent label identifying the door manufacturer, the door model/series number, the positive and negative design wind pressure rating, the installation instruction drawing reference number, and the applicable test standard.

Reason: This proposal is one of several that are addressing labeling of critical components of the building envelope. The primary purpose of this code change is to require that garage doors have a permanent label that provides a way for building owners, homeowners, and others to be able to determine their performance characteristics after the building has been occupied. The 2018 IBC does not require any type of label for garage doors. For products that don't have permanent labels, it becomes nearly impossible for the owner to determine the structural wind load resistance and/or energy efficiency of the garage doors after they've occupied the building. This proposal would simply require some type of permanent marking on the garage door indicating the manufacturer and model/series number, and basic performance characteristics so that the specific performance characteristics could be retrieved at a later date.

This same proposal was submitted for the 2018 IBC but was not approved by the IBC Structural Committee. However, it was nearly unanimously approved at the final action hearings, but did not get the required majority during the OGVC.

For the past 10-15 years, there has been a push towards considering sustainability in the way our buildings are constructed in this country. As a result, building owners and occupants increasingly want more information about the sustainability of the buildings they occupy. Consequently, they need to be provided with ways to determine how critical components are expected to perform in the buildings they use. Garage doors are important components of the building envelope and their performance is critical in preventing wind and water infiltration as well as to maintaining the overall structural integrity of the building.

Some manufacturers already include permanent labels on their products that provide traceability to the manufacture and the product characteristics. The Florida Building Code has required this type of label since the 2007 edition and has continued to require it in subsequent editions. The following is the relevant text from the 6th Edition (2017) Florida Building Code, Building:

1710.5.2.1.1 Garage door labeling. Garage doors shall be labeled with a permanent label provided by the garage door manufacturer. The label shall identify the garage door manufacturer, the garage door model/series number, the positive and negative design pressure rating; indicate impact rated if applicable; the installation instruction drawing reference number; the Florida product approval or Miami-Dade product approval number if applicable; and the applicable test standards. The required garage door components for an approved garage door assembly may be indicated using a checklist form on the label. If a checklist format is used on the label, the door installer or the garage door manufacturer shall mark the selected components on the checklist that are required to assemble an approved garage door system. The installation instructions shall be provided and available on the job site.

Also, Oklahoma Uniform Building Code Commission Rules in their Appendix Y require that garage doors be wind rated to 135 mph. Having a permanent label will facilitate verification that the right type of garage door is installed.

Approval of this proposal assure going forward that new or replaced doors will be labeled such that provide building owners and those considering the purchase of buildings with these products will be able to obtain information necessary for determining the expected performance of these critical components of the building envelope.

Cost Impact: The code change proposal will increase the cost of construction

Will impact cost for some manufacturers. The code does not currently require a permanent label. However, some garage door manufacturers voluntarily apply a permanent label that identifies the critical performance characteristics. There will be no cost impact to those manufacturers.

Proposal # 4363

S110-19

IBC: 1709.5.3 (New), 1709.5.3.1 (New), 202 (New)

Proponent: T. Eric Stafford, representing Insurance Institute for Business and Home Safety (testafford@charter.net)

2018 International Building Code

Add new text as follows:

1709.5.3 Wind-borne debris protection Protection of exterior glazed openings in buildings located in windborne debris regions shall be in accordance with Section 1609.1.2.

1709.5.3.1 Impact protective systems testing and labeling Impact protective systems shall be tested for impact resistance by an approved independent laboratory for compliance with ASTM E 1886 and ASTM E 1996. Impact protective systems shall also be tested for design wind pressure by an approved independent laboratory for compliance with ASTM E 330. Required design wind pressures shall be determined in accordance with Section 1609.6 or ASCE 7, and for the purposes of this section, multiplied by 0.6 to convert to allowable stress design. Impact protective systems shall have a label identifying the manufacturer, performance characteristics, and approved inspection agency. Impact protective systems shall have a permanent label applied in accordance with Section 1703.5.4 that provides traceability to the manufacturer, product designation, and performance characteristics.

Add new definition as follows:

IMPACT PROTECTIVE SYSTEM. Construction that has been shown by testing to withstand the impact of test missiles and that is applied, attached, or locked over exterior glazing.

Reason: This proposal is one of several that are addressing labeling of critical components of the building envelope. The primary purpose of this code change is to require that impact protective systems (hurricane shutters) have a permanent label that provides a way for building owners, homeowners, and others to be able to determine their performance characteristics after the building has been occupied. The 2018 IBC does not require any type of label for impact protective systems. However, the 2018 IRC requires impact protective systems to be labeled with similar language as submitted with this proposal. For products that don't have permanent labels, it becomes nearly impossible for the owner to determine the structural wind load resistance and impact resistance of the products after they've occupied the building. This proposal would simply require some type of permanent marking on the impact protective system indicating the manufacturer and model/series number, that provides traceability so specific performance characteristics can be retrieved at a later date. While the permanent label would only need to provide traceability to the product, it could provide all the required information. If the relevant information is not provided on a permanent label, a temporary removable label is required to be applied so that local code officials can verify that the appropriate impact protective system was provided. For the past 10-15 years, there has been a push towards considering sustainability in the way our buildings are constructed in this country. If this goal is to be successful and building owners and occupants increasingly want more information about the sustainability of the buildings they occupy, they need to be provided ways to be able to determine how critical components are expected to perform in the buildings they use. Impact protective systems are important components of the building envelope and their performance is critical to maintaining the overall structural integrity of the building.

Some manufacturers already include permanent labels on their products that provide traceability to the manufacture and the product characteristics. The Florida Building Code has required a permanent label since the 2007 edition and has continued to require it in subsequent editions. The following is the relevant text from the 5th Edition (2014) Florida Building Code, Building:

1710.8 Impact resistant coverings.

1710.8.1 Labels. A permanent label shall be provided by the product approval holder on all impact-resistant coverings.

1710.8.2 The following information shall be included on the labels on impact-resistant coverings:

1. Product approval holder name and address.
2. All applicable methods of approval. Methods of approval include, but are not limited to Miami-Dade NOA; Florida Building Commission, TDI Product Evaluation; ICC-ES.
3. The test standard or standards specified in Section 1609.1.2, including standards referenced within the test standards specified in Section 1609.1.2 used to demonstrate code compliance.
4. For products with a Florida product approval number or a Miami-Dade County Building and Neighborhood Compliance Department Notice of Acceptance Number (NOA), such numbers shall be included on the label.

This proposal also provides some additional clarification for impact protective systems that is lacking in the IBC. New Section 1709.5.3.1 clarifies that impact protective systems also have to be capable of resisting the required design wind pressure as well as the impact criteria. New language is added to clarify the relationship between design wind loads calculated in accordance with ASCE 7-10 and the wind load testing requirements of ASTM E 330.

Impact protective systems are important components of the building envelope and their performance is critical to maintaining the overall structural integrity of the building. Approval of this proposal will assure, going forward, that new or replaced impact protective systems will be labeled such that building owners and those considering the purchase of buildings with these products will be able to obtain information necessary for determining the expected performance of these critical components used to protect the building envelope in hurricane prone areas.

Cost Impact: The code change proposal will increase the cost of construction

A consultant representing the industry estimates the cost of providing labels on impact resistant covering products to be as follows:

- a. Water Resistant Self-adhering Permanent Labels approximately \$0.15 per label. Such labels would most likely be used on Accordion, Roll, Bahama, and Colonial style shutters.
- b. Embossed or ink jet labels used on metal and plastic panels would cost approximately \$0.05 per label.

Proposal # 4359

S110-19

S111-19

IBC@: 1803.5.7

Proponent: Dale Biggers, P.E. GeoCoalition, representing GeoCoalition (dbiggers@bohros.com); Daniel Stevenson, P.E., representing GeoCoalition (dstevenson@berkelapg.com); Lori Simpson, representing GeoCoalition (lsimpson@langan.com)

2018 International Building Code

Revise as follows:

1803.5.7 Excavation near foundations. Where excavation will reduce support from any foundation, a *registered design professional* shall prepare an assessment of the structure as determined from examination of the structure, ~~the review of available design documents~~, available subsurface data, and, if necessary, excavation of test pits. The *registered design professional* shall determine the requirements for underpinning support and protection of any existing foundation and prepare site-specific plans, details and sequence of work for submission. Such support shall be provided by underpinning, ~~sheeting and bracing~~, excavation retention systems, or by other means acceptable to the *building official*.

Reason:

- “Available subsurface data” may include geotechnical investigations of either the adjacent structure or the building under construction.
- The term “support” is broader in scope and includes “underpinning”.
- Requirements for support are described in Section 3307.
- The term “excavation retention systems” encompasses the many methods which are available today, while “sheeting” is an older term which precludes slurry walls, etc.

Click to see the members of the GeoCoalition : <http://www.piledrivers.org/2019-geocoalition-members/>

Members of the GeoCoalition

The 37 members are structural and geotechnical engineers and contractors from across the country. They are in leadership positions of more than nine organizations including:

- DFI – Deep Foundations Institute
- PDCA – Pile Driving Contractors Association
- ADSC – Association of Drilled Shaft Contractors
- ASCE – American Society of Civil Engineers
- ASTM – American Society of Testing Materials
- ACI – American Concrete Institute
- SAME – Society of American Military Engineers
- NCSEA – National Council of Structural Engineers Associations
- GBA – Geoprofessional Business Association (formerly ASFE)

Leadership positions held include:

- o Chair DFI Soil Nailing and Tiebacks Committee
- o Chair PDCA Technical Committee
- o President of Geo-Institute
- o Chair ADSC-DFI Joint Micropile Committee
- o President of PDCA
- o Chair Earth Retaining Structures of ASCE/G-I
- o Manager DFI Technical Committees
- o Received five ASTM Standards Development Awards
- o Chair DFI Helical Pile Committee
- o Chair DFI Codes and Standards Committee
- o Director of GBA
- o President of DFI
- o PDCA Lifetime Achievement Award
- o Chair DFI Testing and Evaluation Committee
- o ASCE Outstanding Civil Engineer New Orleans
- o DFI Distinguished Service Award

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Proper earth retention systems for protecting existing adjacent structures will eliminate potentially large remediation costs.

Proposal # 4974

S111-19

S112-19

IBC@: 1804.1

Proponent: Dale Biggers, P.E. GeoCoalition, representing GeoCoalition (dbiggers@bohbro.com); Daniel Stevenson, P.E., representing GeoCoalition (dstevenson@berkelapg.com); Lori Simpson, P.E., G.E., representing GeoCoalition (lsimpson@langan.com)

2018 International Building Code

Revise as follows:

1804.1 Excavation near foundations. Excavation for any purpose shall not reduce vertical or lateral support for any foundation or adjacent foundation without first underpinning or protecting the foundation against detrimental lateral or vertical movement, or both, in accordance with Section 1803.5.7.

Reason: · To include reference to preceding Section which contains the supporting information relative to “Excavation near foundations”.
Click here to see the members of the GeoCoalition : <http://www.piledrivers.org/2019-geocoalition-members/>

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Proper earth retention systems for protecting existing adjacent structures will eliminate potentially large remediation costs.

Proposal # 4975

S112-19

S113-19

IBC: 1805.3.2

Proponent: Craig Conner, representing self (craig.conner@mac.com); Joseph Lstiburek (joe@buildingscience.com)

2018 International Building Code

1805.3.1 Floors. Floors required to be waterproofed shall be of concrete and designed and constructed to withstand the hydrostatic pressures to which the floors will be subjected.

Waterproofing shall be accomplished by placing a membrane of rubberized asphalt, butyl rubber, fully adhered/fully bonded HDPE or polyolefin composite membrane or not less than 6-mil [0.006 inch (0.152 mm)] polyvinyl chloride with joints lapped not less than 6 inches (152 mm) or other *approved* materials under the slab. Joints in the membrane shall be lapped and sealed in accordance with the manufacturer's installation instructions.

1805.3.2 Walls. Walls required to be waterproofed shall be of concrete or masonry and shall be designed and constructed to withstand the hydrostatic pressures and other lateral loads to which the walls will be subjected. ~~Waterproofing~~ Waterproofing shall be applied from the bottom of the wall to not less than 12 inches (305 mm) above the maximum elevation of the ground-water table. The remainder of the wall shall be dampproofed in accordance with Section 1805.2.2 . Waterproofing shall consist of two-ply hot-mopped felts, not less than 6-mil (0.006 inch; 0.152 mm) polyvinyl chloride, 40-mil (0.040 inch; 1.02 mm) polymer-modified asphalt, 6-mil (0.006 inch; 0.152 mm) polyethylene ; a drainage layer of not less than 4 inches (100 mm) of free draining granular material; a drainage layer that can be shown to provide equivalent performance to not less than 4 inches (100 mm) of free draining granular material; or other approved methods or materials capable of bridging nonstructural cracks. Joints in the membrane or layers shall be lapped and sealed in accordance with the

~~manufacturer's~~
manufacturer's installation instructions.

1805.3.2.1 Surface preparation of walls. Prior to the application of waterproofing materials on concrete or masonry walls, the walls shall be prepared in accordance with Section 1805.2.2.1 .

1805.3.3 Joints and penetrations. Joints in walls and floors, joints between the wall and floor and penetrations of the wall and floor shall be made water tight utilizing *approved* methods and materials.

Reason: Objective:

Provide more options for foundation waterproofing and dampproofing.

This code change provides additional options for foundation waterproofing and dampproofing.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This change simply adds more options. In some cases it might decrease costs.

Proposal # 5430

S113-19

S114-19

IBC®: 1807.2.3

Proponent: Terry Kozlowski, representing Southern Nevada Chapter; Nenad Mirkovic, representing City of Las Vegas; Amanda Moss, representing SN-ICC Member; Cassidy Wilson, representing SN-ICC Member; Valarie Evans

2018 International Building Code

Revise as follows:

1807.2.3 Safety factor. Retaining walls shall be designed to resist the lateral action of soil to produce sliding and overturning with a minimum safety factor of 1.5 in each case. The load combinations of Section 1605 shall not apply to this requirement. Instead, design shall be based on 0.7 times nominal earthquake loads, 0.6 nominal wind loads, 1.0 times other *nominal loads*, and investigation with one or more of the variable loads set to zero. The safety factor against lateral sliding shall be taken as the available soil resistance at the base of the retaining wall foundation divided by the net lateral force applied to the retaining wall.

Exception: Where earthquake loads or wind are included, the minimum safety factor for retaining wall sliding and overturning shall be 1.1.

Reason: The intent is to address loads that a building is likely to experience and precludes consideration of a FACTORED LOAD which applies to limit state or strength design.

The term “nominal loads” is defined in Chapter 2 as “The magnitudes of the loads specified in Chapter 16 (dead, live, soil, wind, snow, rain, flood and earthquake)”. The term “service loads” as used in the definition of “dangerous” is synonymous with the definition of “nominal loads” loads as defined in the IBC Interpretation 23-10.

The International Building Code Section 1807.2.3 covers retaining walls but it does not clearly address safety factor when the freestanding wall, fence or other structures that are constructed on top of the retaining wall or are in the close proximity of the retaining wall and supported by a retaining wall that is subject to nominal loads that include wind and not earthquake load in the load combination. This provides clarification to indicate service wind load to be used in lieu of nominal load (ultimate wind load).

Bibliography: IBC Section 1602 Definitions and Notations

FACTORED LOAD. The product of a nominal load and a load factor.

NOMINAL LOADS. The magnitudes of the loads specified in this chapter (dead, live, soil, wind, snow, rain, flood and earthquake).

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal will not increase or decrease the cost of construction but rather provides clarification to indicate service wind load to be used in lieu of nominal load (ultimate wind load).

Proposal # 4399

S114-19

S115-19

IRC: 1807.2.4(New), Chapter 35 ASTM (New)

Proponent: Jason Thompson, National Concrete Masonry Association, representing National Concrete Masonry Association
(jthompson@ncma.org)

2018 International Building Code

Add new text as follows:

1807.2.4 Segmental Retaining Walls Dry-cast concrete units used in the construction of segmental retaining walls shall comply with ASTM C1372.

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken PA 19428-2959

C1372-17: Standard Specification for Dry-Cast Segmental Retaining Wall Units

Reason: ASTM C1372, Standard Specification for Dry-Cast Segmental Retaining Wall Units, was first published in 1997 to establish the minimum physical properties and acceptable constituent materials for segmental retaining wall (SRW) units. Key attributes covered include minimum compressive strength, maximum dimensional tolerances, and freeze-thaw durability performance.

As the use of SRW systems continues to grow, material-related failures are unfortunately becoming more commonplace. While ASTM C1372 has been in circulation for more than 20 years, compliance with this standard remains a voluntary option for designers and project specifiers. Introducing a mandatory reference to ASTM C1372 for SRWs into the IBC is intended to address failures due to material deficiencies.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Compliance with ASTM C1372 has been an established industry recommendation for SRW units for decades.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM C1372-17, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 5300

S115-19

S116-19

IBC: 1807.2.4 (New), ASTM Chapter 35 (New), NCMA Chapter 35 (New)

Proponent: Jason Thompson, National Concrete Masonry Association, representing National Concrete Masonry Association
(jthompson@ncma.org)

2018 International Building Code

Add new text as follows:

1807.2.4 Segmental Retaining Walls Dry-cast concrete units used in the construction of segmental retaining walls shall comply with ASTM C1372. The design and construction of segmental retaining walls shall comply with NCMA TR127B.

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken PA 19428-2959

C1372-17: Standard Specification for Dry-Cast Segmental Retaining Wall Units

NCMA

National Concrete Masonry Association
13750 Sunrise Valley
Herndon VA 22071-4662

TR127B-10: Design Manual for Segmental Retaining Walls

Reason: This code change, if accepted, accomplished two goals:

A) It introduces mandatory compliance for segmental retaining wall units to ASTM C1372, Standard Specification for Dry-Cast Segmental Retaining Wall Units. ASTM C1372 was first published in 1997 to establish the minimum physical properties and acceptable constituent materials for segmental retaining wall (SRW) units. Key attributes covered include minimum compressive strength, maximum dimensional tolerances, and freeze-thaw durability performance.

As the use of SRW systems continues to grow, material-related failures are unfortunately becoming more commonplace. While ASTM C1372 has been in circulation for more than 20 years, compliance with this standard remains a voluntary option for designers and project specifiers. Introducing a mandatory reference to ASTM C1372 for SRWs into the IBC is intended to address failures due to material deficiencies.

B) It introduces a reference to NCMA TR127B, Design Manual for Segmental Retaining Walls. It's critical to note that NCMA TR127B does not meet the criteria of CP28 as this document is not written in mandatory language. Further, while NCMA TR127B was developed through an industry consensus process, this process does not comply with all aspects of the consensus process established by ANSI. It is, however, the closest to a consensus standard for SRW systems that exists.

NCMA TR127B was first published in 1993 and has undergone multiple updates and revisions as new research, analyses, and information becomes available. NCMA TR127B can be freely accessed at the following link:

http://ncma-br.org/pdfs/masterlibrary/TR-127_SRWDM_5th_printing.pdf

Reference: NCMA TR127B-12, Design Manual for Segmental Retaining Walls, National Concrete Masonry Association, 2012.

Cost Impact: The code change proposal will increase the cost of construction

Compared to SRW systems that are not designed to any minimum criteria, this change would in theory increase the cost of construction.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM C1372-17, NCMA TR127B-10, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 5303

S116-19

S117-19

IBC@: 1808.8.1

Proponent: Stephen Szoke, American Concrete Institute, representing American Concrete Institute (steve.szoke@concrete.org); Scott Campbell, National Ready Mixed Concrete Association, representing National Ready Mixed Concrete Association (scampbell@nrmca.org)

2018 International Building Code

Revise as follows:

1808.8.1 Concrete or grout strength and mix proportioning. Concrete or grout in foundations shall have a specified compressive strength (f'_c) not less than the largest applicable value indicated in Table 1808.8.1. ~~Where concrete is placed through a funnel hopper at the top of a deep foundation element, the concrete mix shall be designed and proportioned so as to produce a cohesive workable mix having a slump of not less than 4 inches (102 mm) and not more than 8 inches (204 mm).~~

Where concrete or grout is to be pumped, the mix design including slump shall be adjusted to produce a pumpable mixture.

Reason: This code change removes outdated requirements from the IBC. Current concrete mixes are commonly designed with admixtures to better improve and assure placement using funnel hopper and this set of criteria specifying slump is no longer required in the code. The information in IBC Section 1808.1 is outdated as the slump criteria is only applicable for concrete mix designs not containing admixtures used for proper placement. Where such admixtures are used the slump requirement is likely not to be satisfied.

ACI, a professional technical society, recommends the deletion of this outdated criteria and encourages the committee to approve this code change as submitted.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This code change eliminates antiquated prescriptive criteria, allowing admixtures to achieve necessary properties and increase affordability.

Proposal # 4552

S117-19

S118-19

IBC®: 1808.8.1

Proponent: Stephen Szoke, American Concrete Institute, representing American Concrete Institute (steve.szoke@concrete.org); Scott Campbell, National Ready Mixed Concrete Association, representing National Ready Mixed Concrete Association (scampbell@nrmca.org)

2018 International Building Code

Revise as follows:

1808.8.1 Concrete or grout strength and mix proportioning. Concrete or grout in foundations shall have a specified compressive strength (f'_c) not less than the largest applicable value indicated in Table 1808.8.1.

Where concrete is placed through a funnel hopper at the top of a deep foundation element, the concrete mix shall be designed and proportioned so as to produce a cohesive workable mix having a slump of not less than 4 inches (102 mm) and not more than 8 inches (204 mm).

~~Where concrete or grout is to be pumped, the mix design including slump shall be adjusted to produce a pumpable mixture.~~

Reason: This code change removes an inappropriate requirement. Grout to be pumped needs to satisfy more requirements than just those required to facilitate pumping. The consistency of the concrete must also satisfy other requirements including but not limited to workability, durability and structural performance requirements. ACI 301 *Specifications for Structural Concrete* provides that: "4.2.2.2 Slump—Unless otherwise specified, select a target slump or slump flow at the point of delivery for all concrete mixtures. Selected target slump shall not exceed 9 in. Selected target slump flow shall not exceed 30 in. Concrete shall not show visible signs of segregation. The target slump or slump flow value shall be enforced for the duration of the project." Current concrete technology provides for both concrete slump and flow as applicable for concrete placement and performance.

ACI 318 *Building Code Requirements for Structural Concrete* which is a reference in the IBC references ACI 301 for concrete mix design criteria. Thus the appropriate criteria are applicable for concrete are requirements of the IBC by reference. This text should be deleted to assure the appropriate criteria for concrete slump and flow are satisfied regardless of delivery methods. ACI, a technical professional society, recommends the committee approve this code change proposal as submitted.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

In general, this code change will not increase nor decrease the cost of construction except there may be cost savings due to the use of admixtures that improve pumpability of concrete while retaining the other necessary properties of the concrete.

Proposal # 4553

S118-19

S119-19

IBC@: 1808.8.1, TABLE 1808.8.1

Proponent: Stephen Szoke, American Concrete Institute, representing American Concrete Institute (steve.szoke@concrete.org); Scott Campbell, representing National Ready Mixed Concrete Association (scampbell@nrmca.org)

2018 International Building Code

Revise as follows:

1808.8.1 Concrete or grout strength and mix proportioning. Concrete or grout in foundations shall have a specified compressive strength (f'_c) not less than the largest applicable value indicated in Table ~~1808.8.1~~ 19.2.1.1 of ACI 318.

Where concrete is placed through a funnel hopper at the top of a deep foundation element, the concrete mix shall be designed and proportioned so as to produce a cohesive workable mix having a slump of not less than 4 inches (102 mm) and not more than 8 inches (204 mm). Where concrete or grout is to be pumped, the mix design including slump shall be adjusted to produce a pumpable mixture.

Delete without substitution:

~~TABLE 1808.8.1
MINIMUM SPECIFIED COMPRESSIVE STRENGTH f'_c OF CONCRETE OR GROUT~~

FOUNDATION ELEMENT OR CONDITION	SPECIFIED COMPRESSIVE STRENGTH, f'_c
1. Foundations for structures assigned to <i>Seismic Design Category A, B or C</i>	2,500 psi
2a. Foundations for Group R or U occupancies of light-frame construction, two stories or less in height, assigned to <i>Seismic Design Category D, E or F</i>	2,500 psi
2b. Foundations for other structures assigned to <i>Seismic Design Category D, E or F</i>	3,000 psi
3. Precast nonprestressed driven piles	4,000 psi
4. Socketed drilled shafts	4,000 psi
5. Micropiles	4,000 psi
6. Precast prestressed driven piles	5,000 psi

For SI: 1 pound per square inch = 0.00689 MPa.

Reason: Removes the table for compressive strength requirements for the 2018 IBC and directs the user to ACI 318 Table 19.2.1.1 Limits for f'_c . The user is already required to use information from ACI 318 for foundations. For example, Table 1808.8.2 Minimum Concrete Cover directs the user to the requirements of Section 20.6 of ACI 318. By not having information in two places will reduce confusion, avoid unintended differences and reduce the potential for errors. Rather than having criteria in two locations this change places criteria on one reference and helps assure that other applicable provisions of ACI 318 as required by 2018 IBC Chapter 19 are not overlooked. Table 1 below shows the comparison of criteria in 2018 IBC and ACI 318. It is noteworthy that, consistent with the overall methodology throughout ACI 318, the user is directed to one section for all relevant criteria. Note that Table 19.2.1.1 has all limits for specified compressive strength in one location. This improves the user-friendliness provided by ACI 318. Further with criteria in two documents that user is required to refer to both to identify potential differences which can be a cumbersome process.

TABLE 1

Comparison of IBC AND ACI 318 MIN. COMPRESSIVE STRENGTH OF CONCRETE OR GROUT

2018 IBC	ACI 318	2018 IBC	ACI 318
Foundation Element of Condition		Specified Compressive Strength f'_c	Minimum f'_c , psi
1. Foundations for structures assigned to Seismic Design Category A, B or C	1. General	2,500	2,500
2a. Foundations for two stories or less in height, assigned to Seismic Design Category D, E or F	2. Special Moment Frames		
	2a. Special structural walls with Grade 60 or 80 reinforcement	2,500	3,000 ¹
2b. Foundations for other structures assigned to Seismic Design Category D, E or F2	2b. Special Structural walls with Grade 100 reinforcement	3,000	5,000

3. Precast nonprestressed driven piles	4,000 psi	4,000
4. Socketed drilled shafts	4,000 psi	4,000
5. Micropiles	4,000 psi	4,000
6. Precast prestressed driven piles	5,000 psi	5,000

¹ The f'_c for lightweight concrete in special moment frames and special structural walls shall not exceed 5000psi. The limit is permitted to be exceeded where demonstrated by experimental evidence that members made with lightweight concrete provide strength and toughness equal to or exceeding those of comparable members made with normalweight concrete of the same strength.

²Does not include foundations for stud bearing wall construction two stories or less.

ACI, a professional technical society, recommends the deletion of the specified compressive strength criteria from the IBC to better assure that all applicable requirements of ACI 318 are properly considered for design and construction of concrete foundations. ACI encourages the committee to approve this code change as submitted.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Technical criteria remain unchanged and thus no cost impact.

Proposal # 4568

S119-19

S120-19

IBC: 1808.8.2, 1808.8.2.1(New), TABLE 1808.8.2

Proponent: Stephen Szoke, American Concrete Institute, representing American Concrete Institute (steve.szoke@concrete.org); Scott Campbell, representing National Ready Mixed Concrete Association (scampbell@nrmca.org)

2018 International Building Code

Revise as follows:

1808.8.2 Concrete cover. The concrete cover provided for prestressed and nonprestressed reinforcement in for all concrete deep foundations shall be not less than the largest applicable value specified in Table 1808.8.2. Longitudinal bars spaced less than 1½ inches (38 mm) clear distance apart shall be considered to be bundled bars for which the concrete cover provided shall be not less than that required by Section 20.6.1.3.4 of ACI 318. Concrete cover shall be measured from the concrete surface to the outermost surface of the steel to which the cover requirement applies. Where concrete is placed in a temporary or permanent casing or a mandrel, the inside face of the casing or mandrel shall be considered to be the concrete surface, in accordance with ACI 318 Section 20.5.1.3.4 and this section.

Add new text as follows:

1808.8.2.1 Structural steel deep foundations. The concrete cover for structural steel cores within a steel pipe, tube or permanent casing shall not be less than 2 inches.

Delete without substitution:

**TABLE 1808.8.2
MINIMUM CONCRETE COVER**

FOUNDATION ELEMENT OR CONDITION	MINIMUM COVER
1. Shallow foundations	In accordance with Section 20.6 of ACI 318
2. Precast nonprestressed deep foundation elements Exposed to seawater Not manufactured under plant conditions Manufactured under plant control conditions	3 inches 2 inches In accordance with Section 20.6.1.3.3 of ACI 318
3. Precast prestressed deep foundation elements Exposed to seawater Other	2.5 inches In accordance with Section 20.6.1.3.3 of ACI 318
4. Cast in place deep foundation elements not enclosed by a steel pipe, tube or permanent casing	2.5 inches
5. Cast in place deep foundation elements enclosed by a steel pipe, tube or permanent casing	1 inch
6. Structural steel core within a steel pipe, tube or permanent casing	2 inches
7. Cast in place drilled shafts enclosed by a stable rock socket	1.5 inches

For SI: 1 inch = 25.4 mm.

Reason: This code change removes the requirements in IBC Section 1808.2 and Table 1808.2 on concrete cover for foundations to avoid confusion and conflicts between the IBC and ACI 318. Plus, the references are no longer correct, as concrete cover requirements for deep foundations are addressed in Section 20.5.1.3.4 and Table 20.5.1.3.4 of ACI 318. The 2018 IBC incorrectly directs the user to Section 20.6.1.3.3 of ACI 318.

The 2018 IBC advises that ACI 318 is to be followed in addition to any requirements in the IBC by the reference to Chapter 19 of the IBC:

“1808.8 Concrete foundations. The design, materials and construction of concrete foundations shall comply with Sections 1808.8.1 through 1808.8.6 and the provisions of Chapter 19.”

and Chapter 19 of the 2018 IBC reads:

“ 1901.2 Plain and reinforced concrete. Structural concrete shall be designed and constructed in accordance with the requirements of this chapter and ACI 318...”

There is no reason to duplicate requirements of ACI 318 in the IBC.

With regard to removal of text, there are two provisions in the text of IBC Section 1808.2.

1. There are criteria for longitudinal reinforcement and bundled bars, but the requirements in the IBC refer the user to ACI 318 Section 20.6.1.3.4.

This is unnecessary language due to the IBC language in Section 1808.8 and 1901.2 as shown above.

2. The IBC language provides a definition for concrete cover which is already addressed in ACI 318: "distance between the outermost surface of embedded reinforcement and the closest outer surface of the concrete." note that concrete cover is a specified dimension. Thus, where concrete is placed inside casings or mandrels the closest outer surface of the concrete is clearly the inside of the casing or mandrel.

With regard to the criteria in Table 1808.2, the requirements are shown as a side-by-side comparison in the Table below. The requirements remain identical for all concrete cover requirements for foundations except as follows:

1. Concrete cover for precast elements exposed to seawater is permitted to be 2 inches in ACI 318 where the 2018 IBC requires 3 inches and 2-1/2 inches for precast nonprestressed and prestressed, respectively. This modification recognizes the performance of centrifugally manufactured precast concrete piles, which were probably not a consideration when the cover provisions were introduced into the 2018 IBC. Where additional information on cover requirements as related to manufacturing process and materials the commentary of ACI 318 directs the user to ACI 543R *Guide to Design, Manufacture, and Installation of Concrete Piles*. Now that centrifugally are becoming more commonplace, the code would be remiss in not providing for the minimum requirement that reflect current practice and materials. This lowers costs by recognizing the performance of piles manufactured using zero-slump concrete.

2. Where the 2018 IBC permits cover to be a little as 2.5 inches for deep foundations not enclosed by a steel pipe, tube or permanent casing, ACI 318 finds that the ability to assure proper cover in deep foundations is more challenging than that required for shallow foundations. ACI 318 requires the minimum cover to remain the same for deep foundations as that required for shallow foundations, 3 inches.

3. ACI 318 does not differentiate the minimum concrete cover requirements between deep foundations enclosed within a steel pipe, tube or permanent casing whether there is a structural steel core. Further ACI 318 does not consider the requirements for structural steel deep foundations to be with their purview. Section 1808.2 is retained to include the provisions for these deep foundation systems.

4. Research considered by ACI Committee 318 and Subcommittee 318-0F on Foundations showed comparable performance for cover of precast elements regardless of whether manufactured at a plant or site cast.

ACI, a 501.C.3 professional society recommends approval as submitted to reflect current concrete technology and to assure appropriate minimum requirements are provided for the protection of reinforcement.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

There is no significant increase in cost of construction. Cost is decreased for precast prestressed concrete piles by reducing cover and providing for acceptable performance of new technologies and materials. There may be a slight increase in costs where deep foundations are cast without casings or tubes because the cover is increased from 2-1/2 inches to 3 inches.

Proposal # 4567

S120-19

S121-19

IBC: 1808.8.7(New)

Proponent: Terry Kozlowski, representing Southern Nevada Chapter; Valarie Evans, representing Southern Nevada Chapter; Nenad Mirkovic, representing City of Las Vegas; Amanda Moss, representing SN-ICC Member; Cassidy Wilson, representing SN-ICC Member

2018 International Building Code

Add new text as follows:

1808.8.7 Use of non-structural slabs on ground to resist bearing loads. Where bearing loads are proposed to be resisted by non-structural slabs on ground, all of the following conditions shall be satisfied:

1. Structural calculations shall be provided to show the slab can adequately support the proposed load.
2. The maximum allowable subgrade bearing pressure below the slab shall be no greater than 750 psf., with no increases allowed for short duration loads, unless a greater value is justified in a geotechnical investigation report.
3. Presumptive load-bearing values shall apply to class of materials identified in Table 1806.2 as crystalline bedrock; sedimentary and foliated rock; sandy gravel and gravel (GW and GP); sand, silty sand, clayey sand, silty gravel and clayey gravel (SW, SP, SM, SC, GM and GC).

Reason: This proposal correlates with Appendix I (patio covers) Section I105.2. Non-structural slabs on ground are typically exempt from structural design and special inspection requirements in the code. There may be limited requirements for subgrade preparation below non-structural slabs. Provided that the allowable capacity can be demonstrated through calculation, non-structural slabs on ground can be utilized for architectural, electrical, mechanical and plumbing components. The 750 psf. allowable bearing limit takes into account that a slab on ground would have less than the required 12" embedment depth typical to conventional spread footings.

Bibliography: I105.2 Footings. In areas with a frost depth of zero, a patio cover shall be permitted to be supported on a concrete slab on grade without footings, provided that the slab conforms to the provisions of Chapter 19 of this code and is not less than 31/2 inches (89 mm) thick, and the columns do not support loads in excess of 750 pounds (3.36 kN) per column.

Cost Impact: The code change proposal will increase the cost of construction

This proposal will decrease the cost of construction by eliminating the requirement for footings by using non-structural slabs that comply with this section.

Proposal # 4402

S121-19

S122-19

IBC: 1809.5.1 (New)

Proponent: James Smith, American Wood Council, representing ICC Region III Code Development Committee (jsmith@awc.org)

2018 International Building Code

1809.5 Frost protection. Except where otherwise protected from frost, foundations and other permanent supports of buildings and structures shall be protected from frost by one or more of the following methods:

1. Extending below the frost line of the locality.
2. Constructing in accordance with ASCE 32.
3. Erecting on solid rock.

Exception: Free-standing buildings meeting all of the following conditions shall not be required to be protected:

1. Assigned to *Risk Category* I.
2. Area of 600 square feet (56 m²) or less for light-frame construction or 400 square feet (37 m²) or less for other than light-frame construction.
3. Eave height of 10 feet (3048 mm) or less.

Shallow foundations shall not bear on frozen soil unless such frozen condition is of a permanent character.

Add new text as follows:

1809.5.1 Frost Protection at Required Exits. Frost protection shall be provided at exterior landings for all required exits. Frost protection shall only be required to the extent necessary to ensure the unobstructed opening of the required exit doors.

Exception: Landings that serve exits which do not have outward swinging doors.

Reason: The proposed change is to establish a minimum standard that the exterior landings at required outswinging egress doors (when located in climates subject to frost conditions) be provided with frost protection as required for the primary structure. Adding a section for frost protection at required exits will clarify that the landing areas immediately adjacent to all required egress doors must be provided with the same frost protection systems as that of the building being served by the exit. In cold climate areas, this would help prevent concrete landings (at the exit discharge), from heaving and inevitably compromising the normal operation of the required egress door(s). Such heaving actions have been documented to render an egress door entirely unusable (please see Bibliography for a link to a news report on several compromised doors in Vermont). This creates a dire situation for occupancies permitted to have a single egress. There are numerous conditions that can contribute to concrete heaving, making it impossible to predict when and where such heaving may materialize. Additionally, heaving of concrete landings can significantly impact accessibility to the structure. The proposed language is intended to provide the heave protection only for the area of a landing immediately adjacent to the exit door(s) and only for the area required to allow the door to swing open at least 90 degrees from the closed position. The remaining portions of a larger patio or sidewalk need not be provided with the frost protection. Protection would only be required to assure the required egress door(s) will operate.

Bibliography: <https://www.necn.com/news/business/Frost-Heave-Headaches-Front-Doors-Blocked-by-Raised-Pavement-294912761.html>

Cost Impact: The code change proposal will increase the cost of construction

Additional frost protection of landings will negligibly increase the cost of construction for foundations when compared to the overall cost of the foundation system, bearing in mind the minimal area added for the landings, and the fact that this is only required at required egress doors, and not all exterior doors. Initial installation of frost protected landings is significantly lower than the cost of retrofitting frost protection systems or the maintenance and/or repairs to egress doors when heaving has occurred.

Proposal # 5645

S122-19

S123-19

IBC: 1810.2.4.1, 1810.3.2.1(New), 1810.3.2.1.1, 1810.3.2.1.2, 1810.3.2.2, 1810.3.8, 1810.3.8.1, 1810.3.8.2, 1810.3.8.2.1, 1810.3.8.2.2, 1810.3.8.2.3, 1818.3.9.3, 1810.3.9.4, 1810.3.9.4.1, 1810.3.9.4.2, 1810.3.9.4.2.1, 1810.3.9.4.2.2

Proponent: Stephen Szoke, representing American Concrete Institute (steve.szoke@concrete.org)

2018 International Building Code

Revise as follows:

1810.2.4.1 Seismic Design Categories D through F. For structures assigned to *Seismic Design Category* D, E or F, deep foundation elements on *Site Class* E or F sites, as determined in Section 1613.2.2, shall be designed and constructed to withstand maximum imposed curvatures from earthquake ground motions and structure response. Curvatures shall include free-field soil strains modified for soil-foundation-structure interaction coupled with foundation element deformations associated with earthquake loads imparted to the foundation by the structure.

Exception: Deep foundation elements that satisfy the following additional detailing requirements shall be deemed to comply with the curvature capacity requirements of this section.

1. Precast prestressed concrete piles detailed in accordance with Section ~~1810.3.8.3.3~~ 18.13.5.10.5 in ACI 318.
2. Cast-in-place deep foundation elements with a minimum longitudinal reinforcement ratio of 0.005 extending the full length of the element and detailed in accordance with Sections ~~18.7.5.2, 18.7.5.3 and 18.7.5.4 of ACI 318 as required by Section 1810.3.9.4.2.2~~ - Section 18.13.5.5 of ACI 318.

Add new text as follows:

1810.3.2.1 Concrete. Concrete materials shall conform to ACI 318.

Revise as follows:

~~1810.3.2.1~~ **1810.3.2.1.1 Concrete cast in steel pipe.** Where concrete is cast in a steel pipe or where an enlarged base is formed by compacting concrete, the maximum size for coarse aggregate shall be 3/4 inch (19.1 mm). Concrete to be compacted shall have a zero slump.

Delete without substitution:

~~**1810.3.2.1.1 Seismic hooks.** For structures assigned to *Seismic Design Category* C, D, E or F, the ends of hoops, spirals and ties used in concrete deep foundation elements shall be terminated with seismic hooks, as defined in ACI 318, and shall be turned into the confined concrete core.~~

~~**1810.3.2.1.2 ACI 318 Equation (25.7.3.3).** Where this chapter requires detailing of concrete deep foundation elements in accordance with Section 18.7.5.4 of ACI 318, compliance with Equation (25.7.3.3) of ACI 318 shall not be required.~~

~~**1810.3.2.2 Prestressing steel.** Prestressing steel shall conform to ASTM A416.~~

Revise as follows:

1810.3.8 Precast concrete piles. Precast concrete piles shall be designed and detailed in accordance with Sections ~~1810.3.8.1 through 1810.3.8.3~~ ACI 318.

Exception: For structures assigned to *Seismic Design Category* C, D, E or F, the minimum spiral reinforcement index required by Section 18.13.5.10.4 and 18.13.5.10.5 of ACI 318 shall not apply in cases where the design includes full consideration of load combinations specified in ASCE 7, Section 2.3.6 and the applicable overstrength factor, Ω_0 . In such cases, minimum spiral reinforcement index shall be as specified in Section 13.4.5.6 of ACI 318.

Delete without substitution:

~~**1810.3.8.1 Reinforcement.** Longitudinal steel shall be arranged in a symmetrical pattern and be laterally tied with steel ties or wire spiral spaced center to center as follows:~~

1. At not more than 1 inch (25 mm) for the first five ties or spirals at each end; then
2. At not more than 4 inches (102 mm), for the remainder of the first 2 feet (610 mm) from each end; and then
3. At not more than 6 inches (152 mm) elsewhere.

~~The size of ties and spirals shall be as follows:~~

1. For piles having a least horizontal dimension of 16 inches (406 mm) or less, wire shall not be smaller than 0.22 inch (5.6 mm) (No. 5 gage).

- 2- For piles having a least horizontal dimension of more than 16 inches (406 mm) and less than 20 inches (508 mm), wire shall not be smaller than 0.238 inch (6 mm) (No. 4 gage).
- 3- For piles having a least horizontal dimension of 20 inches (508 mm) and larger, wire shall not be smaller than $\frac{1}{4}$ inch (6.4 mm) round or 0.259 inch (6.6 mm) (No. 3 gage).

1810.3.8.2 Precast nonprestressed piles. Precast nonprestressed concrete piles shall comply with the requirements of Sections 1810.3.8.2.1 through 1810.3.8.2.3.

1810.3.8.2.1 Minimum reinforcement. Longitudinal reinforcement shall consist of not fewer than four bars with a minimum longitudinal reinforcement ratio of 0.008.

1810.3.8.2.2 Seismic reinforcement in Seismic Design Categories C through F. For structures assigned to *Seismic Design Category C, D, E or F*, precast nonprestressed piles shall be reinforced as specified in this section. The minimum longitudinal reinforcement ratio shall be 0.01 throughout the length. Transverse reinforcement shall consist of closed ties or spirals with a minimum $\frac{3}{8}$ inch (9.5 mm) diameter. Spacing of transverse reinforcement shall not exceed the smaller of eight times the diameter of the smallest longitudinal bar or 6 inches (152 mm) within a distance of three times the least pile dimension from the bottom of the pile cap. Spacing of transverse reinforcement shall not exceed 6 inches (152 mm) throughout the remainder of the pile.

1810.3.8.2.3 Additional seismic reinforcement in Seismic Design Categories D through F. For structures assigned to *Seismic Design Category D, E or F*, transverse reinforcement shall be in accordance with Section 1810.3.9.4.2.

1810.3.8.3 Precast prestressed piles. Precast prestressed concrete piles shall comply with the requirements of Sections 1810.3.8.3.1 through 1810.3.8.3.3.

1810.3.8.3.1 Effective prestress. The effective prestress in the pile shall be not less than 400 psi (2.76 MPa) for piles up to 30 feet (9144 mm) in length, 550 psi (3.79 MPa) for piles up to 50 feet (15 240 mm) in length and 700 psi (4.83 MPa) for piles greater than 50 feet (15 240 mm) in length. Effective prestress shall be based on an assumed loss of 30,000 psi (207 MPa) in the prestressing steel. The tensile stress in the prestressing steel shall not exceed the values specified in ACI 318.

1810.3.8.3.2 Seismic reinforcement in Seismic Design Category C. For structures assigned to *Seismic Design Category C*, precast prestressed piles shall have transverse reinforcement in accordance with this section. The volumetric ratio of spiral reinforcement shall not be less than the amount required by the following formula for the upper 20 feet (6096 mm) of the pile.

$$\rho_s = 0.04 \left[f'_c / f_{yh} \left(2.6 + \sqrt{34P / (f'_c A_g)} \right) \right] \quad \text{(Equation 18-5)}$$

where:

A_g = Pile cross sectional area square inches (mm²).

f'_c = Specified compressive strength of concrete, psi (MPa).

f_{yh} = Yield strength of spiral reinforcement \geq 85,000 psi (586 MPa).

P = Axial load on pile, pounds (kN), as determined from Equations 16-5 and 16-7.

ρ_s = Spiral reinforcement index or volumetric ratio (vol. spiral/vol. core).

Not less than one-half the volumetric ratio required by Equation 18-5 shall be provided below the upper 20 feet (6096 mm) of the pile.

Exception: The minimum spiral reinforcement index required by Equation 18-5 shall not apply in cases where the design includes full consideration of load combinations specified in ASCE 7, Section 2.3.6 and the applicable overstrength factor, Ω_o . In such cases, minimum spiral reinforcement index shall be as specified in Section 1810.3.8.1.

1810.3.8.3.3 Seismic reinforcement in Seismic Design Categories D through F. For structures assigned to *Seismic Design Category D, E or F*, precast prestressed piles shall have transverse reinforcement in accordance with the following:

- 1- Requirements in ACI 318, Chapter 18, need not apply, unless specifically referenced.
- 2- Where the total pile length in the soil is 35 feet (10 668 mm) or less, the lateral transverse reinforcement in the ductile region shall occur through the length of the pile. Where the pile length exceeds 35 feet (10 668 mm), the ductile pile region shall be taken as the greater of 35 feet (10 668 mm) or the distance from the underside of the pile cap to the point of zero curvature plus three times the least pile dimension.
- 3- In the ductile region, the center to center spacing of the spirals or hoop reinforcement shall not exceed one fifth of the least pile dimension, six times the diameter of the longitudinal strand or 8 inches (203 mm), whichever is smallest.
- 4- Circular spiral reinforcement shall be spliced by lapping one full turn and bending the end of each spiral to a 90 degree hook or by use of a mechanical or welded splice complying with Section 25.5.7 of ACI 318.

- 5- Where the transverse reinforcement consists of circular spirals, the volumetric ratio of spiral transverse reinforcement in the ductile region shall comply with the following:

~~$$\rho_s = 0.06 \left(\frac{f'_c}{f_{yh}} \right) \left[2.8 + \frac{2.34P}{f'_c A_g} \right]$$~~ (Equation 18-6)

but not exceed:

~~$$\rho_s = 0.021$$~~ (Equation 18-7)

where:

A_g = Pile cross-sectional area, square inches (mm²).

f'_c = Specified compressive strength of concrete, psi (MPa).

f_{yh} = Yield strength of spiral reinforcement = 85,000 psi (586 MPa).

P = Axial load on pile, pounds (kN), as determined from Equations 16-5 and 16-7.

ρ_s = Volumetric ratio (vol. spiral/vol. core).

This required amount of spiral reinforcement is permitted to be obtained by providing an inner and outer spiral.

Exception: The minimum spiral reinforcement required by Equation 18-6 shall not apply in cases where the design includes full consideration of load combinations specified in ASCE 7, Section 2.3.6 and the applicable overstrength factor, Ω_o . In such cases, minimum spiral reinforcement shall be as specified in Section 1810.3.8.1.

- 6- Where transverse reinforcement consists of rectangular hoops and cross ties, the total cross-sectional area of lateral transverse reinforcement in the ductile region with spacing, s , and perpendicular dimension, h_c , shall conform to:

~~$$A_{sh} = 0.3 s h_c \left(\frac{f'_c}{f_{yh}} \right) \left(A_g / A_{sh} - 1.0 \right)$$~~ (Equation 18-8)

but not less than:

~~$$A_{sh} = 0.125 h_c \left(\frac{f'_c}{f_{yh}} \right) \left[0.5 + \frac{1.4P}{f'_c A_g} \right]$$~~ (Equation 18-9)

where:

f_{yh} = yield strength of transverse reinforcement $\leq 70,000$ psi (483 MPa).

h_c = Cross-sectional dimension of pile core measured center to center of hoop reinforcement, inch (mm).

s = Spacing of transverse reinforcement measured along length of pile, inch (mm).

A_{sh} = Cross-sectional area of transverse reinforcement, square inches (mm²).

f'_c = Specified compressive strength of concrete, psi (MPa).

The hoops and cross ties shall be equivalent to deformed bars not less than No. 3 in size. Rectangular hoop ends shall terminate at a corner with seismic hooks.

Outside of the length of the pile requiring transverse confinement reinforcing, the spiral or hoop reinforcing with a volumetric ratio not less than one-half of that required for transverse confinement reinforcing shall be provided.

1810.3.8.3.4 Axial load limit in Seismic Design Categories C through F. For structures assigned to *Seismic Design Category C, D, E, or F*, the maximum factored axial load on precast prestressed piles subjected to a combination of seismic lateral force and axial load shall not exceed the following values:

- 1- $0.2f'_c A_g$ for square piles
- 2- $0.4f'_c A_g$ for circular or octagonal piles

Revise as follows:

1810.3.9 Cast-in-place deep foundations. Cast-in-place deep foundation elements shall be designed and detailed in accordance with Sections 1810.3.9.1 through 1810.3.9.6: 1810.3.9.4.

Delete without substitution:

~~**1810.3.9.1 Design cracking moment.** The design cracking moment (ϕM_{cr}) for a cast-in-place deep foundation element not enclosed by a structural steel pipe or tube shall be determined using the following equation:~~

~~$$\phi M_{cr} = 2 \sqrt{f'_c} S_m$$~~
For SI:
~~$$\phi M_{cr} = 0.25 \sqrt{f'_c} S_m$$~~
where:

~~(Equation 18-10)~~

~~f'_c = Specified compressive strength of concrete or grout, psi (MPa).~~

~~S_m = Elastic section modulus, neglecting reinforcement and casing, cubic inches (mm³).~~

~~**1810.3.9.2 Required reinforcement.** Where subject to uplift or where the required moment strength determined using the load combinations of Section 1605.2 exceeds the design cracking moment determined in accordance with Section 1810.3.9.1, cast-in-place deep foundations not enclosed by a structural steel pipe or tube shall be reinforced.~~

Revise as follows:

~~**1810.3.9.3**~~ **1810.3.9.1 Placement of reinforcement.** Reinforcement where required shall be assembled and tied together and shall be placed in the deep foundation element as a unit before the reinforced portion of the element is filled with concrete.

Exceptions:

1. Steel dowels embedded 5 feet (1524 mm) or less shall be permitted to be placed after concreting, while the concrete is still in a semifluid state.
2. For deep foundation elements installed with a hollow-stem auger, tied reinforcement shall be placed after elements are concreted, while the concrete is still in a semifluid state. Longitudinal reinforcement without lateral ties shall be placed either through the hollow stem of the auger prior to concreting or after concreting, while the concrete is still in a semifluid state.
3. For Group R-3 and U occupancies not exceeding two stories of light-frame construction, reinforcement is permitted to be placed after concreting, while the concrete is still in a semifluid state, and the concrete cover requirement is permitted to be reduced to 2 inches (51 mm), provided that the construction method can be demonstrated to the satisfaction of the *building official*.

~~**1810.3.9.4**~~ **1810.3.9.2 Seismic reinforcement.** Where a structure is assigned to *Seismic Design Category C*, reinforcement shall be provided in accordance with Section 1810.3.9.4.1. Where a structure is assigned to *Seismic Design Category C*, D, E, or F, reinforcement shall be provided in accordance with Section ~~1810.3.9.4.2~~ 18.13.5.7 of ACI 318.

Exceptions:

1. Isolated deep foundation elements supporting posts of Group R-3 and U occupancies not exceeding two stories of light-frame construction shall be permitted to be reinforced as required by rational analysis but with not less than one No. 4 bar, without ties or spirals, where detailed so the element is not subject to lateral loads and the soil provides adequate lateral support in accordance with Section 1810.2.1.
2. Isolated deep foundation elements supporting posts and bracing from decks and patios appurtenant to Group R-3 and U occupancies not exceeding two stories of light-frame construction shall be permitted to be reinforced as required by rational analysis but with not less than one No. 4 bar, without ties or spirals, where the lateral load, E, to the top of the element does not exceed 200 pounds (890 N) and the soil provides adequate lateral support in accordance with Section 1810.2.1.
3. Deep foundation elements supporting the concrete foundation wall of Group R-3 and U occupancies not exceeding two stories of light-frame construction shall be permitted to be reinforced as required by rational analysis but with not less than two No. 4 bars, without ties or spirals, where the design cracking moment determined in accordance with Section 1810.3.9.1 ACI 318 exceeds the required moment strength determined using the load combinations with overstrength factor in Section 2.3.6 or 2.4.5 of ASCE 7 and the soil provides adequate lateral support in accordance with Section 1810.2.1.
4. Closed ties or spirals where required by Section ~~1810.3.9.4.2~~ 18.3.5.7.1 of ACI 318 shall be permitted to be limited to the top 3 feet (914 mm) of deep foundation elements 10 feet (3048 mm) or less in depth supporting Group R-3 and U occupancies of *Seismic Design Category D*, not exceeding two stories of light-frame construction.

Delete without substitution:

~~**1810.3.9.4.1 Seismic reinforcement in *Seismic Design Category C*.** For structures assigned to *Seismic Design Category C*, cast-in-place deep foundation elements shall be reinforced as specified in this section. Reinforcement shall be provided where required by analysis. Not fewer than four longitudinal bars, with a minimum longitudinal reinforcement ratio of 0.0025, shall be provided throughout the minimum reinforced length of the element as defined in this section starting at the top of the element. The minimum reinforced length of the element shall be taken as the~~

greatest of the following:

- 1- One third of the element length.
- 2- A distance of 10 feet (3048 mm).
- 3- Three times the least element dimension.
- 4- The distance from the top of the element to the point where the design cracking moment determined in accordance with Section 1810.3.9.1 exceeds the required moment strength determined using the load combinations of Section 1605.2.

Transverse reinforcement shall consist of closed ties or spirals with a minimum 3/8 inch (9.5 mm) diameter. Spacing of transverse reinforcement shall not exceed the smaller of 6 inches (152 mm) or 8 longitudinal bar diameters, within a distance of three times the least element dimension from the bottom of the pile cap. Spacing of transverse reinforcement shall not exceed 16 longitudinal bar diameters throughout the remainder of the reinforced length.

Exceptions:

- 1- The requirements of this section shall not apply to concrete cast in structural steel pipes or tubes.
- 2- A spiral-welded metal casing of a thickness not less than the manufacturer's standard No. 14 gage (0.068 inch) is permitted to provide concrete confinement in lieu of the closed ties or spirals. Where used as such, the metal casing shall be protected against possible deleterious action due to soil constituents, changing water levels or other factors indicated by boring records of site conditions.

1810.3.9.4.2 Seismic reinforcement in Seismic Design Categories D through F. For structures assigned to *Seismic Design Category D, E or F*, cast-in-place deep foundation elements shall be reinforced as specified in this section. Reinforcement shall be provided where required by analysis. Not fewer than four longitudinal bars, with a minimum longitudinal reinforcement ratio of 0.005, shall be provided throughout the minimum reinforced length of the element as defined in this section starting at the top of the element. The minimum reinforced length of the element shall be taken as the greatest of the following:

- 1- One half of the element length.
- 2- A distance of 10 feet (3048 mm).
- 3- Three times the least element dimension.
- 4- The distance from the top of the element to the point where the design cracking moment determined in accordance with Section 1810.3.9.1 exceeds the required moment strength determined using the load combinations of Section 1605.2.

Transverse reinforcement shall consist of closed ties or spirals not smaller than No. 3 bars for elements with a least dimension up to 20 inches (508 mm), and No. 4 bars for larger elements. Throughout the remainder of the reinforced length outside the regions with transverse confinement reinforcement, as specified in Section 1810.3.9.4.2.1 or 1810.3.9.4.2.2, the spacing of transverse reinforcement shall not exceed the least of the following:

- 1- 12 longitudinal bar diameters.
- 2- One half the least dimension of the element.
- 3- 12 inches (305 mm).

Exceptions:

- 1- The requirements of this section shall not apply to concrete cast in structural steel pipes or tubes.
- 2- A spiral-welded metal casing of a thickness not less than manufacturer's standard No. 14 gage (0.068 inch) is permitted to provide concrete confinement in lieu of the closed ties or spirals. Where used as such, the metal casing shall be protected against possible deleterious action due to soil constituents, changing water levels or other factors indicated by boring records of site conditions.

1810.3.9.4.2.1 Site Classes A through D. For *Site Class A, B, C or D* sites, transverse confinement reinforcement shall be provided in the element in accordance with Sections 18.7.5.2, 18.7.5.3 and 18.7.5.4 of ACI 318 within three times the least element dimension of the bottom of the pile cap. A transverse spiral reinforcement ratio of not less than one-half of that required in Section 18.7.5.4(a) of ACI 318 shall be permitted.

1810.3.9.4.2.2 Site Classes E and F. For *Site Class E or F* sites, transverse confinement reinforcement shall be provided in the element in accordance with Sections 18.7.5.2, 18.7.5.3 and 18.7.5.4 of ACI 318 within seven times the least element dimension of the pile cap and within seven times the least element dimension of the interfaces of strata that are hard or stiff and strata that are liquefiable or are composed of soft to medium-stiff clay.

Reason: This Code change includes revisions and additions to the Code in an effort to eliminate conflicting provisions in ACI 318-14, ASCE 7-16 and IBC-2018 regarding design of deep foundations for earthquake resistant structures. Subcommittee F, Foundations, of ACI 318 has coordinated efforts with members from ASCE 7 to bring the concrete material design requirements for foundations to one location. ASCE 7 started this effort in

their cycle ending in 2016. The changes to ACI 318 shown here is the continuation of that effort. A side-by-side comparison is provided, however, difficult to follow with all the changes and dissimilar format. For a more comprehensive look at the changes in ACI 318, please review the public comment version available at <https://www.concrete.org/publications/standards/upcomingstandards.aspx>
Summary of code change proposals:

- Section 1810.2.4.1 is updated to the latest version of ACI 318.
- The sections in Materials for the design and detailing of deep foundations were updated to the latest edition of ACI 318.
 - o Section 1810.3.2.1: A general reference to ACI 318 is made and the existing requirement is moved to 1810.3.2.1.1 as it is not covered in ACI 318.
 - o Section 1810.3.2.1.1: Is covered by Section 18.13.5.4 in ACI 318.
 - o Section 1810.3.2.1.2: Is covered by Section 25.7.3.3 in ACI 318.
 - o Section 1810.3.2.2: Is covered by Section 20.3 in ACI 318.
- Section 18.10.3.8, Precast Concrete pile, was adopted by ACI 318. The exception for minimum spiral reinforcement was retained from Sections 1810.3.8.3.2 and 1810.3.8.3.3 with the appropriate references to ACI 318. The requirements for 18.10.3.8 mostly went to Section 13.4.5 and 18.3.5 of ACI 318. A comparison is provided but for a full review please reference the public comment version of ACI 318.
 - o Section 1810.3.8.1→13.4.5.2 and 13.4.5.6
 - o Section 1810.3.8.2.1→13.4.5.3
 - o Section 1810.3.8.2.2→18.13.5.10.2
 - § Exception remains
 - o Section 1810.3.8.2.3→18.13.5.10.3
 - § Exception remains
 - o Section 1810.3.8.3.1→13.4.5.4 and 13.4.5.5
 - o Section 1810.3.8.3.2→18.13.5.10.4
 - o Section 1810.3.8.3.3→18.13.5.10.5
 - o Section 1810.3.8.3.4→18.13.5.10.6
- Section 18.10.3.9, Cast-in-place deep foundation, was adopted by ACI 318.
 - o Section 1810.3.9.1→13.4.4
 - o Section 1810.3.9.2→13.4.4
 - o Section 1810.3.9.3→Remains
 - o Section 1810.3.9.4→Remains, update reference
 - o Section 1810.3.9.4.1→18.13.5.7
 - § Exception→18.13.5.8
 - o Section 1810.3.9.4.2→18.13.5.7
 - § Exception→18.13.5.8
 - o Section 1810.3.9.4.2.1→18.13.5.5

IBC 2018	ACI 318				
<p>1810.3.2.1.1 Seismic hooks. For structures assigned to Seismic Design Category C, D, E or F, the ends of hoops, spirals and ties used in concrete deep foundation elements shall be terminated with seismic hooks, as defined in ACI 318, and shall be turned into the confined concrete core.</p>	<p>18.13.5.4 For structures assigned to SDC C, D, E, or F, hoops, spirals, and ties in deep foundation members shall be terminated with seismic hooks.</p>				
<p>1810.3.2.1.2 ACI 318 Equation (25.7.3.3). Where this chapter requires detailing of concrete deep foundation elements in accordance with Section 18.7.5.4 of ACI 318, compliance with Equation (25.7.3.3) of ACI 318 shall not be required.</p>	<p>25.7.3.3 Except for transverse reinforcement in deep foundations, the volumetric spiral reinforcement ratio ρ_s shall satisfy Eq. (25.7.3.3).</p>				
<p>1810.3.2.2 Prestressing steel. Prestressing steel shall conform to ASTM A416.</p>	<p>20.3 Prestressing strands, wires, and bars</p> <p>20.3.1 Material properties</p> <p>20.3.1.1 Except as required in 20.3.1.3 for special moment frames and special structural walls, prestressing reinforcement shall conform to (a), (b), (c), or (d):</p> <p>(a) ASTM A416 – strand</p> <p>(b) ASTM A421 – wire</p> <p>(c) ASTM A421 – low-relaxation wire including Supplementary Requirement S1, “Low-Relaxation Wire and Relaxation Testing”</p> <p>(d) ASTM A722 – high-strength bar</p>				
<p>1810.3.8 Precast concrete piles. Precast concrete piles shall be designed and detailed in accordance with Sections 1810.3.8.1 through 1810.3.8.3.</p> <p>1810.3.8.1 Reinforcement. Longitudinal steel shall be arranged in a symmetrical pattern and be laterally tied with steel ties or wire spiral spaced center to center as follows:</p> <ol style="list-style-type: none"> 1. At not more than 1 inch (25 mm) for the first five ties or spirals at each end; then 2. At not more than 4 inches (102 mm), for the remainder of the first 2 feet (610 mm) from each end; and then 3. At not more than 6 inches (152 mm) elsewhere. <p>The size of ties and spirals shall be as follows:</p> <ol style="list-style-type: none"> 1. For piles having a least horizontal dimension of 16 inches (406 mm) or less, wire shall not be smaller than 0.22 inch (5.6 mm) (No. 5 gage). 2. For piles having a least horizontal dimension of more than 16 inches (406 mm) and less than 20 inches (508 mm), wire shall not be smaller than 0.238 inch (6 mm) (No. 4 gage). 	<p>13.4.5 Precast concrete piles</p> <p>13.4.5.1 Precast concrete piles supporting buildings assigned to SDC A or B shall satisfy the requirements of 13.4.5.2 through 13.4.5.6.</p> <p>13.4.5.2 Longitudinal reinforcement shall be arranged in a symmetrical pattern.</p> <p>13.4.5.3 For precast nonprestressed piles, longitudinal reinforcement shall be provided according to (a) and (b):</p> <p>(a) Minimum of 4 bars</p> <p>(b) Minimum area of $0.008A_g$</p> <p>13.4.5.4 For precast prestressed piles, the effective prestress in the pile shall provide a minimum average compressive stress in the concrete in accordance with Table 13.4.5.4.</p> <p>Table 13.4.5.4 Minimum compressive stress in precast prestressed piles</p> <table border="1"> <thead> <tr> <th>Pile length (ft)</th> <th>Minimum compressive stress (psi)</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> </tr> </tbody> </table>	Pile length (ft)	Minimum compressive stress (psi)		
Pile length (ft)	Minimum compressive stress (psi)				

3. For piles having a least horizontal dimension of 20 inches (508 mm) and larger, wire shall not be smaller than 1/4 inch (6.4 mm) round or 0.259 inch (6.6 mm) (No. 3 gage).

1810.3.8.2 Precast nonprestressed piles. Precast nonprestressed concrete piles shall comply with the requirements of Sections 1810.3.8.2.1 through 1810.3.8.2.3.

1810.3.8.2.1 Minimum reinforcement. Longitudinal reinforcement shall consist of not fewer than four bars with a minimum longitudinal reinforcement ratio of 0.008.

...

1810.3.8.3 Precast prestressed piles. Precast prestressed concrete piles shall comply with the requirements of Sections 1810.3.8.3.1 through 1810.3.8.3.3

1810.3.8.3.1 Effective prestress. The effective prestress in the pile shall be not less than 400 psi (2.76 MPa) for piles up to 30 feet (9144 mm) in length, 550 psi (3.79 MPa) for piles up to 50 feet (15 240 mm) in length and 700 psi (4.83 MPa) for piles greater than 50 feet (15 240 mm) in length. Effective prestress shall be based on an assumed loss of 30,000 psi (207 MPa) in the prestressing steel. The tensile stress in the prestressing steel shall not exceed the values specified in ACI 318.

Pile length ≤ 30	400
30 < Pile length ≤ 50	550
Pile length > 50	700

13.4.5.5 For precast prestressed piles, the effective prestress in the pile shall be calculated based on an assumed total loss of 30,000 psi in the prestressed reinforcement.

13.4.5.6 The longitudinal reinforcement shall be enclosed by transverse reinforcement according to Table 13.4.5.6(a) and shall be spaced according to Table 13.4.5.6(b):

Table 13.4.5.6(a) Minimum transverse reinforcement size

Least horizontal pile dimension-h (in.)	Minimum wire size transverse reinforcement ^[1]
h ≤ 16	W4, D4
16 < h < 20	W4.5, D5
h ≥ 20	W5.5, D6

[1] If bars are used, minimum of #3 bar applies to all values of h

Table 13.4.4.6(b) Maximum transverse reinforcement spacing

Reinforcement location in the pile	Maximum center-to-center spacing (in.)
First five ties or spirals at each end of pile	1
24 in. from each end of pile	4
Remainder of pile	6

1810.3.9 Cast-in-place deep foundations. Cast-in-place deep foundation elements shall be designed and detailed in accordance with Sections 1810.3.9.1 through 1810.3.9.6.

1810.3.9.1 Design cracking moment. The design cracking moment (ϕM_n) for a cast-in-place deep foundation element not enclosed by a structural steel pipe or tube shall be determined using the following equation:

$$\phi M_n = 3\sqrt{f'_c} S_m \text{ (Equation 18-10)}$$

For SI: $0.25\sqrt{f'_c} S_m$

where:

f'_c = Specified compressive strength of concrete or grout,

13.4.4 Cast-in-place deep foundations

13.4.4.1 Cast-in-place deep foundations that are subject to uplift or where M_u is greater than $0.4 M_{Cr}$ shall be reinforced, unless enclosed by a structural steel pipe or tube.

Note $f_{cr} = 7.5\sqrt{f'_c}$

<p>psi (MPa).</p> <p>S_m = Elastic section modulus, neglecting reinforcement and casing, cubic inches (mm³).</p> <p>1810.3.9.2 Required reinforcement. Where subject to uplift or where the required moment strength determined using the load combinations of Section 1605.2 exceeds the design cracking moment determined in accordance with Section 1810.3.9.1, cast-in-place deep foundations not enclosed by a structural steel pipe or tube shall be reinforced.</p>	
<p>1810.3.9.4.1 Seismic reinforcement in Seismic Design Category C. For structures assigned to Seismic Design Category C, cast-in-place deep foundation elements shall be reinforced as specified in this section. Reinforcement shall be provided where required by analysis.</p> <p>Not fewer than four longitudinal bars, with a minimum longitudinal reinforcement ratio of 0.0025, shall be provided throughout the minimum reinforced length of the element as defined in this section starting at the top of the element. The minimum reinforced length of the element shall be taken as the greatest of the following:</p> <ol style="list-style-type: none"> 1. One-third of the element length. 2. A distance of 10 feet (3048 mm). 3. Three times the least element dimension. 4. The distance from the top of the element to the point where the design cracking moment determined in accordance with Section 1810.3.9.1 exceeds the required moment strength determined using the load combinations of Section 1605.2. <p>Transverse reinforcement shall consist of closed ties or spirals with a minimum 3/8 inch (9.5 mm) diameter. Spacing of transverse reinforcement shall not exceed the smaller of 6 inches (152 mm) or 8- longitudinal-bar diameters, within a distance of three times the least element dimension from the bottom of the pile cap. Spacing of transverse reinforcement shall not exceed 16 longitudinal bar diameters throughout the remainder of the reinforced length.</p> <p>Exceptions:</p> <ol style="list-style-type: none"> 1. The requirements of this section shall not apply to concrete cast in structural steel pipes or tubes. 2. A spiral-welded metal casing of a thickness not less than the manufacturer's standard No. 14 gage (0.068 inch) is permitted to provide concrete confinement in lieu of the closed ties or spirals. Where used as such, the metal casing shall be protected against possible deleterious action due to soil constituents, changing water levels or other factors indicated by boring records of site conditions. <p>1810.3.9.4.2 Seismic reinforcement in Seismic Design</p>	<p>18.13.5 Deep Foundations</p> <p>18.13.5.1 This section shall apply to the following types of deep foundations</p> <ol style="list-style-type: none"> (a) uncased cast-in-place concrete drilled or augered piles (b) metal cased concrete piles (c) concrete filled pipe piles (d) precast concrete piles <p>18.13.5.2 For structures assigned to SDC C, D, E, or F, piles, piers, or caissons resisting tension loads shall have continuous longitudinal reinforcement over their length resisting to resist design tension forces.</p> <p>18.13.5.3 For structures assigned to SDC C, D, E, or F, the minimum longitudinal and transverse reinforcement required by 18.13.5.7 through 18.13.5.10 shall be extended over the entire unsupported length for the portion of pile in air or water, or in soil that is not capable of providing adequate lateral restraint to prevent buckling throughout this length.</p> <p>18.13.5.4 For structures assigned to SDC C, D, E, or F, hoops, spirals, and ties in deep foundation members shall be terminated with seismic hooks.</p> <p>18.13.5.5 For structures assigned to SDC D, E, or F or located in Site Class E or F, concrete piles shall have transverse reinforcement in accordance with 18.7.5.2, 18.7.5.3, and Table 18.7.5.4(e) within seven pile diameters above and below the interfaces between strata that are hard or stiff and strata that are liquefiable or soft.</p> <p>18.13.5.6 For structures assigned to SDC D, E, or F, in foundations supporting one- and two-story stud bearing wall construction, concrete piles, piers or caissons, and foundation ties are exempt from the transverse reinforcement requirements of 18.13.5.3 through 18.13.5.5.</p> <p>18.13.5.7 Uncased cast-in-place drilled or augered</p>

Categories D through F. For structures assigned to Seismic Design Category D, E or F, cast-in-place deep foundation elements shall be reinforced as specified in this section. Reinforcement shall be provided where required by analysis. Not fewer than four longitudinal bars, with a minimum longitudinal reinforcement ratio of 0.005, shall be provided throughout the minimum reinforced length of the element as defined in this section starting at the top of the element. The minimum reinforced length of the element shall be taken as the greatest of the following:

1. One-half of the element length.
2. A distance of 10 feet (3048 mm).
3. Three times the least element dimension.
4. The distance from the top of the element to the point where the design cracking moment determined in accordance with Section 1810.3.9.1 exceeds the required moment strength determined using the load combinations of Section 1605.2.

Transverse reinforcement shall consist of closed ties or spirals not smaller than No. 3 bars for elements with a least dimension up to 20 inches (508 mm), and No. 4 bars for larger elements. Throughout the remainder of the reinforced length outside the regions with transverse confinement reinforcement, as specified in Section 1810.3.9.4.2.1 or 1810.3.9.4.2.2, the spacing of transverse reinforcement shall not exceed the least of the following:

1. 12 longitudinal bar diameters.
2. One-half the least dimension of the element.
3. 12 inches (305 mm).

Exceptions:

1. The requirements of this section shall not apply to concrete cast in structural steel pipes or tubes.
2. A spiral-welded metal casing of a thickness not less than manufacturer's standard No. 14 gage (0.068 inch) is permitted to provide concrete confinement in lieu of the closed ties or spirals. Where used as such, the metal casing shall be protected against possible deleterious action due to soil constituents, changing water levels or other factors indicated by boring records of site conditions.

1810.3.9.4.2.1 Site Classes A through D. For Site Class A, B, C or D sites, transverse confinement reinforcement shall be provided in the element in accordance with Sections 18.7.5.2, 18.7.5.3 and 18.7.5.4 of ACI 318 within three times the least element dimension of the bottom of the pile cap. A transverse spiral reinforcement ratio of not less than one-half of that required in Section 18.7.5.4(a) of ACI 318 shall be permitted.

1810.3.9.4.2.2 Site Classes E and F. For Site Class E or F

concrete piles or piers

18.13.5.7.1 For structures assigned to SDC C, D, E, or F, reinforcement shall be provided in uncased cast-in-place drilled or augered concrete piles where required by analysis and in accordance with the requirements in Table 18.13.5.7.1.

18.13.5.7.2 Minimum longitudinal and transverse reinforcement shall be provided along minimum reinforced lengths measured from the top of the pile in accordance with Table 18.13.5.7.1.

18.13.5.7.3 Longitudinal reinforcement shall extend at least the development length in tension beyond the flexural length of the pile, which is defined in Table 18.13.5.7.1 as the distance from the bottom of the pile cap to where $0.4M_{cr} > M_u$.

18.13.5.8 Metal-cased concrete piles

18.13.5.8.1 For structures assigned to SDC C, D, E, or F, longitudinal reinforcement requirements and minimum reinforced lengths for metal-cased concrete piles shall be the same as for uncased concrete piles in 18.13.5.7

18.13.5.8.2 Metal-cased concrete piles shall have a spiral-welded metal casing of a thickness not less than 0.0747 in. (No. 14 gauge) that is adequately protected from possible deleterious action due to soil constituents, changing water levels, or other factors indicated by boring records of site conditions.

18.13.5.9 Concrete-filled pipe piles

18.13.5.9.1 For structures assigned to SDC C, D, E or F, concrete-filled pipe piles shall have longitudinal reinforcement in the top of the pile with a total area of at least $0.01A_g$ and with a minimum length within the pile equal to two times the required embedment length into the pile cap, but not less than the development length in tension of the reinforcement.

<p>sites, transverse confinement reinforcement shall be provided in the element in accordance with Sections 18.7.5.2, 18.7.5.3 and 18.7.5.4 of ACI 318 within seven times the least element dimension of the pile cap and within seven times the least element dimension of the interfaces of strata that are hard or stiff and strata that are liquefiable or are composed of soft- to medium-stiff clay.</p>	
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Table 18.13.5.7.1 Minimum reinforcement for uncased cast-in-place or augered concrete piles or pier:

Minimum Reinforcement		SDC C – All Site Classes	SDC D, E, and F – Site Class A, B, C, and D	SDC D, E, and F – Site Class E and F
Minimum Longitudinal Reinforcement Ratio (minimum number of bars)		0.0025 (minimum number of bars in accordance with 10.7.3.1)	0.005 (minimum number of bars in accordance with 10.7.3.1)	0.005 (minimum number of bars in accordance with 10.7.3.1)
Minimum Reinforced Pile Length		Longest of (a) through (d): (a) 1/3 pile length (b) 10 ft. (c) 3 times the pile diameter (d) flexural length of pile - distance from bottom of pile cap to where $0.4M_{cr}$ exceeds M_u .	Longest of (a) through (d): (a) 1/2 pile length (b) 10 ft. (c) 3 times the pile diameter (d) flexural length of pile - distance from bottom of pile cap to where $0.4M_{cr}$ exceeds M_u .	Full length of pile except in accordance with [1] or [2].
Transverse Confinement Reinforcement Zone	Length of Reinforcement Zone	3 times the pile diameter from the bottom of the pile cap	3 times the pile diameter from the bottom of the pile cap.	7 times the pile diameter from the bottom of the pile cap.
	Type of Transverse Reinforcement	Closed ties or spirals with a minimum 3/8 in. diameter.	Minimum of No. 3 closed tie or 3/8 in. diameter spiral for piles ≤ 20 in. diameter. Minimum No. 4 closed tie or 1/2 in. diameter spiral for piles > 20 in. diameter. In accordance with 18.7.5.2	
	Spacing and Amount of Transverse Reinforcement	Spacing shall not exceed lesser of 6 in. or 8 longitudinal bar diameters	In accordance with 18.7.5.3 and not less than one-half the requirement of Table 18.7.5.4(e)	In accordance with 18.7.5.3 and not less than the requirement of Table 18.7.5.4(e).
Transverse Reinforcement in Remainder of Reinforced Pile Length	Type of Transverse Reinforcement	Closed ties or spirals with minimum 3/8 in. diameter.	Minimum of No. 3 closed tie or 3/8 in. diameter spiral for piles ≤ 20 in. diameter.	Minimum of No. 4 closed tie or 1/2 in. diameter spiral for piles > 20 in. diameter.
			In accordance with 18.7.5.2	

	Spacing and Amount of Transverse Reinforcement	Maximum spacing of 16 longitudinal bar diameters.	Spacing shall not exceed the least of (a) through (c): (a) 12 longitudinal bar diameters (b) ½ the pile diameter (c) 12 in.
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[1] For piles sufficiently embedded in firm soil or rock, reinforcement shall be permitted to be terminated a length above the tip equal to the lesser of 5 percent of the pile length and 33 percent of the length of the pile within rock or firm soil.

[2] In lieu of providing full length minimum flexural reinforcement, the deep foundation element shall be designed to withstand maximum imposed curvatures from the earthquake ground motions and structural response. Curvatures shall include free-field soil strains modified for soil-foundation-structure interaction coupled with foundation element deformations associated with earthquake loads imparted to the foundation by the structure. Minimum reinforced length shall not be less than the requirement for SDC D, E, or F; Site Class D.

<p>1810.3.8.2 Precast nonprestressed piles.</p> <p>...</p> <p>1810.3.8.2.2 Seismic reinforcement in Seismic Design Categories C through F. For structures assigned to Seismic Design Category C, D, E or F, precast nonprestressed piles shall be reinforced as specified in this section. The minimum longitudinal reinforcement ratio shall be 0.01 throughout the length. Transverse reinforcement shall consist of closed ties or spirals with a minimum 3/8 inch (9.5 mm) diameter. Spacing of transverse reinforcement shall not exceed the smaller of eight times the diameter of the smallest longitudinal bar or 6 inches (152 mm) within a distance of three times the least pile dimension from the bottom of the pile cap. Spacing of transverse reinforcement shall not exceed 6 inches (152 mm) throughout the remainder of the pile.</p> <p>1810.3.8.2.3 Additional seismic reinforcement in Seismic Design Categories D through F. For structures assigned to Seismic Design Category D, E or F, transverse reinforcement shall be in accordance with Section 1810.3.9.4.2.</p> <p>...</p> <p>1810.3.8.3 Precast prestressed piles.</p> <p>...</p> <p>1810.3.8.3.2 Seismic reinforcement in Seismic Design Category C. For structures assigned to Seismic Design Category C, precast prestressed piles shall have transverse reinforcement in accordance with this section. The volumetric ratio of spiral reinforcement shall not be less than the amount required by the following formula for the upper 20 feet (6096 mm) of the pile.</p> $\rho_s = 0.04(f'_c/f_{yh})[2.8 + 2.34P/f'_c A_g] \text{ (Equation 18-5)}$ <p>where:</p>	<p>18.13.5.10 Precast concrete piles</p> <p>18.13.5.10.1 For precast concrete driven piles, the length of transverse reinforcement provided shall be sufficient to account for potential variations in the elevation of pile tips.</p> <p>18.13.5.10.2 Precast nonprestressed concrete piles for structures assigned to SDC C shall satisfy (a) through (d):</p> <p>(a) Minimum longitudinal steel reinforcement ratio shall be 0.01</p> <p>(b) Longitudinal reinforcement shall be enclosed within a minimum of No. 3 closed ties or 3/8-in. diameter spirals, for up to 20-in. diameter piles, and No. 4 closed ties or ½-in. diameter spirals, for larger diameter piles</p> <p>(c) Spacing of transverse reinforcement within a distance of 3 times the least cross-sectional dimension of the pile from the bottom of the pile cap shall not exceed the lesser of 8 times the diameter of the smallest longitudinal bar and 6 in.</p> <p>(d) Transverse reinforcement shall be provided throughout the length of the pile at a spacing not exceeding 6 in.</p> <p>18.13.5.10.3 For structures assigned to SDC D, E, or F, precast nonprestressed concrete piles shall satisfy the requirements of 18.13.5.10.2 and the requirements for uncased cast-in-place or augered concrete piles in SDC D, E, or F in Table 18.13.5.7.1.</p> <p>18.13.5.10.4 For structures assigned to SDC C, precast prestressed concrete piles shall satisfy (a) and (b):</p> <p>(a) If the transverse reinforcement consists of</p>
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A_g = Pile cross-sectional area square inches (mm^2).

f'_c = Specified compressive strength of concrete, psi (MPa).

f_{yh} = Yield strength of spiral reinforcement $\leq 85,000$ psi (586 MPa).

P = Axial load on pile, pounds (kN), as determined from Equations 16-5 and 16-7.

ρ_s = Spiral reinforcement index or volumetric ratio (vol. spiral/vol. core).

Not less than one-half the volumetric ratio required by Equation 18-5 shall be provided below the upper 20 feet (6096 mm) of the pile.

Exception: The minimum spiral reinforcement index required by Equation 18-5 shall not apply in cases where the design includes full consideration of load combinations specified in ASCE 7, Section 2.3.6 and the applicable overstrength factor, Ω_0 . In such cases, minimum spiral reinforcement index shall be as specified in Section 1810.3.8.1.

1810.3.8.3.3 Seismic reinforcement in Seismic Design Categories D through F. For structures assigned to Seismic Design Category D, E or F, precast prestressed piles shall have transverse reinforcement in accordance with the following:

1. Requirements in ACI 318, Chapter 18, need not apply, unless specifically referenced.

2. Where the total pile length in the soil is 35 feet (10 668 mm) or less, the lateral transverse reinforcement in the ductile region shall occur through the length of the pile. Where the pile length exceeds 35 feet (10 668 mm), the ductile pile region shall be taken as the greater of 35 feet (10 668 mm) or the distance from the underside of the pile cap to the point of zero curvature plus three times the least pile dimension.

3. In the ductile region, the center-to-center spacing of the spirals or hoop reinforcement shall not exceed one-fifth of the least pile dimension, six times the diameter of the longitudinal strand or 8 inches (203 mm), whichever is smallest.

4. Circular spiral reinforcement shall be spliced by lapping one full turn and bending the end of each spiral to a 90-degree hook or by use of a mechanical or welded splice complying with Section 25.5.7 of ACI 318.

5. Where the transverse reinforcement consists of circular spirals, the volumetric ratio of spiral transverse reinforcement in the ductile region shall comply with the following:

$\rho_s = 0.06(f'_c/f_{yh})[2.8 + 2.34P/f'_c A_g]$ (Equation 18-6) but not

spirals or circular hoops, the volumetric ratio of transverse reinforcement, ρ_s , in the upper 20 ft shall not be less than that calculated by Eq. (18.13.5.10.4a) or calculated from a more detailed analysis by Eq. (18.13.5.10.4b):

$$0.15(f'_c/f_{yt}) \quad (18.13.5.10.4a)$$

$$0.04(f'_c/f_{yt})[2.8 + 2.3P_U/f'_c A_g] \quad (18.13.5.10.4b)$$

and f_{yt} shall not be taken greater than 100,000 psi

(b) A minimum of one-half of the volumetric ratio of spiral reinforcement required by Eq. (18.13.5.10.4a) or Eq. (18.13.5.10.4b) shall be provided for the remaining length of the pile.

18.13.5.10.5 For structures assigned to SDC D, E, or F, precast prestressed concrete piles shall satisfy (a) through (e) and the ductile pile region shall be defined as the length of pile measured from the bottom of the pile cap to the point of zero curvature plus 3 times the least pile dimension, but not less than 35 ft. If the total pile length in the soil is 35 ft or less, the ductile pile region shall be taken as the entire length of the pile:

(a) In the ductile pile region, the center-to-center spacing of spirals or hoop reinforcement shall not exceed the least of 0.2 times the least pile dimension, 6 times the diameter of the longitudinal strand, and 6 in.

(b) Spiral reinforcement shall be spliced by lapping one full turn, by welding, or by the use of a mechanical splice. If spiral reinforcement is lap spliced, the ends of the spiral shall terminate in a seismic hook. Mechanical and welded splices of deformed bars shall comply with 25.5.7.

(c) If the transverse reinforcement consists of spirals, or circular hoops, the volumetric ratio of transverse reinforcement, ρ_s , in the ductile pile region shall not be less than that calculated by Eq. (18.13.5.10.5a) or calculated from a more detailed analysis by Eq. (18.13.5.10.5b), and the required volumetric ratio shall be permitted to be obtained by providing an inner and outer spiral.

$$0.2(f'_c/f_{yt}) \quad (18.13.5.10.5a)$$

$$0.06(f'_c/f_{yt})[2.8 + 2.3P_U/f'_c A_g] \quad (18.13.5.10.5b)$$

and f_{yt} shall not be taken as greater than 100,000 psi

(d) Outside of the ductile pile region, spiral or hoop reinforcement shall be provided with a volumetric ratio not less than one-half of that required within the ductile pile region, and the maximum spacing shall be in accordance with Table 13.4.4.6(b).

exceed: $\rho_s = 0.021$ (Equation 18-7)

where:

A_g = Pile cross-sectional area, square inches (mm²).

f'_c = Specified compressive strength of concrete, psi (MPa).

f_{yh} = Yield strength of spiral reinforcement $\leq 85,000$ psi (586 MPa).

P = Axial load on pile, pounds (kN), as determined from Equations 16-5 and 16-7.

ρ_s = Volumetric ratio (vol. spiral/vol. core).

This required amount of spiral reinforcement is permitted to be obtained by providing an inner and outer spiral.

Exception: The minimum spiral reinforcement required by Equation 18-6 shall not apply in cases where the design includes full consideration of load combinations specified in ASCE 7, Section 2.3.6 and the applicable overstrength factor, Ω_o . In such cases, minimum spiral reinforcement shall be as specified in Section 1810.3.8.1.

6. Where transverse reinforcement consists of rectangular hoops and cross ties, the total cross-sectional area of lateral transverse reinforcement in the ductile region with spacing, s , and perpendicular dimension, h_c , shall conform to:

$$A_{sh} = 0.3sh_c(f'_c/f_{yh})(A_g/A_{ch} - 1.0)[0.5 + 1.4P/(f'_c A_g)]$$

(Equation 18-8)

but not less than:

$$A_{sh} = 0.12sh_c(f'_c/f_{yh}) [0.5 + 1.4P/(f'_c A_g)]$$
 (Equation 18-9)

where:

f_{yh} = yield strength of transverse reinforcement $\leq 70,000$ psi (483 MPa).

h_c = Cross-sectional dimension of pile core measured center to center of hoop reinforcement, inch (mm).

s = Spacing of transverse reinforcement measured along length of pile, inch (mm).

A_{sh} = Cross-sectional area of transverse reinforcement, square inches (mm²).

f'_c = Specified compressive strength of concrete, psi (MPa).

The hoops and cross ties shall be equivalent to deformed bars not less than No. 3 in size. Rectangular hoop ends shall terminate at a corner with seismic hooks.

(e) If transverse reinforcement consists of rectangular hoops and crossties, the total cross-sectional area of lateral transverse reinforcement in the ductile region shall be the greater of Eq. (18.13.5.10.5c) and Eq. (18.13.5.10.5d). The hoops and crossties shall be equivalent to deformed bars not less than No. 3 in size, and rectangular hoop ends shall terminate at a corner with seismic hooks.

$$A_{sh} = 0.3sb_c(f'_c/f_{yt})(A_g/A_{ch} - 1.0)[0.5 + 1.4P_u/(f'_c A_g)]$$

(18.13.5.10.5c)

$$A_{sh} = 0.12sb_c(f'_c/f_{yh}) [0.5 + 1.4P_u/(f'_c A_g)]$$

(18.13.5.10.5d)

and f_{yt} shall not be taken as greater than 100,000 psi

18.13.5.10.6 For structures assigned to SDC C, D, E, or F, the maximum factored axial load for precast prestressed piles subjected to a combination of earthquake lateral force and axial load shall not exceed the following values:

(a) $0.2 f'_c A_g$ for square piles

(b) $0.4 f'_c A_g$ for circular or octagonal piles

Outside of the length of the pile requiring transverse confinement reinforcing, the spiral or hoop reinforcing with a volumetric ratio not less than one-half of that required for transverse confinement reinforcing shall be provided.

1810.3.8.3.4 Axial load limit in Seismic Design Categories C through F. For structures assigned to Seismic Design Category C, D, E, or F, the maximum factored axial load on precast prestressed piles subjected to a combination of seismic lateral force and axial load shall not exceed the following values:

1. $0.2f_c'A_g$ for square piles

2. $0.4f_c'A_g$ for circular or octagonal piles

Cost Impact: The code change proposal will not increase or decrease the cost of construction

There is no cost increase or decrease associated with this code change proposal with eliminates requirements addressed in ACI 318 from the IBC to avoid confusion and potenital conflicts.

Proposal # 5475

S123-19

S124-19

IBC®: TABLE 1810.3.2.6

Proponent: Daniel Stevenson, P.E., representing GeoCoalition (dstevenson@berkelapg.com); Dale Biggers, P.E. GeoCoalition, representing GeoCoalition (dbiggers@bohbro.com); Lori Simpson, P.E., G.E., representing GeoCoalition (lsimpson@langan.com)

2018 International Building Code

Revise as follows:

**TABLE 1810.3.2.6
ALLOWABLE STRESSES FOR MATERIALS USED IN DEEP FOUNDATION ELEMENTS**

Portions of table not shown remain unchanged.

MATERIAL TYPE AND CONDITION	MAXIMUM ALLOWABLE STRESS ^a
1. Concrete or grout in compression ^b	
Cast-in-place with a permanent casing in accordance with Section 1810.3.2.7 or Section 1810.3.5.3.4	0.4 f _c
Cast-in-place in a pipe, tube, other permanent casing or rock	0.33 f _c
Cast-in-place without a permanent casing	0.3f _c
Precast nonprestressed	0.33f _c
Precast prestressed	0.33f _c -0.27 f _{pc}

- f'_c is the specified compressive strength of the concrete or grout; f_{pc} is the compressive stress on the gross concrete section due to effective prestress forces only; f_y is the specified yield strength of reinforcement; F_y is the specified minimum yield stress of steel; F_u is the specified minimum tensile stress of structural steel.
- The stresses specified apply to the gross cross-sectional area within the concrete surface. Where a temporary or permanent casing is used, the inside face of the casing shall be considered to be the concrete surface.

- Reason:**
- The code currently allows 0.40 f_c for thin-wall casing (Section 1810.3.2.7) because the concrete is confined. It is reasonable to allow the same 0.40 f_c when the concrete is confined by thicker-wall pipe or tube (in accordance with Section 1810.3.5.3.4)
 - Section 1810.3.2.7 is "Increased allowable compressive stress for cased mandrel-driven cast-in-place elements" which is a legacy requirement mainly for Raymond Step-taper corrugated shell piles which are much weaker than any pipe or tube defined in Section 1810.3.5.3.4.
 - Section 1810.3.5.3.4 is "Steel pipes and tubes" which have better confining ability than corrugated shells.
 - We have not increased the current limit for other permanent casing or rock because of the uncertain nature of "other permanent casing" and because rock is of variable quality.

Click here to see the members of the GeoCoalition : <http://www.piledrivers.org/2019-geocoalition-members/>

Cost Impact: The code change proposal will decrease the cost of construction
It will decrease costs in some cases since it may allow higher design loads where the geotechnical capacity is sufficiently higher than the structural strength.

Proposal # 4555

S124-19

S125-19

IBC@: TABLE 1810.3.2.6

Proponent: Daniel Stevenson, P.E., representing GeoCoalition (dstevenson@berkelapg.com); Dale Biggers, representing GeoCoalition (dbiggers@bohbro.com); Lori Simpson, P.E., G.E., representing GeoCoalition (lsimpson@langan.com)

2018 International Building Code

Revise as follows:

**TABLE 1810.3.2.6
ALLOWABLE STRESSES FOR MATERIALS USED IN DEEP FOUNDATION ELEMENTS**

Portions of table not shown remain unchanged.

MATERIAL TYPE AND CONDITION	MAXIMUM ALLOWABLE STRESS ^a
3. Steel in compression	
Cores within concrete-filled pipes or tubes	$0.5 F_y \leq 32,000$ psi
Pipes, tubes or H-piles, where justified in accordance with Section 1810.3.2.8	$0.5 F_y \leq 32,000$ psi
Pipes or tubes for micropiles	$0.4 F_y \leq 32,000$ psi
Other pipes, tubes or H-piles	$0.35 F_y \leq \del{16,000} 24,000$ psi
Helical piles	$0.6 F_y \leq 0.5 F_u$
5. Steel in tension	
Pipes, tubes or H-piles, where justified in accordance with Section 1810.3.2.8	$0.5 F_y \leq 32,000$ psi
Other pipes, tubes or H-piles	$0.35 F_y \leq \del{16,000} 24,000$ psi
Helical piles	$0.6 F_y \leq 0.5 F_u$

- f'_c is the specified compressive strength of the concrete or grout; f_{pc} is the compressive stress on the gross concrete section due to effective prestress forces only; f_y is the specified yield strength of reinforcement; F_y is the specified minimum yield stress of steel; F_u is the specified minimum tensile stress of structural steel.
- The stresses specified apply to the gross cross-sectional area within the concrete surface. Where a temporary or permanent casing is used, the inside face of the casing shall be considered to be the concrete surface.

Reason: 1. The proposal does not change the 0.35 F_y limit, but only increases the allowable upper limit to 24,000 psi because the yield strength for commonly available steel pilings has increased significantly. When the 16,000 psi upper limit was first established, the common steel yield was perhaps only 36,000 psi (e.g. A36). In 2018, yield strengths are normally 50,000 or 60,000 psi, and yields above 70,000 psi are available and in common use for piling. The code should consider the currently available materials to achieve an economic design.

2. Micropiles have a limit of $0.4 F_y \leq 32,000$ psi, which implies a yield of up to 80,000 psi. The same steel can be used in larger diameter pipes and $0.35 F_y$ of 80,000 psi is 28,000 psi.

Click here to see the members of the GeoCoalition : <http://www.piledrivers.org/2019-geocoalition-members/>

Cost Impact: The code change proposal will decrease the cost of construction

Limiting the upper level of allowable stress to 16,000 psi stress can cause a significant increase in cost of construction on some building projects.

Increasing the upper limit will result in a reduction of construction cost.

Proposal # 5077

S125-19

S126-19

IBC@: TABLE 1810.3.2.6

Proponent: Daniel Stevenson, P.E., representing GeoCoalition (dstevenson@berkelapg.com); Dale Biggers, P.E. GeoCoalition, representing GeoCoalition (dbiggers@bohbro.com); Lori Simpson, P.E., G.E., representing GeoCoalition (lsimpson@langan.com)

2018 International Building Code

Revise as follows:

**TABLE 1810.3.2.6
ALLOWABLE STRESSES FOR MATERIALS USED IN DEEP FOUNDATION ELEMENTS**

Portions of table not shown remain unchanged.

MATERIAL TYPE AND CONDITION	MAXIMUM ALLOWABLE STRESS ^a
4. Nonprestressed reinforcement in tension	
Within micropiles	0.6 f_y
Other conditions	
For load combinations that do not include wind or seismic loads	$0.5 f_y \leq 24,000-30,000$ psi
For load combinations that include wind or seismic loads	$0.5 f_y \leq 40,000$ psi

- a. f'_c is the specified compressive strength of the concrete or grout; f_{pc} is the compressive stress on the gross concrete section due to effective prestress forces only; f_y is the specified yield strength of reinforcement; F_y is the specified minimum yield stress of steel; F_u is the specified minimum tensile stress of structural steel.
- b. The stresses specified apply to the gross cross-sectional area within the concrete surface. Where a temporary or permanent casing is used, the inside face of the casing shall be considered to be the concrete surface.

Reason: 1. Limiting stresses to 30,000 psi will reduce cracking and the potential for corrosion for permanent load conditions, not including wind or earthquake.

2. Limiting stresses to 40,000 psi for temporary load conditions, including wind or earthquake, is appropriate (see reason 3 below).

3. Section 1901.2 states that structural concrete shall be designed and constructed in accordance with the requirements of IBC Chapter 19 and ACI 318. ACI 318 establishes an upper limit of F_y of 80,000 psi for non-prestressed reinforcing and therefore setting the upper limit at 40,000 psi (50% of 80,000 psi) provides consistency between IBC and ACI 318. ACI 318 design methods will typically produce a service level tension stress between 0.56 F_y and 0.64 F_y , therefore the code's current allowable stress of 0.50 F_y is slightly conservative compared to ACI 318.

4. IBC section 1810.3.1.1 allows concrete deep foundation elements to be designed using *approved* strength design methods, which in most cases will be ACI 318. The proposed revisions will provide for greater consistency between allowable stress design and strength design methods.

Click here to see the members of the GeoCoalition : <http://www.piledrivers.org/2019-geocoalition-members/>

Cost Impact: The code change proposal will decrease the cost of construction

The 24,000 psi stress limit has led to a significant increase in cost of construction on some building projects. Increasing the upper limit to a level consistent with that allowed by ACI 318 will result in a reduction of construction cost.

Proposal # 5042

S126-19

S127-19

IRC: TABLE 1810.3.2.6

Proponent: Dale Biggers, P.E. GeoCoalition, representing GeoCoalition (dbiggers@bohbro.com); Lori Simpson, P.E., G.E., representing GeoCoalition (lsimpson@langan.com); Daniel Stevenson, P.E., representing GeoCoalition (dstevenson@berkelapg.com)

2018 International Building Code

1810.3.2.6 Allowable stresses. The allowable stresses for materials used in deep foundation elements shall not exceed those specified in Table 1810.3.2.6.

Revise as follows:

**TABLE 1810.3.2.6
ALLOWABLE STRESSES FOR MATERIALS USED IN DEEP FOUNDATION ELEMENTS**

MATERIAL TYPE AND CONDITION	MAXIMUM ALLOWABLE STRESS ^a
1. Concrete or grout in compression ^b Cast-in-place with a permanent casing in accordance with Section 1810.3.2.7Cast-in-place in a pipe, tube, other permanent casing or rockCast-in-place without a permanent casingPrecast nonprestressedPrecast prestressed	$0.4 f'_c$ $0.33 f'_c$ $0.3 f'_c$ $0.33 f'_c$ $0.33 f'_c$ $0.27 f_{pc}$
2. Nonprestressed reinforcement in compression	$0.4 f_y \leq 30,000$ psi
3. Steel in compression Cores within concrete-filled pipes or tubesPipes, tubes or H-piles, where justified in accordance with Section 1810.3.2.8Pipes or tubes for micropilesOther pipes, tubes or H-pilesHelical piles	$0.5 F_y \leq 32,000$ psi $0.5 F_y \leq 32,000$ psi $0.4 F_y \leq 32,000$ psi $0.35 F_y \leq 16,000$ psi $0.6 F_y \leq 0.5 F_u$
4. Nonprestressed reinforcement in tensionWithin micropilesOther conditions	$0.6 f_y$ $0.5 f_y \leq 24,000$ psi
5. Steel in tensionPipes, tubes or H-piles, where justified in accordance with Section 1810.3.2.8Other pipes, tubes or H-pilesHelical piles	$0.5 F_y \leq 32,000$ psi $0.35 F_y \leq 16,000$ psi $0.6 F_y \leq 0.5 F_u$
6. Timber	In accordance with the ANSI/AWC NDS

- f'_c is the specified compressive strength of the concrete or grout; f_{pc} is the compressive stress on the gross concrete section due to effective prestress forces only; f_y is the specified yield strength of reinforcement; F_y is the specified minimum yield stress of steel; F_u is the specified minimum tensile stress of structural steel.
- The stresses specified apply to the gross cross-sectional area within of the concrete surface for precast prestressed piles and to the net cross-sectional area for all other piles. Where a temporary or permanent casing is used, the inside face of the casing shall be considered ~~to be the outer edge of the concrete surface cross-section.~~

Reason: The stresses should apply to the net area (gross area - steel reinforcement area) not to the gross sectional area. This would be consistent with other codes.

Click here to see the members of the GeoCoalition : <http://www.piledrivers.org/2019-geocoalition-members/>

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is a clarification of the code .

Proposal # 4742

S127-19

S128-19

IBC: TABLE 1810.3.2.6, 1810.3.2.7

Proponent: Stephen Szoke, American Concrete Institute, representing American Concrete Institute (steve.szoke@concrete.org); Scott Campbell, National Ready Mixed Concrete Association, representing National Ready Mixed Concrete Association (scampbell@nrmca.org)

2018 International Building Code

Delete without substitution:

~~1810.3.2.7 Increased allowable compressive stress for cased mandrel-driven cast-in-place elements.~~ The allowable compressive stress in the concrete shall be permitted to be increased as specified in Table 1810.3.2.6 for those portions of permanently cased cast-in-place elements that satisfy all of the following conditions:

- ~~1. The design shall not use the casing to resist any portion of the axial load imposed.~~
- ~~2. The casing shall have a sealed tip and be mandrel driven.~~
- ~~3. The thickness of the casing shall be not less than manufacturer's standard gage No.14 (0.068 inch) (1.75 mm).~~
- ~~4. The casing shall be seamless or provided with seams of strength equal to the basic material and be of a configuration that will provide confinement to the cast-in-place concrete.~~
- ~~5. The ratio of steel yield strength (F_y) to specified compressive strength (f'_c) shall be not less than six.~~
- ~~6. The nominal diameter of the element shall not be greater than 16 inches (406 mm).~~

Revise as follows:

**TABLE 1810.3.2.6
ALLOWABLE STRESSES FOR MATERIALS USED IN DEEP FOUNDATION ELEMENTS**

MATERIAL TYPE AND CONDITION	MAXIMUM ALLOWABLE STRESS ^a
1. Concrete or grout in compression ^b	<u>In accordance with ACI 318</u>
Cast in place with a permanent casing in accordance with Section 1810.3.2.7	$0.4 f'_c$
Cast in place in a pipe, tube, other permanent casing or rock	$0.33 f'_c$
Cast in place without a permanent casing	$0.3 f'_c$
Precast nonprestressed	$0.33 f'_c$
Precast prestressed	$0.33 f'_c - 0.27 f_{pc}$
2. Nonprestressed reinforcement in compression	$0.4 f_y \leq 30,000$ psi
	<u>In accordance with ACI 318</u>
3. Steel in compression	
Cores within concrete-filled pipes or tubes	$0.5 F_y \leq 32,000$ psi
Pipes, tubes or H-piles, where justified in accordance with Section 1810.3.2.8	$0.5 F_y \leq 32,000$ psi
Pipes or tubes for micropiles	$0.4 F_y \leq 32,000$ psi
Other pipes, tubes or H-piles	$0.35 F_y \leq 16,000$ psi
Helical piles	$0.6 F_y \leq 0.5 F_u$
4. Nonprestressed reinforcement in tension	
Within micropiles	$0.6 f_y$
Other conditions	$0.5 f_y \leq 24,000$ psi

5. Steel in tension	
Pipes, tubes or H-piles, where justified in accordance with Section 1810.3.2.8	$0.5F_y \leq 32,000$ psi
Other pipes, tubes or H-piles	$0.35 F_y \leq 16,000$ psi
	$0.6 F_y \leq 0.5 F_u$
6. Timber	In accordance with the ANSI/AWC NDS

- a. ~~f'_c is the specified compressive strength of the concrete or grout; f_{pe} is the compressive stress on the gross concrete section due to effective prestress forces only; f_y is the specified yield strength of reinforcement; F_y is the specified minimum yield stress of steel; F_u is the specified minimum tensile stress of structural steel.~~
- b. ~~The stresses specified apply to the gross cross-sectional area within the concrete surface. Where a temporary or permanent casing is used, the inside face of the casing shall be considered to be the concrete surface.~~

Reason: This proposed code change makes four modifications to the 2018 IBC:

1. In Section 1810.3.2.6, ACI 318 is added to Item 1 as the method for design and construction of concrete deep foundations. This aligns the code with the methodology in ACI 318. A comparison of the provisions removed from the 2018 IBC and the requirements in ACI 318 are shown in Table 1.
2. In Section 1810.3.2.7, all text is deleted as this information is provided in ACI 318. Comparison of the text in 2018 IBC and ACI 318 is shown in Table 2. Requirements are identical, except ACI 318 language more clearly communicates that there are other permissible design and construction methods in accordance with Chapter 10 of ACI 318.

Table 1

Comparison of 2018 IBC and ACI 318 Requirements

2018 IBC	ACI 318
1810.3.2.7 Increased allowable compressive stress for cased mandrell-driven cast-in-place elements. The allowable compressive stress in the concrete shall be permitted to be increased as specified in Table 1810.3.2.6 for those portions of permanently cased cast-in-place elements that satisfy all of the following conditions:	13.4.2 Allowable axial capacity
1. The design shall not use the casing to resist any portion of the axial load imposed.	13.4.2.1 Where concrete deep foundation elements are laterally supported for the entire height and the applied forces cause bending moments no greater than those resulting from accidental eccentricities, structural design of the element using unfactored loads and the allowable capacities specified in Table 13.4.2.2 is permitted. Otherwise, the structural design of concrete deep foundation elements shall be in accordance with Chapter 10.
2. The casing shall have a sealed tip and be mandrel driven.	13.4.2.2 The maximum allowable axial capacity of deep foundation members shall be in accordance with Table 13.4.2.2.
3. The thickness of the casing shall be not less than manufacturer's standard gage No.14 (0.068 inch) (1.75 mm).	13.4.2.2.1 The allowable axial capacity for permanently cased cast-in-place concrete deep foundation members that satisfy (a) through (f) shall be permitted to be increased to the value given in Table 13.4.2.2:
4. The casing shall be seamless or provided with seams of strength equal to the basic material and be of a configuration that will provide confinement to the cast-in-place concrete.	(a) The design shall not use the casing to resist any portion of the axial load imposed.
5. The ratio of steel yield strength (F_y) to specified compressive strength (f'_c) shall be not less than six.	(b) The casing shall have a sealed tip and be mandrel-driven.
6. The nominal diameter of the element shall not be greater than 16 inches (406 mm).	(c) The thickness of the casing shall not be less than manufacturer's standard gage No.14 (0.068 inch).
	(d) The casing shall be seamless or provided with seams of strength equal to the basic material and be of a configuration that will provide confinement to the cast-in-place concrete.
	(e) The ratio of steel yield strength of the casing to f'_c shall be not less than six.
	(f) The nominal diameter of the element shall be not greater than 16-in.

Table 2 Comparison of 2018 IBC TABLE 1810.3.2.6 and ACI 13.4.2.2

ALLOWABLE STRESSES FOR MATERIALS USED IN DEEP FOUNDATION ELEMENTS

Material Type and Condition	IBC 2018	ACI 318
	Maximum allowable Stress	MAXIMUM CAPACITY
1. Concrete or grout in compression	$0.4 f'_c$	$P_n = 0.4f'_c A_g$
Cast-in-place with a permanent casing in accordance with Section 1810.3.2.7	$0.33 f'_c$	$P_n = 0.33f'_c A_g + 0.4f_y A_s$
Cast-in-place in a pipe, tube, other permanent casing or rock	$0.3 f'_c$	$P_n = 0.3f'_c A_g + 0.4f_y A_s$
Cast-in-place without a permanent casing	$0.33 f'_c$	$P_n = 0.33f'_c A_g + 0.4f_y A_s$
Precast nonprestressed	$0.33 f'_c - 0.27 f_{pc}$	$P_n = (0.33f'_c - 0.27f_{pe}) A_g$
Precast prestressed		

The reference to ACI 318 is not a new concept for obtaining information for deep foundations. The IBC currently refers to the American Wood Council for provisions for deep timber foundations.

ACI, a professional technical society, supports these revisions to better align the IBC with current design and construction methodologies addressed in ACI 318 and to better communicate to the user that there additional methods that could result in lower initial costs and for conditions not addressed in 2018 IBC. ACI recommends that the committee approve this code change as submitted.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

There is no increase in cost of construction. This proposal aligns the IBC with the methods used for concrete design and construction in accordance with ACI 318.

Proposal # 4569

S128-19

S129-19

IBC@: 1810.3.3.1

Proponent: Dale Biggers, P.E. GeoCoalition, representing GeoCoalition (dbiggers@bohbro.com); Daniel Stevenson, P.E., representing GeoCoalition (dstevenson@berkelapg.com); Lori Simpson, P.E., G.E., representing GeoCoalition (lsimpson@langan.com)

2018 International Building Code

Revise as follows:

1810.3.3.1 Allowable axial load. The allowable axial load on a deep foundation element shall be determined in accordance with Sections 1810.3.3.1.1 through 1810.3.3.1.9.

Exception: Load testing is not required where approved by the building official.

Reason: The load test waiver provision is at the discretion of the building official and was added to cover the case where applicable local knowledge and experience exist, such as nearby load test data on similar piles in similar subsurface conditions.

Click here to see the members of the GeoCoalition : <http://www.piledrivers.org/2019-geocoalition-members/>

Cost Impact: The code change proposal will decrease the cost of construction

It will decrease the cost of construction if the load test can be waived based on previous experience.

Proposal # 5182

S129-19

S130-19

IBC®: 1810.3.3.1.9

Proponent: Dale Biggers, P.E. GeoCoalition, representing GeoCoalition (dbiggers@bohbro.com); Daniel Stevenson, P.E., representing GeoCoalition (dstevenson@berkelapg.com); Lori Simpson, P.E., G.E., representing GeoCoalition (lsimpson@langan.com)

2018 International Building Code

Revise as follows:

1810.3.3.1.9 Helical piles. The allowable axial design load, P_a , of helical piles shall be determined as follows:

$$P_a = 0.5 P_u$$

(Equation 18-4)

where P_u is the least value of:

1. Base capacity plus shaft resistance of the helical pile. The base capacity is equal to the sum of the areas of the helical bearing plates times the ultimate bearing capacity of the soil or rock comprising the bearing stratum. The shaft resistance only above the uppermost helical bearing plate shall be considered.

2. Ultimate capacity determined from well-documented correlations with installation torque.

3. Ultimate capacity determined from load tests when required by Section 1810.3.3.1.2.

4. Ultimate axial capacity of pile shaft.

5. Ultimate axial capacity of pile shaft couplings.

6. Sum of the ultimate axial capacity of helical bearing plates affixed to pile.

Reason: Value 1: Larger helical pile elements are now common and shaft friction can play an important role for larger shaft diameters. This addition allows for shaft resistance to be taken into account. "Shaft resistance" is the term used to be consistent with Section 1810.3.3.1.4.

Value 3: This item has been misinterpreted to always require load tests. Load testing is costly for small residential projects where helical piles are often used. The requirement for load testing of all piles is covered in Section 1810.3.3.1.2

Click here to see the members of the GeoCoalition : <http://www.piledrivers.org/2019-geocoalition-members/>

Cost Impact: The code change proposal will decrease the cost of construction

This change will reduce the cost of construction for those helical piles where shaft friction can be taken into account and for those situations which do not require a load test.

Proposal # 5136

S130-19

S131-19

IBC®: 1810.3.4

Proponent: Dale Biggers, P.E. GeoCoalition, representing GeoCoalition (dbiggers@bohbro.com); Daniel Stevenson, P.E., representing GeoCoalition (dstevenson@berkelapg.com); Lori Simpson, P.E., G.E., representing GeoCoalition (lsimpson@langan.com)

2018 International Building Code

Revise as follows:

1810.3.4 Subsiding soils or strata. Where deep foundation elements are installed through subsiding ~~fills~~ soils or other subsiding strata and derive support from underlying firmer materials, consideration shall be given to the downward frictional forces potentially imposed on the elements by the subsiding upper strata. Where the influence of subsiding ~~fills~~ soils or strata is considered as imposing loads on the element, the allowable stresses specified in this chapter shall be permitted to be increased where satisfactory substantiating data are submitted.

Reason: · The title of the current Section is “Subsiding soils” – changes are made in the text to match the title.

· Subsiding material includes more than just fill – the change to “soils” includes native soils and fills. Other subsiding strata include manmade material that can subside.

· The title is changed to reflect the existing text which mentions “strata”.

Click here to see the members of the GeoCoalition : <http://www.piledrivers.org/2019-geocoalition-members/>

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The change has no cost impact because it is only a clarification of the code.

Proposal # 4983

S131-19

S132-19

IBC@: 1810.3.5.3.1, 1810.3.11.2

Proponent: Jon-Paul Cardin, American Iron and Steel Institute, representing American Institute of Steel Construction (JCardin@steel.org)

2018 International Building Code

Revise as follows:

1810.3.5.3.1 Structural steel H-piles. Sections of structural steel H-piles shall comply with the requirements for HP shapes in ASTM A6, or the following:

1. The flange projections shall not exceed 14 times the minimum thickness of metal in either the flange or the web and the flange widths shall be not less than 80 percent of the depth of the section.
2. The nominal depth in the direction of the web shall be not less than 8 inches (203 mm).
3. Flanges and web shall have a minimum nominal thickness of $\frac{3}{8}$ inch (9.5 mm).

For structures assigned to Seismic Design Category D, E, or F, design and detailing of H-piles shall also conform to the requirements of AISC 341.

1810.3.11.2 Seismic Design Categories D through F. For structures assigned to *Seismic Design Category* D, E or F, deep foundation element resistance to uplift forces or rotational restraint shall be provided by anchorage into the pile cap, designed considering the combined effect of axial forces due to uplift and bending moments due to fixity to the pile cap. Anchorage shall develop not less than 25 percent of the strength of the element in tension. Anchorage into the pile cap shall comply with the following:

1. In the case of uplift, the anchorage shall be capable of developing the least of the following:
 - 1.1. The nominal tensile strength of the longitudinal reinforcement in a concrete element. .
 - 1.2. The nominal tensile strength of a steel element. .
 - 1.3. The frictional force developed between the element and the soil multiplied by 1.3.
2. In the case of rotational restraint, the anchorage shall be designed to resist the axial and shear forces, and moments resulting from the seismic load effects including overstrength factor in accordance with Section 2.3.6 or 2.4.5 of ASCE 7 or the anchorage shall be capable of developing the full axial, bending and shear nominal strength of the element.
3. The connection between the pile cap and the steel H-piles or unfilled steel pipe piles in structures assigned to Seismic Design Category D, E, or F shall be designed for a tensile force of not less than 10 percent of the pile compression capacity.

Exception: The anchorage is permitted to be designed to resist the axial tension force resulting from the seismic load effects including overstrength factor in accordance with Section 2.3.6 or 2.4.5 of ASCE 7.

Exception: Connection tensile capacity need not exceed the strength required to resist seismic load effects including overstrength of ASCE 7 Section 12.4.3 or 12.14.3.2. Connections need not be provided where the foundation or supported structure does not rely on the tensile capacity of the piles for stability under the design seismic force.

Where the vertical lateral-force-resisting elements are columns, the pile cap flexural strengths shall exceed the column flexural strength. The connection between batter piles and pile caps shall be designed to resist the nominal strength of the pile acting as a short column. Batter piles and their connection shall be designed to resist forces and moments that result from the application of seismic load effects including overstrength factor in accordance with Section 2.3.6 or 2.4.5 of ASCE 7.

Reason: The purpose of this proposal is to correct an oversight and bring in modifications from ASCE 7-16, Section 14.1.8 to IBC Chapter 18. Interestingly, the language has been part of ASCE 7 since the 2005 edition, but not been brought forward to the IBC previously. Since ASCE 7 Chapter 14 is not typically adopted in the IBC for steel, it is necessary to add the language directly. ASCE 7-16 Commentary states: "Steel piles used in higher SDCs are expected to yield just under the pile cap or foundation because of combined bending and axial load. Design and detailing requirements of AISC 341 for H-piles are intended to produce stable plastic hinge formation in the piles. Because piles can be subjected to tension caused by overturning moment, mechanical means to transfer such tension must be designed for the required tension force, but not less than 10% of the pile compression capacity."

Bibliography: AISC (2016), *Seismic Provisions for Structural Steel Buildings*, ANSI/AISC 341-16, American Institute of Steel Construction, Chicago, IL.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal is not intended to make technical changes to the design or construction of H-piles. It is simply intended to clarify the currently accepted practice.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASCE 4-16, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

S133-19

IBC: 1810.3.6

Proponent: Dale Biggers, P.E. GeoCoalition, representing GeoCoalition (dbiggers@bohros.com); Daniel Stevenson, P.E., representing GeoCoalition (dstevenson@berkelapg.com); Lori Simpson, P.E., G.E., representing GeoCoalition (lsimpson@langan.com)

2018 International Building Code

Revise as follows:

1810.3.6 Splices. Splices shall be constructed so as to provide and maintain true alignment and position of the component parts of the deep foundation element during installation and subsequent thereto and shall be designed to resist the axial and shear forces and moments occurring at the location of the splice during driving and for design load combinations. Where deep foundation elements of the same type are being spliced, splices shall develop not less than 50 percent of the bending strength of the weaker section. Where deep foundation elements of different materials or different types are being spliced, splices shall develop the full compressive strength and not less than 50 percent of the tension and bending strength of the weaker section. Where structural steel cores are to be spliced, the ends shall be milled or ground to provide full contact and shall be full-depth welded.

Exception: Splices conforming to generally accepted engineering practices and where approved by the building official.

Splices occurring in the upper 10 feet (3048 mm) of the embedded portion of an element shall be designed to resist at allowable stresses the moment and shear that would result from an assumed eccentricity of the axial load of 3 inches (76 mm), or the element shall be braced in accordance with Section 1810.2.2 to other deep foundation elements that do not have splices in the upper 10 feet (3048 mm) of embedment.

Reason: 1. Section 1810.3.6 already requires that splices "...shall be designed to resist the axial and shear forces and moments occurring at the location of the splice...". Conformance with this requirement already ensures the structural integrity of the splice. Section 1810.3.6.1 contains more restrictive splice requirements for structures assigned to seismic design categories C through F.

2. The current specification precludes commonly available splices that would be acceptable in many design situations, such as a splice located at significant depth. (i.e., where significant tension or bending demands are not expected or possible. Load requirements at the splice diminish due to soil resistance above the splice as the splice is located deeper.).

3. The depth of the splice is known when you are driving to a predefined depth. For example where 240-ft long friction piles are driven to a predefined depth, the splice between two 120-ft sections will be 120-ft below grade.

4. The current code causes unnecessary costs.

Example a.) To make a welded splice on a 20-inch diameter pipe pile costs \$ 1,015 in labor and equipment. To buy a drive-fit pipe-to-pipe splicer costs \$ 495. For 211 piles at \$520 extra, the added cost was \$ 109,720.

Example b.) A tension splice for a 14-inch square prestressed concrete pile costs \$ 553 to purchase. A drive-fit splice for that pile costs \$ 201. For 2,420 piles at \$ 352 extra, the added cost was \$ 851,000.

These are real costs on real jobs, not hypothetical examples.

5. Drive-fit splices were used successfully on the New Orleans Superdome, 52-story Shell Square, 50-story Sheraton Hotel, and many other New Orleans structures. These buildings are more than 40 years old.

6. "Supporting data" may include a geotechnical investigation and/or a load test; this requirement is similar to Section 1810.3.2.8.

Click here to see the members of the GeoCoalition : <http://www.piledrivers.org/2019-geocoalition-members/>

Cost Impact: The code change proposal will decrease the cost of construction

The proposed change will decrease the cost of construction but only in some areas of the country.

Proposal # 4963

S133-19

S134-19

IBC®: 1810.3.8, 1810.3.8.1, 1810.3.8.2, 1810.3.8.2.1, 1810.3.8.2.2, 1810.3.8.2.3, 1810.3.8.3, 1810.3.8.3.1, 1810.3.8.3.2, 1810.3.8.3.3, 1810.3.8.3.4

Proponent: Jason Krohn, Precast/Prestressed Concrete Institute, representing Precast/Prestressed Concrete Institute (jkrohn@pci.org)

2018 International Building Code

Revise as follows:

1810.3.8 Precast concrete piles. Precast concrete piles shall be designed and detailed in accordance with Sections ~~1810.3.8.1 through 1810.3.8.3~~ ACI 318.

Exceptions:

1. Or precast prestressed piles in Seismic Design Category C, the minimum spiral reinforcement required by Section 18.13.5.10.4 of ACI 318 shall not apply in cases where the design includes full consideration of load combinations specified in ASCE 7, Section 2.3.6 or Section 2.4.5 and the applicable overstrength factor, Ω_0 . In such cases, minimum spiral reinforcement index shall be as specified in Section 13.4.5.6 of ACI 318.

2. For precast prestressed piles in Seismic Design Categories D through F, the minimum spiral reinforcement required by Section 18.13.5.10.5(c) of ACI 318 shall not apply in cases where the design includes full consideration of load combinations specified in ASCE 7, Section 2.3.6 or Section 2.4.5 and the applicable overstrength factor, Ω_0 . In such cases, minimum spiral reinforcement shall be as specified in Section 13.4.5.6 of ACI 318.

Delete without substitution:

1810.3.8.1 Reinforcement. Longitudinal steel shall be arranged in a symmetrical pattern and be laterally tied with steel ties or wire spiral spaced center to center as follows:

- 1- At not more than 1 inch (25 mm) for the first five ties or spirals at each end; then
- 2- At not more than 4 inches (102 mm), for the remainder of the first 2 feet (610 mm) from each end; and then
- 3- At not more than 6 inches (152 mm) elsewhere.

The size of ties and spirals shall be as follows:

- 1- For piles having a least horizontal dimension of 16 inches (406 mm) or less, wire shall not be smaller than 0.22 inch (5.6 mm) (No. 5 gage).
- 2- For piles having a least horizontal dimension of more than 16 inches (406 mm) and less than 20 inches (508 mm), wire shall not be smaller than 0.238 inch (6 mm) (No. 4 gage).
- 3- For piles having a least horizontal dimension of 20 inches (508 mm) and larger, wire shall not be smaller than $\frac{3}{4}$ inch (6.4 mm) round or 0.259 inch (6.6 mm) (No. 3 gage).

1810.3.8.2 Precast nonprestressed piles. Precast nonprestressed concrete piles shall comply with the requirements of Sections ~~1810.3.8.2.1 through 1810.3.8.2.3~~.

1810.3.8.2.1 Minimum reinforcement. Longitudinal reinforcement shall consist of not fewer than four bars with a minimum longitudinal reinforcement ratio of 0.008.

1810.3.8.2.2 Seismic reinforcement in *Seismic Design Categories C through F.* For structures assigned to *Seismic Design Category C, D, E or F*, precast nonprestressed piles shall be reinforced as specified in this section. The minimum longitudinal reinforcement ratio shall be 0.01 throughout the length. Transverse reinforcement shall consist of closed ties or spirals with a minimum $\frac{3}{8}$ inch (9.5 mm) diameter. Spacing of transverse reinforcement shall not exceed the smaller of eight times the diameter of the smallest longitudinal bar or 6 inches (152 mm) within a distance of three times the least pile dimension from the bottom of the pile cap. Spacing of transverse reinforcement shall not exceed 6 inches (152 mm) throughout the remainder of the pile.

1810.3.8.2.3 Additional seismic reinforcement in *Seismic Design Categories D through F.* For structures assigned to *Seismic Design Category D, E or F*, transverse reinforcement shall be in accordance with Section ~~1810.3.9.4.2~~.

1810.3.8.3 Precast prestressed piles. Precast prestressed concrete piles shall comply with the requirements of Sections ~~1810.3.8.3.1 through 1810.3.8.3.3~~.

1810.3.8.3.1 Effective prestress. The effective prestress in the pile shall be not less than 400 psi (2.76 MPa) for piles up to 30 feet (9144 mm) in length, 550 psi (3.79 MPa) for piles up to 50 feet (15 240 mm) in length and 700 psi (4.83 MPa) for piles greater than 50 feet (15 240 mm) in length. Effective prestress shall be based on an assumed loss of 30,000 psi (207 MPa) in the prestressing steel. The tensile stress in the prestressing steel shall not exceed the values specified in ACI 318.

1810.3.8.3.2 Seismic reinforcement in Seismic Design Category C. For structures assigned to *Seismic Design Category C*, precast prestressed piles shall have transverse reinforcement in accordance with this section. The volumetric ratio of spiral reinforcement shall not be less than the amount required by the following formula for the upper 20 feet (6096 mm) of the pile.

~~$$\rho_s = 0.04 \left(\frac{f'_c}{f_{yh}} \right) \left[2.5 + \frac{2.34P}{f'_c A_g} \right] \tag{Equation 18-5}$$~~

where:

A_g = Pile cross-sectional area square inches (mm^2).

f'_c = Specified compressive strength of concrete, psi (MPa).

f_{yh} = Yield strength of spiral reinforcement \leq 85,000 psi (586 MPa).

P = Axial load on pile, pounds (kN), as determined from Equations 16-5 and 16-7.

ρ_s = Spiral reinforcement index or volumetric ratio (vol. spiral/vol. core).

Not less than one-half the volumetric ratio required by Equation 18-5 shall be provided below the upper 20 feet (6096 mm) of the pile.

Exception: The minimum spiral reinforcement index required by Equation 18-5 shall not apply in cases where the design includes full consideration of load combinations specified in ASCE 7, Section 2.3.6 and the applicable overstrength factor, Ω_o . In such cases, minimum spiral reinforcement index shall be as specified in Section 1810.3.8.1.

1810.3.8.3.3 Seismic reinforcement in Seismic Design Categories D through F. For structures assigned to *Seismic Design Category D, E or F*, precast prestressed piles shall have transverse reinforcement in accordance with the following:

1. Requirements in ACI 318, Chapter 18, need not apply, unless specifically referenced.
2. Where the total pile length in the soil is 35 feet (10 668 mm) or less, the lateral transverse reinforcement in the ductile region shall occur through the length of the pile. Where the pile length exceeds 35 feet (10 668 mm), the ductile pile region shall be taken as the greater of 35 feet (10 668 mm) or the distance from the underside of the pile cap to the point of zero curvature plus three times the least pile dimension.
3. In the ductile region, the center-to-center spacing of the spirals or hoop reinforcement shall not exceed one-fifth of the least pile dimension, six times the diameter of the longitudinal strand or 8 inches (203 mm), whichever is smallest.
4. Circular spiral reinforcement shall be spliced by lapping one full turn and bending the end of each spiral to a 90-degree hook or by use of a mechanical or welded splice complying with Section 25.5.7 of ACI 318.
5. Where the transverse reinforcement consists of circular spirals, the volumetric ratio of spiral transverse reinforcement in the ductile region shall comply with the following:

~~$$\rho_s = 0.06 \left(\frac{f'_c}{f_{yh}} \right) \left[2.5 + \frac{2.34P}{f'_c A_g} \right] \tag{Equation 18-6}$$~~

but not exceed:

~~$$\rho_s = 0.021 \tag{Equation 18-7}$$~~

where:

A_g = Pile cross-sectional area, square inches (mm^2).

f'_c = Specified compressive strength of concrete, psi (MPa).

f_{yh} = Yield strength of spiral reinforcement = 85,000 psi (586 MPa).

P = Axial load on pile, pounds (kN), as determined from Equations 16-5 and 16-7.

ρ_s = Volumetric ratio (vol. spiral/vol. core).

This required amount of spiral reinforcement is permitted to be obtained by providing an inner and outer spiral.

Exception: The minimum spiral reinforcement required by Equation 18-6 shall not apply in cases where the design includes full consideration of load combinations specified in ASCE 7, Section 2.3.6 and the applicable overstrength factor, Ω_o . In such cases, minimum spiral reinforcement shall be as specified in Section 1810.3.8.1.

6. Where transverse reinforcement consists of rectangular hoops and cross ties, the total cross-sectional area of lateral transverse reinforcement in the ductile region with spacing, s , and perpendicular dimension, b_c , shall conform to:

~~$$A_{sh} = 0.2s_b (f'_c / f_y) (A_g / A_{ch} - 1.0)$$

$$[0.5 + 1.4P / (f'_c A_g)]$$~~

(Equation 18-8)

but not less than:

~~$$A_{sh} = 0.12s_b (f'_c / f_y) [0.5 + 1.4P / (f'_c A_g)]$$~~

(Equation 18-9)

where:

f_y = yield strength of transverse reinforcement $\leq 70,000$ psi (483 MPa);

h_c = Cross-sectional dimension of pile core measured center to center of hoop reinforcement, inch (mm);

s_b = Spacing of transverse reinforcement measured along length of pile, inch (mm);

A_{sh} = Cross-sectional area of transverse reinforcement, square inches (mm²);

f'_c = Specified compressive strength of concrete, psi (MPa);

The hoops and cross ties shall be equivalent to deformed bars not less than No. 3 in size. Rectangular hoop ends shall terminate at a corner with seismic hooks.

Outside of the length of the pile requiring transverse confinement reinforcing, the spiral or hoop reinforcing with a volumetric ratio not less than one-half of that required for transverse confinement reinforcing shall be provided.

1810.3.8.3.4 Axial load limit in Seismic Design Categories C through F. For structures assigned to *Seismic Design Category C, D, E, or F*, the maximum factored axial load on precast prestressed piles subjected to a combination of seismic lateral force and axial load shall not exceed the following values:

1. $0.2f'_c A_g$ for square piles
2. $0.4f'_c A_g$ for circular or octagonal piles

Reason: Section 1810.3.8 of the IBC, along with its subsections, is mostly being deleted because similar provisions have been approved for inclusion in the 2019 edition of ACI 318. Deletion of these provisions from the IBC is necessary to eliminate any potential conflict between the 2021 IBC and ACI 318-19.

Two exceptions for precast prestressed piles are currently present in Sections 1810.3.8.3.2 (for SDC C) and 1810.3.8.3.3 Item 5 (for SDCs D through F). These are being retained because corresponding provisions have not been added to ACI 318-19. The exception statements are similar to other overstrength statements in this code and referenced load and material standards. The exceptions recognize that the volumetric ratio of spiral reinforcement need not be greater than that required for driving and handling stresses when the pile foundation system is designed for load combinations including overstrength. The minimum spiral reinforcement required per Section 13.4.5.6 of ACI 318-19 for driving and handling stresses is the minimum spiral reinforcement required for Seismic Design Categories A and B. In summary, when design includes the effect of overstrength, the increased axial forces, shear forces, and bending moments in the pile provide a large factor of safety against nonlinear pile behavior.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This code change proposal will not affect the cost of construction since it is removing duplicate provisions that already appear in a referenced standard.

Proposal # 5040

S134-19

S135-19

IBC@: 1810.3.11, 1810.3.11.1, 1810.3.11.2

Proponent: Stephen Szoke, representing American Concrete Institute (steve.szoke@concrete.org)

2018 International Building Code

Revise as follows:

1810.3.11 Pile caps. ~~Pile caps shall conform with ACI 318 and this section.~~ Pile caps shall be of reinforced concrete, and shall include all elements to which vertical deep foundation elements are connected, including grade beams and mats. The soil immediately below the pile cap shall not be considered as carrying any vertical load, with the exception of a combined pile raft. The tops of vertical deep foundation elements shall be embedded not less than 3 inches (76 mm) into pile caps and the caps shall extend not less than 4 inches (102 mm) beyond the edges of the elements. The tops of elements shall be cut or chipped back to sound material before capping.

Delete without substitution:

~~**1810.3.11.1 Seismic Design Categories C through F.** For structures assigned to *Seismic Design Category C, D, E or F*, concrete deep foundation elements shall be connected to the pile cap by embedding the element reinforcement or field-placed dowels anchored in the element into the pile cap for a distance equal to their development length in accordance with ACI 318. It shall be permitted to connect precast prestressed piles to the pile cap by developing the element prestressing strands into the pile cap provided that the connection is ductile. For deformed bars, the development length is the full development length for compression, or tension in the case of uplift, without reduction for excess reinforcement in accordance with Section 25.4.10 of ACI 318. Alternative measures for laterally confining concrete and maintaining toughness and ductile-like behavior at the top of the element shall be permitted provided that the design is such that any hinging occurs in the confined region. The minimum transverse steel ratio for confinement shall be not less than one-half of that required for columns.~~

~~For resistance to uplift forces, anchorage of steel pipes, tubes or H-piles to the pile cap shall be made by means other than concrete bond to the bare steel section. Concrete-filled steel pipes or tubes shall have reinforcement of not less than 0.01 times the cross-sectional area of the concrete fill developed into the cap and extending into the fill a length equal to two times the required cap embedment, but not less than the development length in tension of the reinforcement.~~

Revise as follows:

~~**1810.3.11.2**~~ **1810.3.11.1 Seismic Design Categories D through F.** For structures assigned to *Seismic Design Category D, E or F*, deep foundation element resistance to uplift forces or rotational restraint shall be provided by anchorage into the pile cap, designed considering the combined effect of axial forces due to uplift and bending moments due to fixity to the pile cap. Anchorage shall develop not less than 25 percent of the strength of the element in tension. Anchorage into the pile cap shall comply with the following:

1. In the case of uplift, the anchorage shall be capable of developing the least of the following:
 - 1.1. The nominal tensile strength of the longitudinal reinforcement in a concrete element.
 - 1.2. The nominal tensile strength of a steel element.
 - 1.3. The frictional force developed between the element and the soil multiplied by 1.3.

Exception: The anchorage is permitted to be designed to resist the axial tension force resulting from the seismic load effects including overstrength factor in accordance with Section 2.3.6 or 2.4.5 of ASCE 7.

2. In the case of rotational restraint, the anchorage shall be designed to resist the axial and shear forces, and moments resulting from the seismic load effects including overstrength factor in accordance with Section 2.3.6 or 2.4.5 of ASCE 7 or the anchorage shall be capable of developing the full axial, bending and shear nominal strength of the element.

Where the vertical lateral-force-resisting elements are columns, the pile cap flexural strengths shall exceed the column flexural strength. The connection between batter piles and pile caps shall be designed to resist the nominal strength of the pile acting as a short column. Batter piles and their connection shall be designed to resist forces and moments that result from the application of seismic load effects including overstrength factor in accordance with Section 2.3.6 or 2.4.5 of ASCE 7.

Reason: This Code change includes revisions and additions to the Code in an effort to eliminate conflicting provisions in ACI 318-14, ASCE 7-16 and IBC-2018 regarding design of deep foundations for earthquake resistant structures. Subcommittee F, Foundations, of ACI 318 has coordinated efforts with members from ASCE 7 to bring the concrete material design requirements for foundations to one location. ASCE 7 started this effort in their cycle ending in 2016. The changes to ACI 318 shown here is the continuation of that effort. A side-by-side comparison is provided, however, difficult to follow with all the changes and dissimilar format. For a more comprehensive look at the changes in ACI 318, please review the public comment version available at <https://www.concrete.org/publications/standards/upcomingstandards.aspx>

ACI, a 501(c)3 professional technical society, recommends approval as submitted to help avoid confusion and potential conflicts where similar requirements exist in both the IBC and ACI 318.

IBC 2018	ACI 318
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1810.3.11.1 Seismic Design Categories C through F. For structures assigned to Seismic Design Category C, D, E or F, concrete deep foundation elements shall be reinforcement or field-placed dowels anchored in the element into the pile cap for a distance equal to their development length in accordance with ACI 318. It shall be permitted to connect precast prestressed piles to the pile cap by developing the element prestressing strands into the pile cap provided that the connection is ductile. For deformed bars, the development length is the full development length for compression, or tension in the case of uplift, without reduction for excess reinforcement in accordance with Section 25.4.10 of ACI 318. Alternative measures for laterally confining concrete and maintaining toughness and ductile-like behavior at the top of the element shall be permitted provided that the design is such that any hinging occurs in the confined region.

The minimum transverse steel ratio for confinement shall be not less than one-half of that required for columns. For resistance to uplift forces, anchorage of steel pipes, tubes or H-piles to the pile cap shall be made by means other than concrete bond to the bare steel section. Concrete-filled steel pipes or tubes shall have reinforcement of not less than 0.01 times the cross-sectional area of the concrete fill developed into the cap and extending into the fill a length equal to two times the required cap embedment, but not less than the development length in tension of the reinforcement

18.13.6 Anchorage of piles, piers, and caissons

18.13.6.1 For structures assigned to SDC C, D, E, or F, the longitudinal reinforcement in piles, piers, or caissons resisting tension loads shall be detailed to transfer tension forces within the pile cap to supported structural members.

18.13.6.2 For structures assigned to SDC C, D, E, or F, concrete piles and concrete filled pipe piles shall be connected to the pile cap by embedding the pile reinforcement in the pile cap a distance equal to the development length or by the use of field-placed dowels anchored in the concrete pile. For deformed bars, the compression development length is used if the pile is in compression. In the case of uplift, the tension development length is used without reduction in length for excess reinforcement.

18.13.6.3 For structures assigned to SDC D, E, or F, if tension forces induced by earthquake effects are transferred between pile cap or mat foundation and precast pile by reinforcing bars grouted or post-installed in the top of the pile, the grouting system shall have been demonstrated by testing to develop at least $1.25f_y$ of the bar.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. There is no cost increase or decrease, as the technical requirements remain essential unchanged. The proposal eliminates content from the IBC that is addressed in ACI 318.

S136-19

IBC@: 1810.3.12, 1810.3.13

Proponent: Stephen Szoke, representing American Concrete Institute (steve.szoke@concrete.org)

2018 International Building Code

Revise as follows:

1810.3.12 Grade beams. ~~For structures assigned to Seismic Design Category D, E or F, grade~~ Grade beams shall comply with the provisions in Section 18.13.3 of ACI 318 ~~for grade beams, except where they are.~~

Exception: Grade beams designed to resist the seismic load effects including overstrength factor in accordance with Section 2.3.6 or 2.4.5 of ASCE 7.

1810.3.13 Seismic ties. ~~For structures assigned to Seismic Design Category C, D, E or F, individual deep foundations shall be interconnected by ties. Unless it can be demonstrated that equivalent restraint is provided by reinforced concrete beams within slabs on grade or reinforced concrete slabs on grade or confinement by competent rock, hard cohesive soils or very dense granular soils, ties shall be capable of carrying, in tension or compression, a force equal to the lesser of the product of the larger pile cap or column design gravity load times the seismic coefficient, SDS, divided by 10, and 25 percent of the smaller pile or column design gravity load. Seismic ties shall comply with the provisions of ACI 318.~~

Exception: In Group R-3 and U occupancies of light-frame construction, deep foundation elements supporting foundation walls, isolated interior posts detailed so the element is not subject to lateral loads or exterior decks and patios are not subject to interconnection where the soils are of adequate stiffness, subject to the approval of the *building official*.

Reason: This Code change includes revisions and additions to the Code in an effort to eliminate conflicting provisions in ACI 318-14, ASCE 7-16 and IBC-2018 regarding design of deep foundations for earthquake resistant structures. Subcommittee F, Foundations, of ACI 318 has coordinated efforts with members from ASCE 7 to bring the concrete material design requirements for foundations to one location. ASCE 7 started this effort in their cycle ending in 2016. The changes to ACI 318 shown here is the continuation of that effort. A side-by-side comparison is provided, however, difficult to follow with all the changes and dissimilar format. For a more comprehensive look at the changes in ACI 318, please review the public comment version available at <https://www.concrete.org/publications/standards/upcomingstandards.aspx>
Summary of code change proposals:

- Section 1810.3.12→18.13.3
- Section 1810.3.13→18.13.4

IBC 2018	ACI 318
1810.3.12 Grade beams. For structures assigned to Seismic Design Category D, E or F, grade beams shall comply with the provisions in Section 18.13.3 of ACI 318 for grade beams, except where they are designed to resist the seismic load effects including overstrength factor in accordance with Section 2.3.6 or 2.4.5 of ASCE 7.	18.13.3 Grade beams and slabs-on-ground 18.13.3.1 For structures assigned to SDC D, E, or F, grade beams and beams that are part of a mat foundation subjected to flexure from columns that are part of the seismic-force-resisting system shall be in accordance with 18.6. 18.13.3.2 For structures assigned to SDC C, D, E, or F, slabs-on-ground that resist in-plane earthquake forces from walls or columns that are part of the seismic-force-resisting system shall be designed as diaphragms in accordance with 18.12. The construction documents shall clearly indicate that the slab-on-ground is a structural diaphragm and part of the seismic-force-resisting system.
1810.3.13 Seismic ties. For structures assigned to Seismic Design Category C, D, E or F, individual deep foundations shall be interconnected by ties. Unless it can be demonstrated that equivalent restraint is provided by reinforced concrete beams within slabs on grade or reinforced concrete slabs on grade or confinement by competent rock, hard cohesive soils or very dense	18.13.4 Foundation Seismic Ties 18.13.4.1 For structures assigned to SDC C, D, E, or F, individual pile caps, piers, or caissons shall be interconnected by foundation seismic ties in orthogonal directions, unless it can be demonstrated that equivalent restraint is provided

granular soils, ties shall be capable of carrying, in tension or compression, a force equal to the lesser of the product of the larger pile cap or column design gravity load times the seismic coefficient, S_{DS} , divided by 10, and 25 percent of the smaller pile or column design gravity load.

Exception: In Group R-3 and U occupancies of lightframe construction, deep foundation elements supporting foundation walls, isolated interior posts detailed so the element is not subject to lateral loads or exterior decks and patios are not subject to interconnection where the soils are of adequate stiffness, subject to the approval of the building official.

by other means.

18.13.4.2 For structures assigned to SDC D, E, or F, individual spread footings founded on soil defined in ASCE 7 as Site Class E or F shall be interconnected by foundation seismic ties.

18.13.4.3 Where required, foundation seismic ties shall have a design strength in tension and compression at least equal to $0.1S_{DS}$ times the greater of the pile cap or column factored dead load plus factored live load unless it is demonstrated that equivalent restraint will be provided by (a), (b), (c), or (d):

(a) reinforced concrete beams within the slab-on-ground

(b) reinforced concrete slabs-on-ground

(c) confinement by competent rock, hard cohesive soils, or very dense granular soils

(d) other means approved by the building official.

18.13.4.4 For structures assigned to SDC D, E, or F, grade beams designed to act as horizontal foundation seismic ties between pile caps or footings shall have continuous longitudinal reinforcement that shall be developed within or beyond the supported column or anchored within the pile cap or footing at all discontinuities and shall satisfy (a) and (b):

(a) The smallest cross-sectional dimension of the grade beam shall be at least equal to the clear spacing between connected columns divided by 20, but need not exceed 18 in.

(b) Closed tie transverse reinforcement shall be provided at a spacing not to exceed the lesser of 0.5 times the smallest orthogonal cross-sectional dimension and 12 in.

ACI, a 501(c)3 professional technical society recommends approval as submitted to avoid confusion by eliminating criteria addressed in ACI 318 from the IBC. ACI, a 501(c)3 professional technical society recommends approval as submitted to avoid confusion by eliminating criteria addressed in ACI 318 from the IBC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

There is no increase or decrease in cost of construction. Provisions of ACI 318 are applicable and code change proposal removes requirements from IBC that are also addressed in ACI 318.

Proposal # 5627

S136-19

S137-19

IBC®: 1810.4.1.2

Proponent: Daniel Stevenson, P.E., representing GeoCoalition (dstevenson@berkelapg.com); Dale Biggers, P.E. GeoCoalition, representing GeoCoalition (dbiggers@bohbro.com); Lori Simpson, representing GeoCoalition (lsimpson@langan.com)

2018 International Building Code

Revise as follows:

1810.4.1.2 Casing. Shafts in unstable soils. Where cast-in-place deep foundation elements are formed through unstable soils ~~and concrete is placed in an open drilled hole, a casing shall be inserted in the hole~~, the open hole shall be stabilized by a casing, suitable slurry, or other approved method prior to placing the concrete. Where the casing is withdrawn during concreting, the level of concrete shall be maintained above the bottom of the casing at a sufficient height to offset any hydrostatic or lateral soil pressure. Driven casings shall be mandrel driven their full length in contact with the surrounding soil.

- Reason:**
1. There are other commonly used means of stabilizing unstable soils besides casing, such as the use of drilling slurry.
 2. Because there are means other than casings to stabilize the hole, the title is changed to "Shafts in unstable soils" because the focus of the section is stabilizing shafts in unstable soils.
 3. The current code version says in the first sentence "concrete is placed in an open hole". Those words are redundant, and thus removed, because the sentence begins with the context of a cast-in-place element. The "open hole...prior to placing the concrete" wording is maintained in the revision.

Click here to see the members of the GeoCoalition : <http://www.piledrivers.org/2019-geocoalition-members/>

Cost Impact: The code change proposal will decrease the cost of construction
This change can lower construction cost by allowing other commonly used stabilization methods.

It will decrease costs in some cases since it may allow higher design loads where the geotechnical capacity is sufficiently higher than the structural strength

Proposal # 4561

S137-19

S138-19

IBC®: 1810.4.1.3

Proponent: Daniel Stevenson, P.E., representing GeoCoalition (dstevenson@berkelapg.com); Dale Biggers, P.E. GeoCoalition, representing GeoCoalition (dbiggers@bohbro.com); Lori Simpson, P.E., G.E., representing GeoCoalition (lsimpson@langan.com)

2018 International Building Code

Revise as follows:

1810.4.1.3 Driving near uncased concrete. Deep foundation elements shall not be driven within six element diameters center to center in granular soils or within one-half the element length in cohesive soils of an uncased element filled with concrete less than 48 hours old unless *approved* by the *building official*. ~~During driving near uncased concrete, if the concrete surface in any completed element rises or drops significantly or bleeds additional water, the previously completed element shall be replaced.~~ Driven uncased deep foundation elements shall not be installed in soils that could cause heave.

Reason: 1. Minor rises or drops are normal due to consolidation of the concrete, etc. Only significant changes in elevation are of concern.
2. There are other possible areas of concern in addition to a change of elevation of the top surface of a previously completed element. It is common to get some minimal bleed water due to concrete consolidation, but if there is excessive bleed water due to installation of another nearby pile then there is likely a problem.

3. In locations of high water table, installing piles can force ground water into previously installed piles.

4. The change clarifies the current guidelines and calls attention to conditions that should already be under consideration.

5. The proposal also clarifies that the previously completed element is the one to be replaced.

Click here to see the members of the GeoCoalition : <http://www.piledrivers.org/2019-geocoalition-members/>

Cost Impact: The code change proposal will not increase or decrease the cost of construction
These requirements are current industry standard quality control practice.

It will decrease costs in some cases since it may allow higher design loads where the geotechnical capacity is sufficiently higher than the structural strength.

Proposal # 4584

S138-19

S139-19

IBC®: 1810.4.1.3

Proponent: Daniel Stevenson, P.E., representing GeoCoalition (dstevenson@berkelapg.com); Dale Biggers, P.E. GeoCoalition, representing GeoCoalition (dbiggers@bohbro.com); Lori Simpson, P.E., G.E., representing GeoCoalition (lsimpson@langan.com)

2018 International Building Code

Revise as follows:

1810.4.1.3 Driving near uncased concrete. Deep foundation elements shall not be driven within six element diameters center to center in granular soils or within one-half the element length in cohesive soils of an uncased element filled with concrete less than 48 hours old unless *approved* by the *building official*. If the concrete surface in any completed element rises or drops, the element shall be replaced. ~~Driven uncased deep foundation elements shall not be installed in soils that could cause heave.~~

Reason: The deleted sentence has nothing to do with the subject of this code section, the title of which is "Driving near uncased concrete." Prior to 2009, this sentence was contained in a code section that pertained only to the installation of driven uncased piles (e.g. 2006 IBC **1810.4.3 Installation** under **1810.4 Driven uncased piles**). However there is no longer a code section which specifically addresses the installation of driven uncased piles.

Click here to see the members of the GeoCoalition : <http://www.piledrivers.org/2019-geocoalition-members/>

Cost Impact: The code change proposal will not increase or decrease the cost of construction
It only removes antiquated language.

Proposal # 5525

S139-19

S140-19

IBC®: 1810.4.5

Proponent: Dale Biggers, P.E. GeoCoalition, representing GeoCoalition (dbiggers@bohbro.com); Daniel Stevenson, P.E., representing GeoCoalition (dstevenson@berkelapg.com); Lori Simpson, representing GeoCoalition (lsimpson@langan.com)

2018 International Building Code

Revise as follows:

1810.4.5 Vibratory driving. Vibratory drivers shall only be used to install deep foundation elements where the element load capacity is verified by load tests in accordance with Section 1810.3.3.1.2. The installation of production elements shall be controlled according to power consumption, rate of penetration or other *approved* means that ensure element capacities equal or exceed those of the test elements.

Exceptions:

1. The pile installation is completed by driving with an impact hammer in accordance with Section 1810.3.3.1.1.
2. The pile is to be used only for lateral resistance.

Reason: 1. Axial load tests are only needed when there are axial loads and the capacity is in doubt.

2. This proposal adds the exception for "the pile installation is completed by driving with an impact hammer..." because piles that are started using a vibratory hammer but completed using an impact hammer should be treated as piles that are installed by an impact hammer.

3. An impact hammer can be used to assure that you have achieved or exceeded the minimum required axial capacity. Section 1810.3.3.1.1. details how capacity might be determined from impact driving.

4. The exception for " the pile is to be used only for lateral resistance" is needed because a load test for axial capacity (as implied by 1810.3.3.1.2) is not needed for piles used only for lateral resistance. Lateral load capacity requirements are covered in Section 1810.3.3.2.

Click here to see the members of the GeoCoalition : <http://www.piledrivers.org/2019-geocoalition-members/>

Cost Impact: The code change proposal will decrease the cost of construction

Will not increase the cost of construction. In fact, it will likely decrease cost as an axial load test will not be required where piles are used only for lateral resistance or where the pile installation is completed using an impact hammer.

Proposal # 5139

S140-19

S141-19

IBC@: 1810.4.11

Proponent: Dale Biggers, P.E. GeoCoalition, representing GeoCoalition (dbiggers@bohbro.com); Daniel Stevenson, P.E., representing GeoCoalition (dstevenson@berkelapg.com); Lori Simpson, P.E., G.E., representing GeoCoalition (lsimpson@langan.com)

2018 International Building Code

Revise as follows:

1810.4.11 Helical piles. Helical piles shall be installed to specified embedment depth and torsional resistance criteria as determined by a *registered design professional*. The torque applied during installation shall not exceed the manufacturer's rated maximum allowable ~~allowable~~ installation torque resistance of the helical pile.

Reason: The term "manufacturer's rated maximum installation torque resistance" is consistent with the language that appears in many evaluation reports published by ICC-ES, which reflect the testing per acceptance criteria AC358 of ICC-ES. The term "maximum allowable" has created confusion and is not defined.

Click here to see the members of the GeoCoalition : <http://www.piledrivers.org/2019-geocoalition-members/>

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The code change proposal will not increase the cost of construction since it is a clarification to the code

Proposal # 5145

S141-19

S142-19

IBC: 202, 1901.2, 1901.2.1 (New), 1905.1.1, 1905.1.6

Proponent: Stephen Szoke, American Concrete Institute, representing American Concrete Institute (steve.szoke@concrete.org); Scott Campbell, representing National Ready Mixed Concrete Association (scampbell@nrmca.org)

2018 International Building Code

SECTION 202 DEFINITIONS

Delete without substitution:

~~[BS] DETAILED PLAIN CONCRETE STRUCTURAL WALL. See Section 1905.1.1.~~

~~[BS] ORDINARY PRECAST STRUCTURAL WALL. See Section 1905.1.1.~~

~~[BS] ORDINARY REINFORCED CONCRETE STRUCTURAL WALL. See Section 1905.1.1.~~

~~[BS] ORDINARY STRUCTURAL PLAIN CONCRETE WALL. See Section 1905.1.1.~~

Revise as follows:

1901.2 Plain and reinforced concrete. Structural concrete shall be designed and constructed in accordance with the requirements of this chapter and ACI 318 ~~as amended in Section 1905 of this code.~~ Except for the provisions of Sections 1904 and 1907, the design and construction of slabs on grade shall not be governed by this chapter unless they transmit vertical loads or lateral forces from other parts of the structure to the soil. Precast concrete diaphragms in buildings assigned to *Seismic Design Category C, D, E or F* shall be designed in accordance with the requirements of ASCE 7, Section 14.2.4.

1905.1.1 ACI 318, Section 2.3. Modify existing definitions and add the following definitions to ACI 318, Section 2.3.

DESIGN DISPLACEMENT. Total lateral displacement expected for the design-basis earthquake, *as specified by Section 12.8.6 of ASCE 7.*

SPECIAL STRUCTURAL WALL. A cast-in-place or precast wall complying with the requirements of 18.2.4 through 18.2.8, 18.10 and 18.11, as applicable, in addition to the requirements for ordinary reinforced concrete structural walls *or ordinary precast structural walls, as applicable. Where ASCE 7 refers to a "special reinforced concrete structural wall," it shall be deemed to mean a "special structural wall."*

Delete without substitution:

~~**DETAILED PLAIN CONCRETE STRUCTURAL WALL.** A wall complying with the requirements of Chapter 14, including 14.6.2.~~

~~**ORDINARY PRECAST STRUCTURAL WALL.** A precast wall complying with the requirements of Chapters 1 through 13, 15, 16 and 19 through 26.~~

~~**ORDINARY REINFORCED CONCRETE STRUCTURAL WALL.** A *cast-in-place* wall complying with the requirements of Chapters 1 through 13, 15, 16 and 19 through 26.~~

~~**ORDINARY STRUCTURAL PLAIN CONCRETE WALL.** A wall complying with the requirements of Chapter 14, *excluding 14.6.2.*~~

Revise as follows:

~~1905.1.6~~ **1901.2.1 ACI 318, Section 14.6. Detailed plain concrete structural wall.** Modify ACI 318, Section 14.6 by adding new Section 14.6.2 to read as follows:

- ~~14.6.2—Detailed plain concrete structural walls:~~
- ~~14.6.2.1—Detailed plain concrete structural walls are walls conforming to the requirements of ordinary structural plain concrete walls and 14.6.2.2:~~
- ~~14.6.2.2—Reinforcement shall be provided as follows:~~
Detailed plain concrete structural walls shall comply with the requirements of Chapter 14 of ACI 318 with reinforcement provided as follows:

(a) Vertical reinforcement of at least 0.20 square inch (129 mm²) in cross-sectional area shall be provided continuously from support to support at each corner, at each side of each opening and at the ends of walls. The continuous vertical bar required beside an opening is permitted to substitute for one of the two No. 5 bars required by Section 14.6.1 of ACI 318.

(b) *Horizontal reinforcement at least 0.20 square inch (129 mm²) in cross-sectional area shall be provided:*

1. *Continuously at structurally connected roof and floor levels and at the top of walls.*
2. *At the bottom of load-bearing walls or in the top of foundations where doweled to the wall.*
3. *At a maximum spacing of 120 inches (3048 mm).*

Reinforcement at the top and bottom of openings, where used in determining the maximum spacing specified in Item 3 above, shall be continuous in the wall.

Reason: There is no technical change to the requirements for design and construction of structural concrete. This change improves the clarity of the code and the coordination with ACI 318 by:

- 1) removing redundant language that advises concrete shall be in accordance with “this chapter” and “Section 1905” where the latter is part of the chapter.
- 2) relocating the provisions for detailed plain concrete structural wall from IBC Section 1905.1.6 to new Section 1901.2.1 for clarity and to facilitate use.
- 3) removing definition of ordinary precast concrete wall which has the same definition as ordinary reinforced concrete wall and not differentiated in ACI 318 or in the IBC.
- 4) removing definitions for other walls systems defined in ACI 318 and transcribed from ACI 318 simply to have all wall system definitions in one place when adding a definition for “detailed plain concrete structural wall.”

In addition, because the current language is presented as a modification, it portrays that criteria in ACI 318 for such walls are being modified. ACI Committee 318 does not recognize and thus does not address detailed plain concrete structural walls. This should not be presented as a modification to ACI 318, but included as specific language that permits detailed plain concrete structural walls in the IBC.

Deletion of “as amended in Section 1905 of this code.” In Section 1901.2 “as amended in Section 1905 of this code” is removed because it is redundant. The same sentence where this text occurs advises that “structural concrete be designed and constructed in accordance with the requirements of this chapter and ACI 318.” There is no need for the superfluous language: “as amended in Section 1905 of this code.” Language already advises that both ACI 318 and Chapter 19 shall be satisfied and IBC administration sections advise that Chapter 19 shall govern over ACI 318.

Detailed plain concrete structural wall. The current organization forces the user to flip back and forth between the IBC and ACI 318, only to discover the differences in the two are only applicable to “detailed plain concrete structural walls” which are not addressed in ACI 318. The new proposed language makes it clear to the user the provisions only where “detailed plain concrete structural walls” are being used in the project. This code change proposal removed redundant and superfluous language and clarifies the code. This change removes text transcribed from ACI simply to have all definitions in one place.

The technical requirements (text) is moved from Section 1905.1.6 new Section 1901.2.1 titled “detailed plain concrete structural wall” with minor editorial modifications necessary to accommodate the relocation.

Ordinary precast concrete wall. The definition for “ordinary precast structural wall” is deleted. The definition is identical to that for ordinary reinforced concrete structural wall and ACI does not differentiate between ordinary reinforced and precast structural walls. The language in the 2018 edition of the IBC creates confusion because the definition in the IBC encourages the user to seek specific language and criteria identified for ordinary precast concrete wall where it does not exist in ACI 318. ACI 318 is clear that both are addressed in ACI 318 Chapter 11. ACI 318 Section 11.1. Scope states:

“11.1.1 This chapter shall apply to the design of nonprestressed and prestressed walls including (a) through (c):

- (a) Cast-in-place
- (b) Precast in-plant
- (c) Precast on-site including tilt-up”

Removal of repetitive definitions in the IBC. Several definitions in the 2018 IBC are similar to those in ACI 318. Continuation of carrying definitions in both documents requires additional coordination in Sections of ACI 318. The transcription of these definitions in the IBC was to have all structural wall definitions together when the IBC was simply adding criteria for “detailed plain concrete structural wall.” Having the new Section 1901.2.1 addresses “detailed plain concrete structural wall” and eliminates potential confusion on the definitions and applicable section of ACI 318. This will reduce the need for subsequent code change proposals simply to coordinate ACI 318 and the IBC. The definitions in both documents are

show in the table below.

Removal of points called definitons in Section 202. Pointers are removed from Section 202 for the definitons being removed from Section 1905.1.1

<p>2018 IBC 1905.1.1</p> <p>Definition for “structural wall: is absent from the 2018 IBC.</p> <p>DETAILED PLAIN CONCRETE STRUCTURAL WALL. A wall complying with the requirements of Chapter 14, including 14.6.2.</p> <p>ORDINARY PRECAST STRUCTURAL WALL. A precast wall complying with the requirements of Chapters 1 through 13, 15, 16 and 19 through 26.</p> <p>ORDINARY REINFORCED CONCRETE STRUCTURAL WALL. A cast-in-place wall complying with the requirements of Chapters 1 through 13, 15, 16 and 19 through 26.</p> <p>ORDINARY STRUCTURAL PLAIN CONCRETE WALL. A wall complying with the requirements of Chapter 14, excluding 14.6.2.</p> <p>SPECIAL STRUCTURAL WALL. A cast-in-place or precast wall complying with the requirements of 18.2.4 through 18.2.8, 18.10 and 18.11, as applicable, in addition to the requirements for ordinary reinforced concrete structural walls or ordinary precast structural walls, as applicable. Where ASCE 7 refers to a special reinforced concrete structural wall,” it shall be deemed to mean a “special structural wall.”</p> <p>IBC has no provisions for intermediate precast walls.</p>	<p>ACI 318</p> <p>structural wall—wall proportioned to resist combinations of shears, moments, and axial forces in the plane of the wall; a shear wall is a structural wall.</p> <p>Detailed plain concrete structural walls are not addressed in ACI 318. IBC text is moved from Section 1905.1.6 to new section 1901.2.1. Commentary to the IBC should be added to indicate that detailed plain concrete structural walls are not recognized by ACI Committee 318 and thus not addressed in ACI 318 <i>Building Code Requirements for Structural Concrete</i>.</p> <p>Ordinary precast structural wall. ACI 318 does not differentiate between ordinary precast structural walls and ordinary reinforced structural walls. Note that the definitions in the IBC are identical for both Ordinary Precast Structural Wall and Ordinary Reinforced concrete structural Wall</p> <p>structural wall, ordinary reinforced concrete—a wall complying with Chapter 11.</p> <p>Structural wall, ordinary plain concrete—a wall complying with Chapter 14.</p> <p>Section 14.6.2 does not exist in ACI 318 and is a modification to ACI 318 in IBC Section 1905.1.6 which provides new Section 14.6.2. This is very confusing. Text from 1905.1.6 identifying and adding a non-existing Section 14.6.2 in ACI 318 is revised to eliminate reference to ACI 318 and moves to new Section 1901.2.1</p> <p>structural wall, special—a cast-in-place structural wall in accordance with 18.2.3 through 18.2.8 and 18.10; or a precast structural wall in accordance with 18.2.3 through 18.2.8 and 18.11.</p> <p>structural wall, intermediate precast—a wall complying with 18.5.</p>
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ACI, a 501.C.3 professional technical society, encourages the approval of this code change proposal to improve the IBC by more clearly advising the user that there are provisions in the IBC for “detailed plain concrete structural walls” which are not addressed in ACI 318. The change removes transcription from ACI 318 and eliminates the need for frequent code change proposals to coordinate referenced ACI sections cited in the IBC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
 No change to technical requirements

S143-19

IBC®: 1901.2

Proponent: Stephen Szoke, American Concrete Institute, representing American Concrete Institute (steve.szoke@concrete.org); Jason Krohn, Precast/Prestressed Concrete Institute, representing Precast/Prestressed Concrete Institute (jkrohn@pci.org)

2018 International Building Code

Revise as follows:

1901.2 Plain and reinforced concrete. Structural concrete shall be designed and constructed in accordance with the requirements of this chapter and ACI 318 as amended in Section 1905 of this code. Except for the provisions of Sections 1904 and 1907, the design and construction of slabs on grade shall not be governed by this chapter unless they transmit vertical loads or lateral forces from other parts of the structure to the soil. ~~Precast concrete diaphragms in buildings assigned to Seismic Design Category C, D, E or F shall be designed in accordance with the requirements of ASCE 7, Section 14.2.4.~~

Reason: This information has been coordinated between ASCE 7 and ACI 318. ACI 318-19 now contains duplicate provisions as Section 14.2.4 of ASCE 7-16. Future versions of ASCE 7 plan to remove the duplicate language. Therefore, ACI 318 should be the design reference for precast concrete diaphragms in buildings assigned to Seismic Design Category C, D, E or F.

ACI, a 501.C.3, professional technical society, encourages the approval of this code change proposal to improve the IBC by avoiding unnecessary duplication of text in code and referenced standards.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Design and construction requirements are unaltered, change only removes text that is no longer necessary.

Proposal # 4535

S143-19

S144-19

IBC: 1901.2, SECTION 1907, 1907.1, 1907.2, 1907.3

Proponent: Stephen Szoke, American Concrete Institute, representing American Concrete Institute (steve.szoke@concrete.org); Scott Campbell, representing National Ready Mixed Concrete Association (scampbell@nrmca.org)

2018 International Building Code

Revise as follows:

1901.2 Plain and reinforced concrete. Structural concrete shall be designed and constructed in accordance with the requirements of this chapter and ACI 318 as amended in Section 1905 of this code. ~~Except for the provisions of Sections 1904 and 1907, the design and construction of slabs on grade shall not be governed by this chapter unless they transmit vertical loads or lateral forces from other parts of the structure to the soil.~~ Precast concrete diaphragms in buildings assigned to *Seismic Design Category* C, D, E or F shall be designed in accordance with the requirements of ASCE 7, Section 14.2.4.

SECTION 1907 MINIMUM SLAB PROVISIONS SLABS-ON-GROUND

1907.1 General. ~~Slabs-on-ground not transmitting vertical loads or lateral forces from other parts of the structure to the soil shall be designed and constructed in accordance with section 1904 and this section. The thickness of concrete floor slabs supported directly on the ground shall be not less than 3¹/₂ inches (89 mm). A 6-mil (0.006 inch; 0.15 mm) polyethylene vapor retarder with joints lapped not less than 6 inches (152 mm) shall be placed between the base course or subgrade and the concrete floor slab, or other approved equivalent methods or materials shall be used to retard vapor transmission through the floor slab.~~

Exceptions: ~~A vapor retarder is not required:~~

- ~~1. For detached structures accessory to occupancies in Group R-3, such as garages, utility buildings or other unheated facilities.~~
- ~~2. For unheated storage rooms having an area of less than 70 square feet (6.5 m²) and carports attached to occupancies in Group R-3.~~
- ~~3. For buildings of other occupancies where migration of moisture through the slab from below will not be detrimental to the intended occupancy of the building.~~
- ~~4. For driveways, walks, patios and other flatwork that will not be enclosed at a later date.~~
- ~~5. Where approved based on local site conditions.~~

Add new text as follows:

1907.1.1 Slabs-on-ground transmitting loads. Where slabs-on-ground transmit vertical loads or lateral forces from other parts of the structure to the soil all provisions in this Chapter shall be applicable.

1907.2 Thickness. The thickness of concrete floor slabs supported directly on the ground shall be not less than 3¹/₂ inches (89 mm).

1907.3 Vapor retarder. A polyethylene vapor retarder having a minimum 6-mil (0.006 inch; 0.15 mm) polyethylene vapor retarder thickness and with joints lapped not less than 6 inches (152 mm) shall be placed between the base course or subgrade and the concrete floor slab, or other approved equivalent methods or materials shall be used to retard vapor transmission through the floor slab.

Exceptions: A vapor retarder is not required:

1. For detached structures accessory to occupancies in Group R-3, such as garages, utility buildings or other unheated facilities.
2. For unheated storage rooms having an area of less than 70 square feet (6.5 m²) and carports attached to occupancies in Group R-3.
3. For buildings of other occupancies where migration of moisture through the slab from below will not be detrimental to the intended occupancy of the building.
4. For driveways, walks, patios and other flatwork that will not be enclosed at a later date.
5. Where approved based on local site conditions.

Reason: Reason: The current language is not clear. First the provisions are only applicable to slabs on ground and this should be more clearly stated. Further it is generally understood that all provisions of the IBC are minimum requirements. This code change places all provisions uniquely applicable to slabs-on-ground in one section rather than having provisions in sections 1901.2 and 1907.

Modifications shown as new section 1907.1.1. This portion of the proposed revision is editorial, deleting slab-on-ground provisions from Section 1901.2 (shown above as deleted text) and moving the provisions to the more appropriate section, 1907. This places provisions for concrete slabs-on-ground in one section.

Modifications shown as new section 1907.1.2. This portion of the proposed revision is editorial and clarifies that thickness criteria are for concrete slabs-on-ground.

Modifications shown as new section 1907.1.3. This portion of the proposed revision is editorial and appropriately assigns provisions for vapor retarders to vapor retarders and not to slabs-on-ground.

ACI, a 501.C.3 professional society, encourages the approval of this code change proposal to improve the IBC by more clearly advising the user that these provisions are only applicable to slabs-on-ground and relocates slab-on-ground provisions in one section.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
No change to cost of design or construction, change places slab related criteria in one section.

Proposal # 4538

S144-19

S145-19

IBC@: 1901.3

Proponent: Stephen Szoke, American Concrete Institute, representing American Concrete Institute (steve.szoke@concrete.org); Scott Campbell, representing National Ready Mixed Concrete Association (scampbell@nrmca.org)

2018 International Building Code

Revise as follows:

1901.3 Anchoring to concrete. Anchoring to concrete shall be in accordance with ACI 318 as amended in Section 1905, and applies to cast-in (headed bolts, headed studs and hooked J- or L-bolts); ~~post-installed expansion (torque-controlled and displacement-controlled); undercut and adhesive~~; and screw anchors.

Reason: This code change adds screws conforming to the requirements of ACI 318 as permissible anchoring devices. This make the IBC more current and reflects technological advancements integrated into standardization. Further the use of screws adds flexibility for design and construction.

ACI, a 501.C.3 professional society encourages the approval of this code change proposal to improve the IBC by adding increased flexibility by adding screws as acceptable elements for anchoring to concrete.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

While there is no quantitative data, the addition of another method of anchorage improves flexibility in design and construction which may reduce initial cost. The addition of screws as a method for attachment will not increase cost.

Proposal # 4455

S145-19

S146-19

IBC®: 1901.5

Proponent: Stephen Szoke, American Concrete Institute, representing American Concrete Institute (steve.szoke@concrete.org); Scott Campbell, National Ready Mixed Concrete Association, representing National Ready Mixed Concrete Association (scampbell@nrmca.org); Amy Trygestad, representing Concrete Reinforcing Steel Institute (atrygestad@crsi.org)

2018 International Building Code

Delete without substitution:

~~1901.5 Construction documents. The construction documents for structural concrete construction shall include:~~

- ~~1- The specified compressive strength of concrete at the stated ages or stages of construction for which each concrete element is designed.~~
- ~~2- The specified strength or grade of reinforcement.~~
- ~~3- The size and location of structural elements, reinforcement and anchors.~~
- ~~4- Provision for dimensional changes resulting from creep, shrinkage and temperature.~~
- ~~5- The magnitude and location of prestressing forces.~~
- ~~6- Anchorage length of reinforcement and location and length of lap splices.~~
- ~~7- Type and location of mechanical and welded splices of reinforcement.~~
- ~~8- Details and location of contraction or isolation joints specified for plain concrete.~~
- ~~9- Minimum concrete compressive strength at time of posttensioning.~~
- ~~10- Stressing sequence for posttensioning tendons.~~
- ~~11- For structures assigned to Seismic Design Category D, E or F, a statement if slab on grade is designed as a structural diaphragm.~~

Reason: This code change proposal removes an incomplete list of criteria necessary for the construction documents applicable to structural concrete. The list in the IBC is not as comprehensive as the list in referenced ACI documents. Many of the omissions from the IBC list are shown in the table below. Since the IBC supersedes referenced ACI documents the partial list in the IBC is all that would be required although ACI documents have significantly more extensive requirements. If the list in the IBC is to indicate what may be of particular importance to the building code official, then that list might be best included in the commentary to the IBC, but not provided as the applicable requirements for construction documents. Further maintaining duplicate lists becomes problematic and results code change proposals that would not alter the requirements. The list in the IBC is outdate and many important items recently added to ACI documents are not addressed, in particular note the requirements for anchors and qualifications for personnel.

IBC Requirements	ACI Requirements
	Loads used in design
	Design work delegated to contractor
	Cementitious materials and combinations
	Water cement ratio
	Aggregates
	Mixing water
	Admixtures
	If water reducing – amount of modification
	If retarding – modification in setting time
	Where expansive cements are used – admixture compatibility
	Steel fiber reinforcement
Compressive strength of concrete	Compressive strength of concrete
	Test age for compressive strengths
	Maximum water cement ratio
	Maximum size of aggregate
	Exposure Category F – air content
	Exposure Class C – chloride ion limits
	Exposure Class S – types of cement
	Density of lightweight aggregate

	Volumetric fracture of aggregates where required in design
	Where used for shear – requirements for steel-fiber reinforced concrete
	Exposure class at option of engineer
	Compressive strength as various phases at option of engineer.
	Concrete mix proportions
	Material storage
	Concrete batching, mixing, and transport/delivery
	Pump pipe requirements
	Concrete placement
	Vertical lift requirements
	Field cured specimens if required
	Temperature of high early strength concrete
	Accelerated curing requirements if employed
	Protection and curing concrete
	Cold weather concrete procedures if applicable
	Hot weather concrete procedures if applicable
	Locations where slab column interfaces are integrated
	Locations where steel-fiber reinforcement is required
	Saw cutting locations
Strength or grade of reinforcement	Designation and grade of reinforcement
Size and location of elements	Size and location of members
	Tolerance of members
Size and location of reinforcement	Size and location of reinforcement
	Tolerances for reinforcement
	Designation of protective coatings
	Mill reports
	Field bending of reinforcement
Provisions for dimensional change	Provisions for dimensional change
	Qualifications of anchors
	Type, size, location requirements, effective embedment depth, and installation requirements for anchors
	For adhesive anchors, minimum age of concrete, concrete temperature range, moisture condition of concrete at time of installation, type of lightweight concrete if applicable, and requirements for hole drilling and preparation
	Qualifications for anchor installers
	Corrosion protect for exposed anchors
	Type, size, details, and location of embedments
	Details of lifting devices, embedments, and related reinforcement required to resist temporary loads from handling, storage, transportation, and erection, where designed by the licensed design professional.
Magnitude and location of prestressing forces	Magnitude and location of prestressing forces
Anchor and lap splice lengths	Anchor and lap splice lengths
Type and location of welded and mechanical splices	Type and location of welded and mechanical splices
	Type and location of end-bearing splices

Details and location of construction joints	Details and location of construction joints
	Design of construction joints
	Surface preparation
	Shear transfer where required
Minimum compressive strength for post-tensioning	Minimum compressive strength for post-tensioning
Post-tensioning stressing sequence	Post-tensioning stressing sequence
	Tolerances for tendons
	Materials and details of corrosion protection for tendons, couplers, end fittings, post-tensioning anchorages, and anchorage regions.
	Requirements for grouting of bonded tendons, including maximum water-soluble chloride ion
	Formwork, including removal
	Qualifications of filed technicians
	Qualifications of inspectors
	Qualifications of testing agency and technicians
Slab on grade resisting seismic forces.	Identify if a slab-on-ground is designed as a structural diaphragm or part of the seismic-force-resisting system

ACI, a 501.C.3. professional technical society, recommends approval of this code change as submitted to assure that all relevant requirements for structural concrete as included on construction documents and to reduce confusion and eliminate the need to maintain duplicate lists.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This code change proposal removes potential conflicts between the IBC and ACI requirements for construction documents.

Proposal # 4470

S146-19

S147-19

IBC: 1901.7 (New), 1901.7.1 (New), 1901.7.2 (New), ACI Chapter 35 (New)

Proponent: Stephen Szoke, representing American Concrete Institute (steve.szoke@concrete.org)

2018 International Building Code

Add new text as follows:

1901.7 Tolerances for structural concrete. Where not indicated in construction documents, structural tolerances for concrete structural elements shall be in accordance with this section.

1901.7.1 Cast-in-place concrete tolerances. Structural tolerances for cast-in-place concrete structural elements shall be in accordance with ACI 117.

Exceptions:

1. Group R-3 detached one or two-family dwellings are not required to comply with this section
2. Shotcrete is not required to comply with this section

1901.7.2 Precast concrete tolerances. Structural tolerances for precast concrete structural elements shall be in accordance with ACI ITG-7.

Exception: Group R-3 detached one or two-family dwellings are not required to comply with this section.

ACI

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117-10: Specification for Tolerances for Concrete Construction and Materials

ACI

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ITG-7-09: Specification for Tolerances for Precast Concrete

Reason: ACI staff receive frequent technical inquiries regarding the allowable tolerances of structural concrete elements when tolerances are not indicated in construction documents. Adding these reference standards to the IBC provides the user with the information necessary for structural elements to perform as intended.

ACI, a 501(c)3 professional technical society, recommends approval as submitted to help assure that the appropriate tolerances for structural concrete elements applicable where not included in construction documents.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
There is no cost change associated with these requirements which are routinely cited in construction documents.

Staff Analysis: A review of the standard proposed for inclusion in the code, ACI 117-1 and ITG-7-09, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 5639

S147-19

S148-19

IBC: 202, SECTION 1902, 1902.1

Proponent: Stephen Szoke, American Concrete Institute, representing American Concrete Institute (steve.szoke@concrete.org); Scott Campbell, representing National Ready Mixed Concrete Association (scampbell@nrmca.org); Amy Trygestad, representing Concrete Reinforcing Steel Institute (atrygestad@crsi.org)

2018 International Building Code

SECTION 202 DEFINITIONS

Delete without substitution:

~~[BS] SPECIAL STRUCTURAL WALL. See Section 1905.1.1.~~

~~[BS] DESIGN DISPLACEMENT. See Section 1905.1.1.~~

Revise as follows:

SECTION 1902 DEFINITIONS COORDINATION OF TERMS

1902.1 General. The words and terms defined in ACI 318 shall, for the purposes of this chapter and as used elsewhere in this code for concrete construction, have the meanings shown in ACI 318 as modified by Section 1905.1.1. Coordination of terminology used in ACI 318 and ASCE 7 shall be as follows:

Add new text as follows:

1902.1.1 Design displacement Design displacement shall be the total lateral displacement expected for the design-basis earthquake, as specified by Section 12.8.6 of ASCE 7.

1902.1.2 Special structural wall. Special structural walls made of cast-in-place or precast concrete shall comply with the requirements of Sections 18.2.4 through 18.2.8, 18.10 and 18.11 of ACI 318, as applicable, in addition to the requirements for ordinary reinforced concrete structural walls or ordinary precast structural walls, as applicable. Where ASCE 7 refers to a "special reinforced concrete shear wall," it shall be deemed to mean a "special structural wall."

Revise as follows:

1905.1.1 ACI 318, Section 2.3. Modify existing definitions and add the following definitions to ACI 318, Section 2.3.

DESIGN DISPLACEMENT. Total lateral displacement expected for the design-basis earthquake, as specified by Section 12.8.6 of ASCE 7.

SPECIAL STRUCTURAL WALL. A cast-in-place or precast wall complying with the requirements of 18.2.4 through 18.2.8, 18.10 and 18.11, as applicable, in addition to the requirements for ordinary reinforced concrete structural walls or ordinary precast structural walls, as applicable. Where ASCE 7 refers to a "special reinforced concrete structural wall," it shall be deemed to mean a "special structural wall."

(portions of section 1905.1.1 not shown are unchanged)

Reason: There is no change to the requirements for design and construction of structural concrete. This change improves the clarity of the code and the coordination with ACI 318 by:

1) removing redundant language that advises concrete shall be in accordance with "this chapter" and "Section 1905" where the latter is part of the chapter.

2) relocating the provisions for "design displacement" from IBC Section 1905.1.6 to new Section 1901.2.1 for clarity and to facilitate use. This appropriately removes criteria from a definition and places the criteria in a section.

3) relocating the provisions for "special structural wall" from IBC Section 1905.1.6 to new Section 1901.2.1 for clarity and to facilitate use. This appropriately removes criteria from a definition and places the criteria in a section. The definition and criteria for special structural wall in the IBC and ACI 318 are shown in Table 1

Deletion of "as amended in Section 1905 of this code." In Section 1901.2 "as amended in Section 1905 of this code" is removed because it is redundant. The same sentence where this text occurs advises that "structural concrete be designed and constructed in accordance with the requirements of this chapter and ACI 318." There is no need for the superfluous language: "as amended in Section 1905 of this code." Language

already advises that both ACI 318 and Chapter 19 shall be satisfied and IBC administration sections advise that Chapter 19 shall govern over ACI 318.

Removal of repetitive definitions in the IBC. Several definitions in the 2018 IBC are similar to those in ACI 318. This will reduce the need for subsequent code change proposals simply to coordinate ACI 318 and the IBC.

Elimination of pointers. Unnecessary pointers in Section 202 Definitions are removed.

Table 1 - Comparison of IBC and ACI 318 definitions and criteria for special structural walls.

2018 IBC 1905.1.1	ACI 318
<p>SPECIAL STRUCTURAL WALL. A cast-in-place or precast wall complying with the requirements of 18.2.4 through 18.2.8, 18.10 and 18.11, as applicable, in addition to the requirements for ordinary reinforced concrete structural walls or ordinary precast structural walls, as applicable. Where ASCE 7 refers to a special reinforced concrete structural wall," it shall be deemed to mean a "special structural wall."</p>	<p>structural wall, special—a cast-in-place structural wall in accordance with 18.2.3 through 18.2.8 and 18.10; or a precast structural wall in accordance with 18.2.3 through 18.2.8 and 18.11.</p>
<p>IBC has no provisions for intermediate precast walls.</p>	<p>structural wall, intermediate precast—a wall complying with 18.5.</p>

ACI, a 501.C.3 professional technical society, encourages the approval of this code change proposal to improve the IBC by more clearly advising the user that there are provisions in the IBC for "detailed plain concrete structural walls" which are not addressed in ACI 318. The change removes transcription from ACI 318 and eliminates the need for frequent code change proposals to coordinate referenced ACI sections cited in the IBC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This change does not alter design or construction criteria but makes the code more user friendly, reducing the potential for errors or conflicts.

Proposal # 4474

S148-19

S149-19

IBC®: 1903.1

Proponent: Stephen Szoke, American Concrete Institute, representing American Concrete Institute (steve.szoke@concrete.org); Scott Campbell, representing National Ready Mixed Concrete Association (scampbell@nrmca.org)

2018 International Building Code

Revise as follows:

1903.1 General. Materials used to produce concrete, concrete itself and testing thereof shall comply with the applicable standards listed in ACI 318.

~~**Exception:** The following standards as referenced in Chapter 35 shall be permitted to be used:~~

- ~~1. ASTM C150~~
- ~~2. ASTM C595~~
- ~~3. ASTM C1157~~

Reason: This language was introduced when there was concern that reference to the re-formatted edition of ACI 318-14 might not be approved for inclusion as a referenced standard in the 2015 edition of the International Building Code (IBC). The re-formatted edition of ACI 318 was included in the IBC and thus these cement standards, as referenced in ACI 318, are part of the IBC because language in Chapter 19 advises that:

1901.2 Plain and reinforced concrete. *Structural concrete shall be designed and constructed in accordance with the requirements of this chapter and ACI 318 as amended in Section 1905 of this code.*

Further, ACI 318 permits other cementitious materials and the exception has implied to some users that these are the only cementitious materials permitted for concrete. All permissible cement standard specifications are listed in ACI 318:

C150/C150M-12—Standard Specification for Portland Cement

C595/C595M-14—Standard Specification for Blended Hydraulic Cements

C618-12a—Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

C845/C845M-12—Standard Specification for Expansive Hydraulic Cement

C989/C989M-13—Standard Specification for Slag Cement for Use in Concrete and Mortars

C1157/C1157M-11—Standard Performance Specification for Hydraulic Cement

C1240-14—Standard Specification for Silica Fume Used in Cementitious Mixtures

ACI, a 501.C.3 professional society, encourages the approval of this code change proposal as submitted to remove redundant and potentially misleading language.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This code change proposal continues to permit the use of cement cited in the the 2018 editon of the IBC, and may reduce costs on specific projects by expanding the acceptable types of cement in accordance with those permitted in ACI 318.

Proposal # 4471

S149-19

S150-19

IBC: 1109.5(New). 1905.1.1, 1905.1.2, 1905.1.3, 1905.1.4, 1905.1.5, 1905.1.7, 1905.1.8(New), 1905.1.8.1(New), 1905.1.8.2(New), 1905.1.9(New)

Proponent: Stephen Szoke, American Concrete Institute, representing American Concrete Institute (steve.szoke@concrete.org); Scott Campbell, representing National Ready Mixed Concrete Association (scampbell@nrmca.org); Amy Trygestad, representing Concrete Reinforcing Steel Institute (atrygestad@crsi.org)

2018 International Building Code

Add new text as follows:

1905 SEISMIC DESIGN REQUIREMENTS

Revise as follows:

~~1905.1.1 1905.1 ACI 318, Section 2.3: Seismic design category requirements.~~ Modify existing definitions and add the following definitions to ACI 318, Section 2.3: The requirements of this section shall govern the design and construction of structural concrete elements subjected to seismic forces.

Add new text as follows:

1905.1.1 Seismic design category A. Structures assigned to Seismic Design Category A shall not be required to satisfy the requirements of Chapter 18 of ACI 318.

Delete without substitution:

~~1905.1.2 ACI 318, Section 18.2.1.~~ Modify ACI 318 Sections 18.2.1.2 and 18.2.1.6 to read as follows:

~~18.2.1.2—Structures assigned to Seismic Design Category A shall satisfy requirements of Chapters 1 through 17 and 19 through 26; Chapter 18 does not apply. Structures assigned to Seismic Design Category B, C, D, E or F shall satisfy 18.2.1.3 through 18.2.1.7, as applicable. Except for structural elements of plain concrete complying with Section 1905.1.7 of the International Building Code, structural elements of plain concrete are prohibited in structures assigned to Seismic Design Category C, D, E or F.~~
~~18.2.1.6—Structural systems designated as part of the seismic force-resisting system shall be restricted to those permitted by ASCE 7. Except for Seismic Design Category A, for which Chapter 18 does not apply, the following provisions shall be satisfied for each structural system designated as part of the seismic force-resisting system, regardless of the seismic design category:~~

- (a) Ordinary moment frames shall satisfy 18.3.
- (b) Ordinary reinforced concrete structural walls ~~and ordinary precast structural walls~~ need not satisfy any provisions in Chapter 18.
- (c) Intermediate moment frames shall satisfy 18.4.
- (d) Intermediate precast ~~structural walls~~ shall satisfy 18.5.
- (e) Special moment frames shall satisfy 18.6 through 18.9.
- (f) Special structural walls shall satisfy 18.10.
- (g) Special structural walls constructed using precast concrete shall satisfy 18.11.

~~Special moment frames and special structural walls shall also satisfy 18.2.4 through 18.2.8.~~

Add new text as follows:

1905.1.2 Seismic design categories B, C, D, E and F. Structures assigned to Seismic Design Category B, C, D, E or F shall satisfy 18.2.1.3 through 18.2.1.7 of ACI 318, as applicable.

Revise as follows:

~~1905.1.7 1905.1.3 ACI 318, Section 14.1.4: Structural plain concrete.~~ Delete ACI 318, Section 14.1.4 and replace with the following:

- ~~14.1.4—Plain concrete in structures assigned to Seismic Design Category C, D, E or F.~~
- ~~14.1.4.1—Structures Structural elements of plain concrete are prohibited in structures assigned to Seismic Design Category C, D, E or F shall not have elements of structural plain concrete, except as follows:~~
 - (a) *Structural plain concrete basement, foundation or other walls below the base as defined in ASCE 7 are permitted in detached one- and two-family dwellings three stories or less in height constructed with stud-bearing walls. In dwellings assigned to Seismic Design Category D or E, the height of the wall shall not exceed 8 feet (2438 mm), the thickness shall be not less than 7¹/₂ inches (190 mm), and the wall shall retain no more than 4 feet (1219 mm) of unbalanced fill. Walls shall have reinforcement in accordance with 14.6.1.*

- (b) *Isolated footings of plain concrete supporting pedestals or columns are permitted, provided the projection of the footing beyond the face of the supported member does not exceed the footing thickness.*

Exception: *In detached one- and two-family dwellings three stories or less in height, the projection of the footing beyond the face of the supported member is permitted to exceed the footing thickness.*

- (c) *Plain concrete footings supporting walls are permitted, provided the footings have at least two continuous longitudinal reinforcing bars. Bars shall not be smaller than No. 4 and shall have a total area of not less than 0.002 times the gross cross-sectional area of the footing. For footings that exceed 8 inches (203 mm) in thickness, a minimum of one bar shall be provided at the top and bottom of the footing. Continuity of reinforcement shall be provided at corners and intersections.*

Exceptions:

1. In *Seismic Design Categories A, B and C*, detached one- and two-family dwellings three stories or less in height constructed with stud-bearing walls are permitted to have plain concrete footings without longitudinal reinforcement.
2. For foundation systems consisting of a plain concrete footing and a plain concrete stemwall, a minimum of one bar shall be provided at the top of the stemwall and at the bottom of the footing.
3. Where a slab on ground is cast monolithically with the footing, one No. 5 bar is permitted to be located at either the top of the slab or bottom of the footing.

Add new text as follows:

1905.1.4 Seismic force resisting system. Structural systems designated as part of the seismic force-resisting system shall be restricted to those permitted by ASCE 7. Except for Seismic Design Category A, for which Chapter 18 of ACI 318 does not apply, the following provisions shall be satisfied for each structural system designated as part of the seismic force-resisting system, regardless of the seismic design category:

1. Ordinary moment frames shall satisfy Section 18.3 of ACI 318.
2. Ordinary reinforced concrete structural walls and ordinary precast structural walls need not satisfy any provisions in Chapter 18 of ACI 318.
3. Intermediate moment frames shall satisfy Section 18.4 of ACI 318.
4. Intermediate precast structural walls shall satisfy Section 18.5 of ACI 318.
5. Special moment frames shall satisfy Sections 18.6 through 18.9 of ACI 318.
6. Special structural walls shall satisfy Section 18.10 of ACI 318.
7. Special structural walls constructed using precast concrete shall satisfy Section 18.11 of ACI 318.

1905.1.5 Special structural elements. Special moment frames and special structural walls shall also satisfy Sections 18.2.4 through 18.2.8 of ACI 318.

Revise as follows:

~~1905.1.4~~ ~~1905.1.6 ACI 318, Section 18.11, Precast special structural concrete walls.~~ Modify ACI 318, Section 18.11.2.1 to read as follows:
~~18.11.2.1—Special structural walls constructed using precast concrete shall satisfy all the requirements of Section 18.10.18.11 for cast-in-place special structural walls in addition to 18.5.2. add Section 18.5.2 of ACI 318.~~

~~1905.1.5~~ ~~1905.1.7 ACI 318, Section 18.13.1.1, Seismic force resisting foundations.~~ Modify ACI 318, Section 18.13.1.1 to read as follows:
~~18.13.1.1—~~

Foundations resisting earthquake-induced forces or transferring earthquake-induced forces between a structure and ground shall comply with the requirements of 18.13 and other applicable provisions of ACI 318 unless modified by Chapter 18 of the International Building Code.

Delete without substitution:

~~1905.1.3 ACI 318, Section 18.5.~~ Modify ACI 318, Section 18.5 by adding new Section 18.5.2.2 and renumbering existing Sections 18.5.2.2 and 18.5.2.3 to become 18.5.2.3 and 18.5.2.4, respectively:

~~18.5.2.2—Connections that are designed to yield shall be capable of maintaining 80 percent of their design strength at the deformation induced by the design displacement or shall use Type 2 mechanical splices.~~

~~18.5.2.3—Elements of the connection that are not designed to yield shall develop at least 1.5 S_y .~~

~~18.5.2.4—In structures assigned to SDG D, E or F, wall piers shall be designed in accordance with 18.10.8 or 18.14 in ACI 318.~~

Add new text as follows:

1905.1.8 Connections. Connections shall comply with Sections 1905.8.1 and 1905.8.2.

1905.1.8.1 Connections designed to yield. Connections that are designed to yield shall be capable of maintaining 80 percent of their design strength at the deformation induced by the design displacement or shall use Type 2 mechanical splices.

1905.1.8.2 Elements of connections not designed to yield. Elements of the connection that are not designed to yield shall develop at least 1.5 ~~S_y~~.

1905.1.9 Wall piers. In structures assigned to Seismic Design Category D, E or F, wall piers shall be designed in accordance with ACI 318 Section 18.10.8 or 18.14 of ACI 318.

Reason: These proposed revisions do not alter the criteria in the IBC, but instead make it clear to the user what systems and applications are being addressed. Rather than having the user read sections 14.1.4, 14.1.4.1 etc., the revisions clearly advise the user what is being addressed in the section. The user can more easily determine if the criteria are applicable to the project.

Modifications shown as new section 1905.1. The Chapter already requires compliance with applicable sections of ACI 318. The change removes superfluous language included to simply advise the user that the requirements of Chapter 18 are not applicable in SDC A.

Modifications shown as new section 1905.1.2. Retains the criteria for structures assigned to SDC B, C, D, E, and F, but clearly identifies that criteria as only being applicable to those SDCs. This change makes the code more user friendly, especially where used for projects in SDC A.

NOTE: Requirements of 2018 IBC 1905.1.2 are relocated to new *Section 1905.1.4 Seismic force resisting system*.

Modifications shown as new section 1905.1.3. This revision more clearly presents the requirements and

exceptions for plain concrete used in seismic design categories in an appropriately identified section. The criteria of section 1905.1.7 is moved to new section 1906.1.3. This also eliminates a pointer to other sections of the code.

NOTE: Requirements of 2018 IBC 1905.1.3 addressing connections are relocated to new *Section 1905.1.8 Connections*; and requirements in 2018 IBC 1905.1.3 addressing wall piers are relocated to new *Section 1905.1.9 Wall piers*.

Modifications shown as new section 1905.1.4. This revision identifies the section topic as "Seismic force resisting systems" in lieu of ACI 318 Section "18.2.1.6." This provides clarity and improves direction to the user.

Modifications shown as new section 1905.1.5. This revision identifies the section topic as "Special structural elements." and not as ACI 318, Section 18.11. This provides clarity and improves direction to the user

Modification shown as new section 1905.1.6. This revision identifies the section as "Precast special structural concrete walls." in lieu of 1905.1.4 ACI 318, Section 18.11. This provide clarity and direction to the user. This revision makes it clear that the user need not be concerned with these criteria where projects do not involve precast concrete. This modification also updates the referenced section to align with the provisions of ACI 318-19.

Modification shown as new section 1905.1.7. This revision identifies the section as "Seismic force-resisting foundations." in lieu of "ACI 318, Section 18.13.1.1." This provides clarity and direction to the user. This revision makes it clear that the user need not be concerned with these criteria where projects do not involve seismic force-resisting foundations.

Modification shown as new section 1905.1.8. This revision identifies the section as "Connections" in lieu of "ACI 318, Section 18.5." This provide clarity and direction to the user. This revision makes it clear that the user need not be concerned with these criteria are applicable to connections and further clearly delineates between elements designed to yield and those not designed to yield.

Modification shown as new section 1905.1.9. This revision identifies the section as "Wall piers" in lieu of "ACI "18.5.2.4." To the user it is unclear whether to search IBC or ACI 318 for Section 18.5.2.4. Further, if wall piers are not employed on the project, the user can easily identify that these requirements may not be applicable. Finally, the revised language makes it clearer that the cited references are both in ACI 318

ACI, a 501.C.3 professional technical society, encourages the approval of this code change proposal to improve the IBC by more clearly advising the user that the provisions addressed in this section are related to seismic design category requirements, reduces transcription/duplication of language in IBC and ACI 318, reduces confusion by eliminating multiple indicators that are solely section numbers from ACI 318.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The requirements are not changed. Text is reorganized and presented in a more clear manner identifying specifically to what applications criteria pertain rather than just listing section numbers of ACI 318 which is very confusing.

This proposal could result in cost reductions by reducing confusion as presented in the 2018 IBC.

S151-19

IBC: 1905.1.8, 1906 (New), 1906.1 (New), 1906.1.1 (New), 1906.1.2 (New), 1906.1.2.1 (New), 1906.1.2.2 (New), 1906.1.2.3 (New)

Proponent: Stephen Szoke, American Concrete Institute, representing American Concrete Institute (steve.szoke@concrete.org); Scott Campbell, representing National Ready Mixed Concrete Association (scampbell@nrmca.org)

2018 International Building Code

Delete without substitution:

~~1905.1.8 ACI 318, Section 17.2.3. Modify ACI 318 Sections 17.2.3.4.2, 17.2.3.4.3(d) and 17.2.3.5.2 to read as follows:~~

~~17.2.3.4.2—Where the tensile component of the strength-level earthquake force applied to anchors exceeds 20 percent of the total factored anchor tensile force associated with the same load combination, anchors and their attachments shall be designed in accordance with 17.2.3.4.3. The anchor design tensile strength shall be determined in accordance with 17.2.3.4.4.~~

~~**Exception:** Anchors designed to resist wall out-of-plane forces with design strengths equal to or greater than the force determined in accordance with ASCE 7 Equation 12.11-1 or 12.14-10 shall be deemed to satisfy Section 17.2.3.4.3(d).~~

~~17.2.3.4.3(d)—The anchor or group of anchors shall be designed for the maximum tension obtained from design load combinations that include E, with E increased by Ω_e . The anchor design tensile strength shall be calculated from 17.2.3.4.4.~~

~~17.2.3.5.2—Where the shear component of the strength-level earthquake force applied to anchors exceeds 20 percent of the total factored anchor shear force associated with the same load combination, anchors and their attachments shall be designed in accordance with 17.2.3.5.3. The anchor design shear strength for resisting earthquake forces shall be determined in accordance with 17.5.~~

Exceptions:

- 1: For the calculation of the in-plane shear strength of anchor bolts attaching wood sill plates of bearing or nonbearing walls of light-frame wood structures to foundations or foundation stem walls, the in-plane shear strength in accordance with 17.5.2 and 17.5.3 need not be computed and 17.2.3.5.3 shall be deemed to be satisfied provided all of the following are met:
 - 1.1: The allowable in-plane shear strength of the anchor is determined in accordance with ANSI/AWC NDS Table 12E for lateral design values parallel to grain.
 - 1.2: The maximum anchor nominal diameter is $\frac{5}{8}$ inch (16 mm).
 - 1.3: Anchor bolts are embedded into concrete a minimum of 7 inches (178 mm).
 - 1.4: Anchor bolts are located a minimum of $1\frac{3}{4}$ inches (45 mm) from the edge of the concrete parallel to the length of the wood sill plate.
 - 1.5: Anchor bolts are located a minimum of 15 anchor diameters from the edge of the concrete perpendicular to the length of the wood sill plate.
 - 1.6: The sill plate is 2-inch (51 mm) or 3-inch (76 mm) nominal thickness.
- 2: For the calculation of the in-plane shear strength of anchor bolts attaching cold-formed steel track of bearing or nonbearing walls of light-frame construction to foundations or foundation stem walls, the in-plane shear strength in accordance with 17.5.2 and 17.5.3 need not be computed and 17.2.3.5.3 shall be deemed to be satisfied provided all of the following are met:
 - 2.1: The maximum anchor nominal diameter is $\frac{5}{8}$ inch (16 mm).
 - 2.2: Anchors are embedded into concrete a minimum of 7 inches (178 mm).
 - 2.3: Anchors are located a minimum of $1\frac{3}{4}$ inches (45 mm) from the edge of the concrete parallel to the length of the track.
 - 2.4: Anchors are located a minimum of 15 anchor diameters from the edge of the concrete perpendicular to the length of the track.
 - 2.5: The track is 33 to 68 mil (0.84 mm to 1.73 mm) designation thickness.

Allowable in-plane shear strength of exempt anchors, parallel to the edge of concrete, shall be permitted to be determined in accordance with AISI S100 Section E3.3.1.

- 3: In light-frame construction bearing or nonbearing walls, shear strength of concrete anchors less than or equal to 1 inch [25 mm] in diameter attaching sill plate or track to foundation or foundation stem wall need not satisfy 17.2.3.5.3(a) through (c) when the design strength of the anchors is determined in accordance with 17.5.2.1(c).

Add new text as follows:

SECTION 1906 ANCHORS TO CONCRETE

1906.1 General Anchors to concrete shall be designed and installed in accordance with Chapter 17 of ACI 318 and the provisions of this section.

1906.1.1 Anchors resisting out-of-plane forces. Anchors designed to resist wall out-of-plane forces with design strengths equal to or greater than the force determined in accordance with ASCE 7 Equation 12.11-1 or 12.14-10 shall be deemed to satisfy Section 17.2.3.4.3(d) of ACI 318.

Add new text as follows:

1906.1.2 Anchorage of light frame walls to concrete. For the calculation of the in-plane shear strength of anchor bolts attaching wood sill plates or cold-formed steel track of bearing or nonbearing walls of light-frame structures to foundations or foundation stem walls, the in-plane shear strength in accordance with 17.5.2 and 17.5.3 of ACE 318 need not be computed and 17.2.3.5.3 of ACI 318 shall be deemed to be satisfied where the requirements of Sections 1906.1.2.1 and 1906.1.2.2 are met.

1906.1.2.1 Wood light frame walls. For anchor bolts attaching wood sill plates of light frame wood walls to foundations or foundation stem walls:

1. The allowable in-plane shear strength of the anchor is determined in accordance with ANSI/AWC NDS Table 12E for lateral design values parallel to grain.
2. The maximum anchor nominal diameter is 5/8 inch (16 mm).
3. Anchor bolts are embedded into concrete a minimum of 7 inches (178 mm).
4. Anchor bolts are located a minimum of 13/4 inches (45 mm) from the edge of the concrete parallel to the length of the wood sill plate.
5. Anchor bolts are located a minimum of 15 anchor diameters from the edge of the concrete perpendicular to the length of the wood sill plate.
6. The sill plate is 2-inch (51 mm) or 3-inch (76 mm) nominal thickness.

Add new text as follows:

1906.1.2.2 Cold-formed steel light frame walls. For anchor bolts attaching cold-formed steel track of light frame construction to foundations or foundation stem walls:

1. The maximum anchor nominal diameter is 5/8 inch (16 mm).
2. Anchors are embedded into concrete a minimum of 7 inches (178 mm).
3. Anchors are located a minimum of 13/4 inches (45 mm) from the edge of the concrete parallel to the length of the track.
4. Anchors are located a minimum of 15 anchor diameters from the edge of the concrete perpendicular to the length of the track.
5. The track is 33 to 68 mil (0.84 mm to 1.73 mm) designation thickness.

1906.1.2.3 Anchors 1 inch (25 mm) or less in diameter. In light-frame construction bearing or nonbearing walls, shear strength of concrete anchors less than or equal to 1 inch [25 mm] in diameter attaching sill plate or track to foundation or foundation stem wall need not satisfy 17.10.6.3(a) through (c) of ACI 318 when the design strength of the anchors is determined in accordance with 17.7.2.1(c) of ACI 318.

Reason: This code change proposal:

- 1) More clearly identifies the subject matter as anchors to concrete.
- 2) Removes duplicative text transcribed from ACI 318 to which the chapter already requires compliance. Deleted text from the IBC is shown with text in ACI 318 in the table below.
- 3) More clearly indicates where exceptions for light-frame anchorage to concrete are applicable and that the exceptions are only applicable to light-frame.
- 4) Moves anchor requirement in one section.

2018 IBC	ACI 318
17.2.3.4.2 – Where the tensile component of the strength-level earthquake force applied to anchors exceeds 20 percent of the total factored anchor tensile force associated with the same load combination, anchors and their attachments shall be designed in accordance with 17.2.3.4.3. The anchor design tensile strength shall be determined in accordance with 17.2.3.4.4.	17.2.3.4.2 Where the tensile component of the strength level earthquake force applied to anchors exceeds 20 percent of the total factored anchor tensile force associated with the same load combination, anchors and their attachments shall be designed in accordance with 17.2.3.4.3. The anchor design tensile strength shall be determined in accordance with 17.2.3.4.4. <i>Comment: Criteria are the same and text is recommended for deletion from IBC. Further such a change avoids routine code change proposals to coordinate section of ACI 318 referenced in the IBC.</i>
17.2.3.4.3(d) – The anchor or group of anchors shall be designed for the maximum tension obtained from design load combinations that include E,	(d) The anchor or group of anchors shall be designed for the maximum tension obtained from design load combinations that include E, with the

<p>with E increased by 0. The anchor design tensile strength shall be calculated from 17.2.3.4.4.</p>	<p>horizontal component of E increased by Ω_0. The anchor design tensile strength shall satisfy the tensile strength requirements of 17.2.3.4.4</p> <p><i>Comment: Criteria are the same and text is recommended for deletion from IBC. Further such a change avoids routine code change proposals to coordinate section of ACI 318 referenced in the IBC.</i></p>
<p>17.2.3.5.2 – Where the shear component of the strength-level earthquake force applied to anchors exceeds 20 percent of the total factored anchor shear force associated with the same load combination, anchors and their attachments shall be designed in accordance with 17.2.3.5.3. The anchor design shear strength for resisting earthquake forces shall be determined in accordance with 17.5</p>	<p>17.2.3.5.2 Where the shear component of the strength level earthquake force applied to anchors exceeds 20 percent of the total factored anchor shear force associated with the same load combination, anchors and their attachments shall be designed in accordance with 17.2.3.5.3. The anchor design shear strength for resisting earthquake forces shall be determined in accordance with 17.5</p> <p><i>Comment: Criteria are the same and text is recommended for deletion from IBC. Further such a change avoids routine code change proposals to coordinate section of ACI 318 referenced in the IBC.</i></p>

This code change also removes unnecessary transcription from ACI 318 to further improve clarity.

ACI, a 501.C.3 professional technical society, encourages the approval of this code change proposal to improve the IBC by removing transcription from ACI 318, as the transcription makes the user think there is something different that must be addressed when the chapter already requires compliance with ACI 318. Further this proposed revision places anchor requirements in one section.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This code change does not alter any technical requirements, but make the code more user-friendly by clearly communicating where deviations from ACI 318 are permitted.

Proposal # 4477

S151-19

S152-19

IBC®: SECTION 1906, 1906.1

Proponent: Stephen Szoke, American Concrete Institute, representing American Concrete Institute (steve.szoke@concrete.org); Scott Campbell, representing National Ready Mixed Concrete Association (scampbell@nrmca.org)

2018 International Building Code

Revise as follows:

SECTION 1906 ~~STRUCTURAL PLAIN CONCRETE FOOTINGS FOR LIGHTFRAME CONSTRUCTION~~

1906.1 Scope: Plain concrete footings. ~~The design and construction of structural plain concrete, both cast-in-place and precast, shall comply with the minimum requirements of ACI 318, as modified in Section 1905.~~ **Exception:** For Group R-3 occupancies and buildings of other occupancies less than two stories above grade plane of light-frame construction, the required ~~footing~~ thickness of ~~ACI 318 plain concrete footings~~ is permitted to be reduced to 6 inches (152 mm), provided that the footing does not extend more than 4 inches (102 mm) on either side of the supported wall.

Reason: This code change removes unnecessary text and clearly indicate to the user that the provisions of this sections are restricted to light-frame construction. Sections 1905 and 1901 already advise that structural plain concrete must follow the ACI 318 and the appropriate sections of the IBC. This redundant language is eliminated. Further text is editorially modified to alter language presented as an "exception" to be presented as an appropriate provision.

ACI, a 501.C.3 professional technical society, encourages the approval of this code change proposal to improve the IBC by more clearly advising the user that these provisions are only applicable footing supporting light-frame construction.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
No change to criteria, improved language for clarify and direction.

Proposal # 4537

S152-19

S153-19

IBC®: 1907.1, ASTM Chapter 35 (New)

Proponent: Terry Kozlowski, representing Southern Nevada Chapter; Nenad Mirkovic, representing City of Las Vegas; Amanda Moss, representing SN-ICC Member; Cassidy Wilson, representing SN-ICC Member; Valarie Evans

2018 International Building Code

Revise as follows:

1907.1 General. The thickness of concrete floor slabs supported directly on the ground shall be not less than 3½ inches (89 mm). A ~~6-mil-10-mil~~ (0.006-0.010 inch; 0.15-0.254 mm) polyethylene vapor retarder conforming to ASTM E 1745 Class A requirements with joints lapped not less than 6 inches (152 mm) shall be placed between the base course or subgrade and the concrete floor slab, or other *approved* equivalent methods or materials shall be used to retard vapor transmission through the floor slab.

Exception: A vapor retarder is not required:

1. For detached structures accessory to occupancies in Group R-3, such as garages, utility buildings or other unheated facilities.
2. For unheated storage rooms having an area of less than 70 square feet (6.5 m²) and carports attached to occupancies in Group R-3.
3. For buildings of other occupancies where migration of moisture through the slab from below will not be detrimental to the intended occupancy of the building.
4. For driveways, walks, patios and other flatwork that will not be enclosed and heated at a later date.
5. Where *approved* based on local site conditions.

Add new text as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken PA 19428-2959

E1745-17: Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs

Reason: By coordinating the requirements for the vapor retarder with the American Concrete Institute (ACI) recommendations, this proposal will promote consistency across codes and standards for various moisture conditions.

Bibliography: ACI 302.2R Section 9.3:

"...ACI 302.1R recommends a minimum 10 mil (0.25 mm) vapor retarder thickness when the retarder is protected with a granular fill. When the vapor retarder is not protected by a fill, some specifiers require a 15 mil (0.38 mm) thickness or greater..."

Cost Impact: The code change proposal will increase the cost of construction

This proposal will increase the cost of construction by an estimated \$0.045/sq foot, based on cost analysis in current market conditions. For example, a 50,000 square foot commercial building will have an estimated increase of \$2,250.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM E1745-17, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 4405

S153-19

S154-19

IBC: 1907.2 (New)

Proponent: Amy Dowell, Post-Tensioning Institute, representing Post-Tensioning Institute (amy.dowell@post-tensioning.org); Stephen Szoke (steve.szoke@concrete.org)

2018 International Building Code

1808.6.2 Slab-on-ground foundations. Moments, shears and deflections for use in designing slab-on-ground, mat or raft foundations on expansive soils shall be determined in accordance with *WRI/CRSI Design of Slab-on-Ground Foundations or PTI DC 10.5*. Using the moments, shears and deflections determined above, nonprestressed slabs-on-ground, mat or raft foundations on expansive soils shall be designed in accordance with *WRI/CRSI Design of Slab-on-Ground Foundations* and post-tensioned slab-on-ground, mat or raft foundations on expansive soils shall be designed in accordance with *PTI DC 10.5*. It shall be permitted to analyze and design such slabs by other methods that account for soil-structure interaction, the deformed shape of the soil support, the plate or stiffened plate action of the slab as well as both center lift and edge lift conditions. Such alternative methods shall be rational and the basis for all aspects and parameters of the method shall be available for peer review.

Add new text as follows:

1907.2 Post-tensioned concrete slabs-on-ground. Post-tensioned concrete slabs placed on expansive or stable soils shall be designed in accordance with *PTI DC-10.5*.

Reason: There are currently no provisions for designing post-tensioned slabs on stable soils in IBC. The updated PTI standard, PTI DC10.5-19 has been updated to include stable soils. This title of the reference document has been changed to: PTI DC10.5-19 Standard Requirements for Design and Analysis of Shallow Concrete Foundations on Expansive and Stable Soils.

Post-tensioned slabs are commonly used on stable soils for crack control as well as reduced slab thickness and nonprestressed steel use. This reduction in material use typically offsets the cost of the post-tensioning materials and labor.

Additional documentation can be viewed at [http://ww2.post-tensioning.org/PDF_FILES/190102-DC10.5-Expansive and Stable Soils-Public Review.pdf](http://ww2.post-tensioning.org/PDF_FILES/190102-DC10.5-Expansive%20and%20Stable%20Soils-Public%20Review.pdf).

Bibliography: .

Cost Impact: The code change proposal will not increase or decrease the cost of construction

Post-tensioned slabs are commonly used on expansive and stable soils for crack control as well as reduced slab thickness and nonprestressed steel use. This reduction in material use typically offsets the cost of the post-tensioning materials and labor.

Proposal # 4492

S154-19

S155-19

IBC®: SECTION 1908, 1908.1, 1908.2, 1908.3, 1908.4, 1908.4.1, 1908.4.2, 1908.4.3, 1908.4.4, 1908.5, 1908.6, 1908.7, 1908.8, 1908.9, 1908.9.1, 1908.9.2, 1908.9.3, 1908.10, 1908.10.1, 1908.10.2, 1908.10.3

Proponent: Stephen Szoke, American Concrete Institute, representing American Concrete Institute (steve.szoke@concrete.org); Charles Hanskat, American Shotcrete Association, representing American Shotcrete Association (charles.hanskat@shotcrete.org); Scott Campbell, representing National Ready Mixed Concrete Association (scampbell@nrmca.org)

2018 International Building Code

SECTION 1908 SHOTCRETE

Revise as follows:

~~1908.1 General. Shotcrete is mortar or concrete that is pneumatically projected at high velocity onto a surface. Except as specified in this section, shotcrete shall conform to the requirements of this chapter for plain or reinforced concrete. shall be in accordance with the requirements of ACI 318.~~

Delete without substitution:

~~1908.2 Proportions and materials. Shotcrete proportions shall be selected that allow suitable placement procedures using the delivery equipment selected and shall result in finished in-place hardened shotcrete meeting the strength requirements of this code.~~

~~1908.3 Aggregate. Coarse aggregate, if used, shall not exceed $\frac{3}{4}$ inch (19.1 mm).~~

~~1908.4 Reinforcement. Reinforcement used in shotcrete construction shall comply with the provisions of Sections 1908.4.1 through 1908.4.4.~~

~~1908.4.1 Size. The maximum size of reinforcement shall be No. 5 bars unless it is demonstrated by preconstruction tests that adequate encasement of larger bars will be achieved.~~

~~1908.4.2 Clearance. Where No. 5 or smaller bars are used, there shall be a minimum clearance between parallel reinforcement bars of $2\frac{1}{2}$ inches (64 mm). When bars larger than No. 5 are permitted, there shall be a minimum clearance between parallel bars equal to six diameters of the bars used. Where two curtains of steel are provided, the curtain nearer the nozzle shall have a minimum spacing equal to 12 bar diameters and the remaining curtain shall have a minimum spacing of six bar diameters.~~

~~**Exception:** Subject to the approval of the *building official*, required clearances shall be reduced where it is demonstrated by preconstruction tests that adequate encasement of the bars used in the design will be achieved.~~

~~1908.4.3 Splices. Lap splices of reinforcing bars shall utilize the noncontact lap splice method with a minimum clearance of 2 inches (51 mm) between bars. The use of contact lap splices necessary for support of the reinforcing is permitted where *approved* by the *building official*, based on satisfactory preconstruction tests that show that adequate encasement of the bars will be achieved, and provided that the splice is oriented so that a plane through the center of the spliced bars is perpendicular to the surface of the shotcrete.~~

~~1908.4.4 Spirally tied columns. Shotcrete shall not be applied to spirally tied columns.~~

~~1908.5 Preconstruction tests. Where preconstruction tests are required by Section 1908.4, a test panel shall be shot, cured, cored or sawn, examined and tested prior to commencement of the project. The sample panel shall be representative of the project and simulate job conditions as closely as possible. The panel thickness and reinforcing shall reproduce the thickest and most congested area specified in the structural design. It shall be shot at the same angle, using the same nozzleman and with the same concrete mix design that will be used on the project. The equipment used in preconstruction testing shall be the same equipment used in the work requiring such testing, unless substitute equipment is *approved* by the *building official*. Reports of preconstruction tests shall be submitted to the *building official* as specified in Section 1704.5.~~

~~1908.6 Rebound. Any rebound or accumulated loose aggregate shall be removed from the surfaces to be covered prior to placing the initial or any succeeding layers of shotcrete. Rebound shall not be used as aggregate.~~

~~1908.7 Joints. Except where permitted herein, unfinished work shall not be allowed to stand for more than 30 minutes unless edges are sloped to a thin edge. For structural elements that will be under compression and for construction joints shown on the *approved construction documents*, square joints are permitted. Before placing additional material adjacent to previously applied work, sloping and square edges shall be cleaned and wetted.~~

~~1908.8 Damage. In-place shotcrete that exhibits sags, sloughs, segregation, honeycombing, sand pockets or other obvious defects shall be removed and replaced. Shotcrete above sags and sloughs shall be removed and replaced while still plastic.~~

~~1908.9 Curing. During the curing periods specified herein, shotcrete shall be maintained above 40°F (4°C) and in moist condition.~~

~~1908.9.1 Initial curing.~~ Shotcrete shall be kept continuously moist for 24 hours after shotcreting is complete or shall be sealed with an *approved* curing compound.

~~1908.9.2 Final curing.~~ Final curing shall continue for seven days after shotcreting, or for three days if high-early-strength cement is used, or until the specified strength is obtained. Final curing shall consist of the initial curing process or the shotcrete shall be covered with an *approved* moisture-retaining cover.

~~1908.9.3 Natural curing.~~ Natural curing shall not be used in lieu of that specified in this section unless the relative humidity remains at or above 85 percent, and is authorized by the *registered design professional* and *approved* by the *building official*.

~~1908.10 Strength tests.~~ Strength tests for shotcrete shall be made by an *approved* agency on specimens that are representative of the work and that have been water soaked for not fewer than 24 hours prior to testing. Where the maximum-size aggregate is larger than $\frac{3}{8}$ inch (9.5 mm), specimens shall consist of not less than three 3-inch-diameter (76 mm) cores or 3-inch (76 mm) cubes. Where the maximum-size aggregate is $\frac{3}{8}$ inch (9.5 mm) or smaller, specimens shall consist of not less than 2-inch-diameter (51 mm) cores or 2-inch (51 mm) cubes.

~~1908.10.1 Sampling.~~ Specimens shall be taken from the in-place work or from test panels, and shall be taken not less than once each shift, but not less than one for each 50 cubic yards (38.2 m³) of shotcrete.

~~1908.10.2 Panel criteria.~~ Where the maximum-size aggregate is larger than $\frac{3}{8}$ inch (9.5 mm), the test panels shall have minimum dimensions of 18 inches by 18 inches (457 mm by 457 mm). Where the maximum-size aggregate is $\frac{3}{8}$ inch (9.5 mm) or smaller, the test panels shall have minimum dimensions of 12 inches by 12 inches (305 mm by 305 mm). Panels shall be shot in the same position as the work, during the course of the work and by the nozzlemen doing the work. The conditions under which the panels are cured shall be the same as the work.

~~1908.10.3 Acceptance criteria.~~ The average compressive strength of three cores from the in-place work or a single test panel shall equal or exceed $0.85 f'_c$ with no single core less than $0.75 f'_c$. The average compressive strength of three cubes taken from the in-place work or a single test panel shall equal or exceed f'_c with no individual cube less than $0.88 f'_c$. To check accuracy, locations represented by erratic core or cube strengths shall be retested.

Reason: The current criteria in the International Building Code (IBC) is based on American Concrete Institute (ACI) *Guide to Fiber-Reinforced Shotcrete* (ACI 506.1R). The guide was last updated in 2008 and much of the information in the current edition of the IBC is based on recommendations published in the 1998 edition of ACI 506.1R. The current criteria in the IBC is for the most part archaic and does not reflect shotcrete that is readily available today. Mandatory criteria for the design and construction of shotcrete is now integrated into ACI *Building Code Requirements for Structural Concrete and Commentary* (ACI 318). ACI 318 includes shotcrete along with plain and reinforced cast-in-place concrete and precast and prestressed concrete:

“4.2.1.1 Design properties of shotcrete shall conform to the requirements for concrete except as modified by specific provisions of the Code.”

The provisions unique to shotcrete as shown below under “Shotcrete provisions included in ACI 318,” demonstrating a fully comprehensive effort by ACI Committee 318 to integrate shotcrete into ACI 318 *Building Code Requirements for Structural Concrete*. These provisions are in addition to all exiting applicable provisions of ACI 318. Among the significant differences between the current language in the 2018 edition of the IBC and ACI 318 are:

- 1) New durability requirements added to Chapter 19
- 2) Criteria that allow for additional spacings of reinforcement to improve economy added to Chapter 25.
- 3) Additional criteria for reinforcement and splices to better assure life safety and desired performance added to Chapter 25.
- 4) Criteria for inspection and quality assurance specific to shotcrete added to ACI 318 Chapter 26.

With ACI 318 being the premier document for design and construction of structural concrete, this inclusion elevates the overall acceptance of shotcrete thereby providing owners, developers, and designers with increased confidence when using shotcrete. This in turn allows owners, developers and designers to more readily use the most economical concrete solutions for their projects. Inclusion in ACI 318 also provides all relevant design and construction criteria in mandatory language required for design and construction of shotcrete to assure an acceptable level of life safety and performance while more appropriately addressing current industry practice.

Further ACI 318 is referenced as applicable to plain and reinforced concrete in Section 1901.2: “Structural concrete shall be designed and constructed in accordance with the requirements of this chapter and ACI 318...” Since shotcrete may be a type of structural concrete, the removal of the criteria in the IBC, in addition to updating the requirements to current technology and practice, will help remove confusion and eliminate errors.

This code change proposal:

- 1) Replaces general language in Section 1908.1 and simply directs the user to ACI 318.

2) Removes archaic criteria from the IBC in favor of current criteria applicable to current shotcrete products, design, construction, and inspection as addressed in ACI 318.

3) Removes pointers for inspection from Table 1705.3 Required Special Inspections and Tests of Concrete Construction, as these pointers are no longer required where compliance is in accordance with ACI 318.

4) Adds ACI 318 as a reference to Section 1908 of the IBC.

As a not-for-profit professional society, ACI recommends approval of this code change proposal as submitted to reflect current products and design and construction practices for the benefit of the public and to improve design and construction flexibility and lower costs.

Shotcrete provisions included in ACI 318

Chapter 2 – Notation and Terminology

panel, shotcrete mockup—a shotcrete specimen that simulates the size and detailing of reinforcement in a proposed structural member for preconstruction evaluation of the nozzle operator’s ability to encase the reinforcement-

panel, shotcrete test—a shotcrete specimen prepared in accordance with ASTM C1140 for evaluation of shotcrete. **shotcrete** — mortar or concrete placed pneumatically by high velocity projection from a nozzle onto a surface.

shotcrete, dry mix—shotcrete in which most of the mixing water is added to the concrete ingredients at the nozzle.

shotcrete, wet mix—shotcrete in which the concrete ingredients, including water, are mixed before introduction into the delivery hose.

Chapter 4 – Structural System Requirements

4.2—Materials

4.2.1.1 Design properties of shotcrete shall conform to the requirements for concrete except as modified by specific provisions of the Code.

Chapter 19—Concrete: Design and Durability Requirements

19.3.3.3 Wet-mix shotcrete subject to freezing-and-thawing Exposure Classes F1, F2, or F3 shall be air entrained. Dry-mix shotcrete subject to freezing-and thawing Exposure Class F3 shall be air entrained. Except as permitted in 19.3.3.6, air content shall conform to Table 19.3.3.3.

Table 19.3.3.3—Total air content for shotcrete exposed to cycles of freezing and thawing.

Mixture Type	Target air content, percent		
	F1	F2	F3
Wet-mix shotcrete, before placement	5.0	6.0	6.0
Dry-mix shotcrete (in place)	N/A	N/A	4.5

19.3.3.4 Wet-mix shotcrete shall be sampled in accordance with ASTM C172, and air content shall be measured in accordance with ASTM C231 or ASTM C173.

19.3.3.5 Dry-mix shotcrete shall be sampled and air content shall be measured as directed by the licensed design professional.

19.3.3.6 For f'_c exceeding 5000 psi, reduction of air content indicated in Tables 19.3.3.1 and 19.3.3.3 by 1.0 percentage point is permitted.

Chapter 25—Reinforcement Details

25.2—Minimum spacing of reinforcement

25.2.7 For parallel nonprestressed reinforcement in shotcrete members, the clear spacing shall be in accordance with (a) or (b):

(a) The clear spacing between bars shall be at least the greater of $6d_b$ and 2½ in.

(b) If two curtains of reinforcement are provided, the clear spacing between bars in the curtain nearer the nozzle shall be at least $12d_b$. The clear spacing between bars in the remaining curtain shall conform to (a).

25.2.7.1 It shall be permitted to use a clear spacing that does not meet 25.2.7(a) or 25.2.7(b) provided shotcrete mockup panels are used to demonstrate proper reinforcement encasement in accordance with (a) and (b):

- (a) The shotcrete mockup panels shall be representative of the most complex reinforcement configurations to be encountered.
- (b) The licensed design professional shall specify the shotcrete mock-up panel quantity, frequency of shooting per nozzleman and member type, and panel thickness to verify reinforcement encasement.

25.2.8 For prestressed strands in shotcrete members, minimum center-to-center spacing s shall satisfy 25.2.4, except as permitted in 25.2.6.

25.2.9 For prestressed wire in shotcrete members, minimum center-to-center spacing s shall satisfy the requirements for wire in 25.2.5, except as permitted in and 25.2.6.

25.2.10 For ties, hoops, and spiral reinforcement in columns to be placed with shotcrete, minimum clear spacing shall be 3 in.

25.2.10.1 It shall be permitted to use a clear spacing other than 3 in. provided shotcrete mockup panels are used to demonstrate proper encasement of the reinforcement in accordance with 25.2.7.1

25.5—Splices

25.5.1.6 Non-contact lap splices for reinforcement in shotcrete shall have clear spacing in accordance with (a) or (b):

- (a) For No. 6 and smaller bars, the clear spacing between bars shall be at least the greater of $6d_b$ and $2\frac{1}{2}$ in.
- (b) For No. 7 and larger bars, the clear spacing shall be established using a shotcrete mockup panel to demonstrate that the reinforcement is properly encased.

25.5.1.7 Contact lap splices for reinforcement in shotcrete shall be oriented with the plane of the spliced bars perpendicular to the surface of the shotcrete and approved by the licensed design professional based on a shotcrete mockup panel to demonstrate that the reinforcement is properly encased.

Chapter 26 – Construction Documents and Inspection

26.3—Member information

26.3.1 (b) Members to be constructed using shotcrete

26.3.2(a) Use of shotcrete for structural members not identified in the construction documents as required to be placed by shotcrete shall be permitted in accordance with the project contract documents.

26.4—Concrete materials and mixture requirements

26.4.1.2.1 Compliance requirements:

- (e) For shotcrete, the aggregate gradation shall comply with ASTM C1436.

26.4.1.4 Admixtures

26.4.1.4.1 Compliance requirements:

- (e) Admixtures used in shotcrete shall conform to ASTM C1141.

26.4.1.6 Packaged, pre-blended, dry, combined materials for shotcrete

26.4.1.6.1 Compliance requirements:

- (a) Packaged, pre-blended, dry, combined materials for shotcrete shall conform to ASTM C1480.

26.4.2 Concrete mixture requirements

26.4.2.1 Design information:

(a)(17) For shotcrete, the nominal maximum size of coarse aggregate shall not exceed 1/2 in.

26.4.3 Proportioning of concrete mixtures

26.4.3.1 Compliance requirements:

(e) Shotcrete mixture proportions shall be established so that shotcrete satisfies (1) through (3):

(1) Can be placed without segregation and fully encase reinforcement.

(2) Meets durability requirements given in the construction documents.

(3) Conforms to strength test requirements for shotcrete.

26.4.4 Documentation of concrete mixture characteristics

26.4.4.1 Compliance requirements:

(d) Documentation of shotcrete mixture characteristics shall be submitted for review by the licensed design professional before the mixture is used and before making changes to mixtures already approved. Evidence of the ability of the proposed shotcrete mixture to comply with the concrete mixture requirements in the construction documents shall be included in the documentation.

26.5.2 Concrete placement and consolidation

26.5.2.1 Compliance requirements:

(j) Prior to placement of a new layer of shotcrete, rebound and overspray from adjacent placements shall be removed.

(k) Cuttings and rebound shall not be incorporated into the Work.

(l) Shotcrete surfaces intended to receive subsequent shotcrete placement shall be roughened to a full amplitude of approximately 1/4-in. before the shotcrete has reached final set.

(m) Before placing additional material onto hardened shotcrete, laitance shall be removed, joints shall be cleaned, and the surface dampened.

(n) In-place fresh shotcrete that exhibits sags, sloughs, segregation, honeycombing, or sand pockets shall be removed and replaced.

(o) A certified shotcrete nozzle operator shall place all shotcrete.

(p) If a project-specific shotcrete mockup panel is required, each nozzle operator shall have demonstrated the ability to shoot an approved shotcrete mockup panel.

26.5.3 Curing

26.5.3.2 Compliance requirements:

(f) Shotcrete shall be cured in accordance with (1) through (3).

1. For 24 hours from completion of placement, initial curing shall be provided by one of the following methods:

i. Ponding, fogging, or continuous sprinkling;

ii. Absorptive mat, fabric, or other protective covering kept continuously moist;

iii. Application of a membrane-forming curing compound.

2. After 24 hours from completion of placement, final curing shall be provided by one of the following methods:

i. Same method used in the initial curing process;

ii. Sheet materials;

iii. Other moisture-retaining covers kept continuously moist.

3. Final curing shall be maintained for a minimum duration of not less than the following:

i. 7 days,

ii. 3 days if high-early-strength cement or an accelerating admixture is used.

26.5.6 Construction, contraction, and isolation joints

26.5.6.1 Design information:

26.5.6.1(f) For shotcrete, location of construction joints for which square joints are permitted.

26.5.6.2 Compliance information:

26.5.6.2 (g) For shotcrete, construction joint surfaces shall be cut at a 45-degree angle to the finished surface, unless a square joint is designated in the construction documents.

26.5.6.2(h) For shotcrete, construction joints proposed at locations not shown on the construction documents shall be submitted to the licensed design professional for approval prior to shotcrete placement.

26.12—Concrete evaluation and acceptance

26.12.1 General

26.12.1.1 Compliance requirements:

(b) For shotcrete, a strength test shall be the average strengths of at least three 3-in. diameter cores taken from a test panel prepared in accordance with ASTM C1140 and tested at 28 days from time of placement or at test age designated for f'_c .

26.12.2 Frequency of testing

26.12.2.1 Compliance requirements:

(d) For shotcrete, prepare a shotcrete test panel for each mixture and each nozzle operator at least once per day or for every 50 yd³ placed, whichever results in the greater number of panels

26.12.4 Acceptance for shotcrete

26.12.4.1 Compliance requirements:

(a) Specimens for acceptance tests shall be in accordance with (1) and (2):

(1) Test panels shall be prepared in the same orientation and by the same nozzle operator placing shotcrete.

(2) Cores shall be obtained, conditioned, and tested in accordance with ASTM C1604.

(b) Strength level of a shotcrete mixture shall be acceptable if (1) and (2) are satisfied:

(1) Every arithmetic average of the strengths from three consecutive test panels equals or exceeds f'_c .

(2) The average compressive strength of three cores from a single test panel is not less than $0.85 f'_c$ with no core having a strength less than $0.75 f'_c$.

(c) If either of the requirements of 26.12.4.1(b) are not satisfied, steps shall be taken to increase the average of subsequent strength results.

(d) Requirements for investigating low strength-test results shall apply if the requirements of 26.12.4.1(b)(2) are not met.

Table 1 - Comparison of 2018 IBC and ACI 318 Provisions

2018 IBC Provisions	ACI 318-19 Provisions
	<p>Chapter 2 – Notation and Terminology</p> <p>shotcrete — mortar or concrete placed pneumatically by high velocity projection from a nozzle onto a surface.</p> <p>shotcrete, dry mix—shotcrete in which most of the mixing water is added to the concrete ingredients at the nozzle.</p> <p>shotcrete, wet mix—shotcrete in which the concrete ingredients, including water, are mixed before introduction into the delivery hose.</p>
<p>1908.2 Proportions and materials. Shotcrete proportions shall be selected that allow suitable placement procedures using the delivery equipment selected and shall result in finished in-place hardened shotcrete meeting the strength requirements of this code.</p>	<p>Chapter 4 – Structural System Requirements</p> <p>4.2—Materials</p> <p>4.2.1.1 Design properties of shotcrete shall conform to the requirements for concrete except as modified by specific provisions of the Code.</p> <hr/> <p>26.4.3 Proportioning of concrete mixtures</p> <p>26.4.3.1 Compliance requirements:</p> <p>(e) Shotcrete mixture proportions shall be established so that shotcrete satisfies (1) through (3):</p> <p>(1) Can be placed without segregation and fully encase reinforcement.</p> <p>(2) Meets durability requirements given in the construction documents.</p> <p>(3) Conforms to strength test requirements for shotcrete.</p> <p>26.4.4.1 Compliance requirements:</p> <p>(d) Documentation of shotcrete mixture characteristics shall be submitted for review by the licensed design professional before the mixture is used and before making changes to mixtures already approved in use. Evidence of the ability of the proposed shotcrete mixture to comply with the concrete mixture requirements in the construction documents shall be included in the documentation.</p>
<p><i>Comment: ACI 318-19 addresses durability in addition to strength and placement.</i></p>	
<p>1908.3 Aggregate. Coarse aggregate, if used, shall not exceed 3/4 inch (19.1 mm).</p>	<p>26.4.2 Concrete mixture requirements</p> <p>26.4.2.1 Design information:</p> <p>(a)(17) For shotcrete, the nominal maximum size of coarse aggregate shall not exceed 1/2 in.</p>
<p><i>Comment: The ACI 318-19 provisions more appropriately limit the maximum aggregate size for shotcrete to ½ inch in lieu of ¾ inch as allowed in the IBC.</i></p>	
<p>1908.4 Reinforcement. Reinforcement used in shotcrete construction shall comply with the provisions of Sections 1908.4.1 through 1908.4.4.</p> <p>1908.4.1 Size. The maximum size of reinforcement shall be No. 5 bars unless it is demonstrated by preconstruction tests that adequate encasement of larger bars will be achieved.</p>	<p>Chapter 25—Reinforcement Details</p> <p>25.2—Minimum spacing of reinforcement</p> <p>25.2.7 For parallel nonprestressed reinforcement in shotcrete members, the clear spacing shall be in accordance with (a) or (b):</p>

(a) The clear spacing between bars shall be at least the greater of $6d_b$ and 2½ in.

(b) If two curtains of reinforcement are provided, the clear spacing between bars in the curtain nearer the nozzle shall be at least $12d_b$. The clear spacing between bars in the remaining curtain shall conform to (a).

25.2.7.1 It shall be permitted to use a clear spacing that does not meet 25.2.7(a) or 25.2.7(b) provided shotcrete mockup panels are used to demonstrate proper reinforcement encasement in accordance with (a) and (b):

(a) The shotcrete mockup panels shall be representative of the most complex reinforcement configurations to be encountered.

(b) The licensed design professional shall specify the shotcrete mock-up panel quantity, frequency of shooting per nozzleman and member type, and panel thickness to verify reinforcement encasement.

Comment: To reflect current state-of-the art, minimum bar sizes are No. 6 in ACI 318-19.

25.2.8 For prestressed strands in shotcrete members, minimum center-to-center spacing s shall satisfy 25.2.4, except as permitted in 25.2.6.

25.2.9 For prestressed wire in shotcrete members, minimum center-to-center spacing s shall satisfy the requirements for wire in 25.2.5, except as permitted in and 25.2.6.

Comment: ACI 318-19 appropriately addresses prestressing strand and wire use in shotcrete members.

1908.5 Preconstruction tests. Where preconstruction tests are required by Section 1908.4, a test panel shall be shot, cured, cored or sawn, examined and tested prior to commencement of the project.

The sample panel shall be representative of the project and simulate job conditions as closely as possible. The panel thickness and reinforcing shall reproduce the thickest and most congested area specified in the structural design.

panel, shotcrete test—a shotcrete specimen prepared in accordance with ASTM C1140 for evaluation of shotcrete.

panel, shotcrete mockup—a shotcrete specimen that simulates the size and detailing of reinforcement in a proposed structural member for preconstruction evaluation of the nozzle operator’s ability to encase the reinforcement.

26.5.2 Concrete placement and consolidation

26.5.2.1 Compliance requirements:

(o) A certified shotcrete nozzle operator shall place all shotcrete.

(p) If a project-specific shotcrete mockup panel is required, each nozzle operator shall have demonstrated the ability to shoot an approved shotcrete mockup panel.

Comment: ACI 318-19 uses the current terminology of mockup panel versus sample panel. ACI 318-19 has clear language addressing size and detailing of reinforcement.

26.12—Concrete evaluation and acceptance

26.12.1 General

26.12.1.1 Compliance requirements:

(b) For shotcrete, a strength test shall be the average strengths of at least three 3-in. diameter cores taken from a test panel prepared in accordance with ASTM C1140 and

	tested at 28 days from time of placement or at test age designated for f'_c .
<i>Comment: ACI 318-19 has specific requirements for sampling and testing cores</i>	
It shall be shot at the same angle, using the same nozzleman and with the same concrete mix design that will be used on the project. The equipment used in preconstruction testing shall be the same equipment used in the work requiring such testing, unless substitute equipment is approved by the building official.	<p>26.12.4.1 Compliance requirements:</p> <p>(a) Specimens for acceptance tests shall be in accordance with (1) and (2):</p> <p>(1) Test panels shall be prepared in the same orientation and by the same nozzle operator placing shotcrete.</p> <p>(2) Cores shall be obtained, conditioned, and tested in accordance with ASTM C1604.</p>
<i>Comment: ACI 318-19 adds requirements for placement of shotcrete to be performed by the same nozzle operator doing the work.</i>	
Reports of preconstruction tests shall be submitted to the building official as specified in Section 1704.5.	
<i>Comment: ACI 318-18 contains more specific requirements including but not limited to frequency of tests.</i>	
<p>1908.4.2 Clearance. Where No. 5 or smaller bars are used, there shall be a minimum clearance between parallel reinforcement bars of 2 1/2 inches (64 mm). When bars larger than No. 5 are permitted, there shall be a minimum clearance between parallel bars equal to six diameters of the bars used. Where two curtains of steel are provided, the curtain nearer the nozzle shall have a minimum spacing equal to 12 bar diameters and the remaining curtain shall have a minimum spacing of six bar diameters</p> <p>Exception: Subject to the approval of the building official, required clearances shall be reduced where it is demonstrated by preconstruction tests that adequate encasement of the bars used in the design will be achieved.</p>	<p>25.2.10 For ties, hoops, and spiral reinforcement in columns to be placed with shotcrete, minimum clear spacing shall be 3 in.</p> <p>25.2.10.1 It shall be permitted to use a clear spacing other than 3 in. provided shotcrete mockup panels are used to demonstrate proper encasement of the reinforcement in accordance with 25.2.7.1</p>
<p>1908.4.3 Splices. Lap splices of reinforcing bars shall utilize the noncontact lap splice method with a minimum clearance of 2 inches (51 mm) between bars. The use of contact lap splices necessary for support of the reinforcing is permitted where approved by the building official, based on satisfactory preconstruction tests that show that adequate encasement of the bars will be achieved, and provided that the splice is oriented so that a plane through the center of the spliced bars is perpendicular to the surface of the shotcrete.</p>	<p>25.5—Splices</p> <p>25.5.1.6 Non-contact lap splices for reinforcement in shotcrete shall have a clear spacing in accordance with (a) or (b):</p> <p>(a) For No. 6 and smaller bars, the clear spacing between bars shall be at least the greater of $6d_b$ and 2 1/2 in.</p> <p>(b) For No. 7 and larger bars, the clear spacing shall be established using a shotcrete mockup panel to demonstrate that the reinforcement is properly encased.</p> <p>25.5.1.7 Contact lap splices for reinforcement in shotcrete shall be oriented with the plane of the spliced bars perpendicular to the surface of the shotcrete and approved by the licensed design professional based on a shotcrete mockup panel to demonstrate that the reinforcement is properly encased.</p>
<p>1908.4.4 Spirally tied columns. Shotcrete shall not be applied to spirally tied columns.</p>	<p>25.2.10 For ties, hoops, and spiral reinforcement in columns to be placed with shotcrete, minimum clear spacing shall be 3 in.</p> <p>25.2.10.1 It shall be permitted to use a clear spacing other than 3 in. provided shotcrete mockup panels are used to demonstrate proper encasement of the reinforcement in accordance with 25.2.7.1</p>
	<p>Chapter 19—Concrete: Design and Durability Requirements</p> <p>19.3.3.4 Wet-mix shotcrete shall be sampled in accordance</p>

	<p>with ASTM C172, and air content shall be measured in accordance with ASTM C231 or ASTM C173.</p> <p>19.3.3.5 Dry-mix shotcrete shall be sampled and air content shall be measured as directed by the licensed design professional.</p>
<i>Comment: ACI 318-19 includes specific requirements for sampling wet-mix and dry-mix shotcrete</i>	
	<p>19.3.3.6 For f'c exceeding 5000 psi, reduction of air content indicated in Tables 19.3.3.1 and 19.3.3.3 by 1.0 percentage point is permitted.</p>
<i>Comment: ACI 318-19 reflects the durability and performance of higher strength concrete by relaxing the requirements for air content.</i>	
<p>1908.6 Rebound. Any rebound or accumulated loose aggregate shall be removed from the surfaces to be covered prior to placing the initial or any succeeding layers of shotcrete. Rebound shall not be used as aggregate.</p>	<p>26.5.2 Concrete placement and consolidation</p> <p>26.5.2.1 Compliance requirements:</p> <p>(j) Prior to placement of a new layer of shotcrete, rebound and overspray from adjacent placements shall be removed.</p> <p>(k) Cuttings and rebound shall not be incorporated into the Work.</p>
<i>Comment: ACI 318-19 clearly address overspray, rebound and cuttings.</i>	
	<p>26.5.2 Concrete placement and consolidation</p> <p>26.5.2.1 Compliance requirements:</p> <p>(l) Shotcrete surfaces intended to receive subsequent shotcrete placement shall be roughened to a full amplitude of approximately 1/4-in. before the shotcrete has reached final set.</p>
<i>Comment: ACI 318-19 includes requirements for placement of subsequent concrete not addressed in the 2018 IBC.</i>	
<p>1908.7 Joints. Except where permitted herein, unfinished work shall not be allowed to stand for more than 30 minutes unless edges are sloped to a thin edge. For structural elements that will be under compression and for construction joints shown on the approved construction documents, square joints are permitted. Before placing additional material adjacent to previously applied work, sloping and square edges shall be cleaned and wetted.</p>	<p>26.5.6 Construction, contraction, and isolation joints</p> <p>26.5.6.1 Design information:</p> <p>26.5.6.1(f) For shotcrete, location of construction joints for which square joints are permitted.</p> <p>26.5.6.2 Compliance information:</p> <p>26.5.6.2 (g) For shotcrete, construction joint surfaces shall be cut at a 45-degree angle to the finished surface, unless a square joint is designated in the construction documents.</p> <p>26.5.6.2(h) For shotcrete, construction joints proposed at locations not shown on the construction documents shall be submitted to the licensed design professional for approval prior to shotcrete placement.</p>
<p>1908.7 Joints. Except where permitted herein, unfinished work shall not be allowed to stand for more than 30 minutes unless edges are sloped to a thin edge. For structural elements that will be under compression and for construction joints shown on the approved construction documents, square joints are permitted. Before placing additional material adjacent to previously applied work, sloping and square edges shall be cleaned and wetted.</p>	<p>26.5.2 Concrete placement and consolidation</p> <p>26.5.2.1 Compliance requirements:</p> <p>(m) Before placing additional material onto hardened shotcrete, laitance shall be removed, joints shall be cleaned, and the surface dampened.</p>
<p>1908.8 Damage. In-place shotcrete that exhibits sags, sloughs, segregation, honeycombing, sand pockets or other obvious defects shall be removed and replaced. Shotcrete above sags and sloughs shall be removed and replaced while</p>	<p>26.5.2 Concrete placement and consolidation</p> <p>26.5.2.1 Compliance requirements:</p>

still plastic.	(n) In-place fresh shotcrete that exhibits sags, sloughs, segregation, honeycombing, or sand pockets shall be removed and replaced.
1908.9 Curing. During the curing periods specified herein, shotcrete shall be maintained above 40°F (4°C) and in moist condition.	
<i>Comment: This requirement in ACI 318-19 is applicable to all concrete and not specifically called out for shotcrete.</i>	
1908.9.1 Initial curing. Shotcrete shall be kept continuously moist for 24 hours after shotcreting is complete or shall be sealed with an approved curing compound.	<p>26.5.3 Curing concrete and shotcrete</p> <p>26.5.3.2 Compliance requirements:</p> <p>(f) Shotcrete shall be cured in accordance with (1) through (3).</p> <p>1. For 24 hours from completion of placement, initial curing shall be provided by one of the following methods:</p> <ul style="list-style-type: none"> i. Ponding, fogging, or continuous sprinkling; ii. Absorptive mat, fabric, or other protective covering kept continuously moist; iii. Application of a membrane-forming curing compound. <p>2. After 24 hours from completion of placement, final curing shall be provided by one of the following methods:</p> <ul style="list-style-type: none"> i. Same method used in the initial curing process; ii. Sheet materials; iii. Other moisture-retaining covers kept continuously moist.
<i>Comment: ACI 318-19 reflects specific requirements addressed in the appropriate ASTM product specifications for shotcrete.</i>	
1908.9.2 Final curing. Final curing shall continue for seven days after shotcreting, or for three days if high early-strength cement is used, or until the specified strength is obtained. Final curing shall consist of the initial curing process or the shotcrete shall be covered with an approved moisture-retaining cover.	<p>26.5.3 Curing concrete and shotcrete</p> <p>26.5.3.2 Compliance requirements:</p> <p>3. Final curing shall be maintained for a minimum duration of not less than the following:</p> <ul style="list-style-type: none"> i. 7 days, ii. 3 days if high-early-strength cement or an accelerating admixture is used.
<i>Comment: ACI 318-19 provides time-period for curing but appropriately defers to the ASTM specifications for methods.</i>	
1908.9.3 Natural curing. Natural curing shall not be used in lieu of that specified in this section unless the relative humidity remains at or above 85 percent, and is authorized by the registered design professional and approved by the building official.	
<i>Comment: ACI 318-19 appropriately defers curing methods as provided in the applicable ASTM product specifications.</i>	
<p>1908.10 Strength tests. Strength tests for shotcrete shall be made by an approved agency on specimens that are representative of the work and that have been water soaked for not fewer than 24 hours prior to testing. Where the maximum size aggregate is larger than 3/8 inch (9.5 mm), specimens shall consist of not less than three 3-inch-diameter (76 mm) cores or 3-inch (76 mm) cubes. Where the maximum-size aggregate is 3/8 inch (9.5 mm) or smaller, specimens shall consist of not less than 2-inch-diameter (51 mm) cores or 2-inch (51 mm) cubes.</p>	<p>Cores shall be obtained, conditioned, and tested in accordance with ASTM C1604</p> <p>26.12.4 Acceptance for shotcrete</p> <p>26.12.4.1 Compliance requirements:</p> <p>(a) Specimens for acceptance tests shall be in accordance with (1) and (2):</p>

	<p>(1) Test panels shall be prepared in the same orientation and by the same nozzle operator placing shotcrete.</p> <p>(2) Cores shall be obtained, conditioned, and tested in accordance with ASTM C1604.</p> <p>(b) Strength level of a shotcrete mixture shall be acceptable if (1) and (2) are satisfied:</p> <p>(1) Every arithmetic average of the strengths from three consecutive test panels equals or exceeds f'_c.</p> <p>(2) The average compressive strength of three cores from a single test panel is not less than $0.85 f'_c$ with no core having a strength less than $0.75 f'_c$.</p> <p>(c) If either of the requirements of 26.12.4.1(b) are not satisfied, steps shall be taken to increase the average of subsequent strength results.</p> <p>(d) Requirements for investigating low strength-test results shall apply if the requirements of 26.12.4.1(b)(2) are not met.</p> <p>19.3.3.3 Wet-mix shotcrete subject to freezing-and-thawing Exposure Classes F1, F2, or F3 shall be air entrained. Dry-mix shotcrete subject to freezing-and thawing Exposure Class F3 shall be air entrained. Except as permitted in 19.3.3.6, air content shall conform to Table 19.3.3.3</p>
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Comment: ACI 318-19 appropriately references ASTM C1604 Obtaining and Testing Drilled Cores of Shotcrete for sampling and testing shotcrete cores.

<p>1908.10.1 Sampling. Specimens shall be taken from the in-place work or from test panels, and shall be taken not less than once each shift, but not less than one for each 50 cubic yards (38.2 m3) of shotcrete.</p>	<p>26.12.2 Frequency of testing</p> <p>26.12.2.1 Compliance requirements:</p> <p>(d) For shotcrete, prepare a shotcrete test panel for each mixture and each nozzle operator at least once per day or for every 50 yd³ placed, whichever results in the greater number of panels</p>
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<p>1908.10.2 Panel criteria. Where the maximum-size aggregate is larger than 3/8 inch (9.5 mm), the test panels shall have minimum dimensions of 18 inches by 18 inches (457 mm by 457 mm). Where the maximum-size aggregate is 3/8 inch (9.5 mm) or smaller, the test panels shall have minimum dimensions of 12 inches by 12 inches (305 mm by 305 mm).</p>	
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Comment: ACI 318-19 appropriately references ASTM C1140 Standard Practice for Preparing and Testing Specimens from Shotcrete Test Panel.

<p>Panels shall be shot in the same position as the work, during the course of the work and by the nozzle men doing the work</p>	<p>26.12.4.1 Compliance requirements:</p> <p>(a) Specimens for acceptance tests shall be in accordance with (1) and (2):</p> <p>(1) Test panels shall be prepared in the same orientation and by the same nozzle operator placing shotcrete.</p>
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The conditions under which the panels are cured shall be the same as the work.

Comment: ACI 318-19 appropriately references ASTM C1140 Standard Practice for Preparing and Testing Specimens from Shotcrete Test Panel.

<p>1908.10.3 Acceptance criteria. The average compressive strength of three cores from the in-place work or a single test panel shall equal or exceed $0.85 f'_c$ with no single core less than $0.75 f'_c$. The average compressive strength of three cubes taken from the in-place work or a single test panel shall equal or exceed f'_c with no</p>	<p>26.12.1 General</p> <p>26.12.1.1 Compliance requirements:</p>
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individual cube less than $0.88 f'_c$. To check accuracy, locations represented by erratic core or cube strengths shall be retested.

(b) For shotcrete, a strength test shall be the average strengths of at least three 3-in. diameter cores taken from a test panel prepared in accordance with ASTM C1140 and tested at 28 days from time of placement or at test age designated for f'_c .

26.12.4 Acceptance for shotcrete

26.12.4.1 Compliance requirements:

(a) Specimens for acceptance tests shall be in accordance with (1) and (2):

(1) Test panels shall be prepared in the same orientation and by the same nozzle operator placing shotcrete.

(2) Cores shall be obtained, conditioned, and tested in accordance with ASTM C1604.

(b) Strength level of a shotcrete mixture shall be acceptable if (1) and (2) are satisfied:

(1) Every arithmetic average of the strengths from three consecutive test panels equals or exceeds f'_c .

(2) The average compressive strength of three cores from a single test panel is not less than $0.85 f'_c$ with no core having a strength less than $0.75 f'_c$.

(c) If either of the requirements of 26.12.4.1(b) are not satisfied, steps shall be taken to increase the average of subsequent strength results.

(d) Requirements for investigating low strength-test results shall apply if the requirements of 26.12.4.1(b)(2) are not met.

19.3.3.3 Wet-mix shotcrete subject to freezing-and-thawing Exposure Classes F1, F2, or F3 shall be air entrained. Dry-mix shotcrete subject to freezing-and thawing Exposure Class F3 shall be air entrained. Except as permitted in 19.3.3.6, air content shall conform to Table 19.3.3.3.

Comment: ACI 318-19 provides general requirements and appropriately references ASTM C1140 Standard Practice for Preparing and Testing Specimens from Shotcrete Test Panel

Chapter 26 – Construction Documents and Inspection

26.3—Member information

26.3.1 (b) Members to be constructed using shotcrete

26.3.2(a) Use of shotcrete for structural members not identified in the construction documents as required to be placed by shotcrete shall be permitted in accordance with the project contract documents.

26.4—Concrete materials and mixture requirements

26.4.1.2.1 Compliance requirements:

(ee) For shotcrete, the aggregate gradation shall comply with ASTM C1436.

26.4.1.4 Admixtures

26.4.1.4.1 Compliance requirements:

(e) Admixtures used in shotcrete shall conform to ASTM C1141.

26.4.1.6 Packaged, pre-blended, dry, combined materials for shotcrete

26.4.1.6.1 Compliance requirements:

(a) Packaged, pre-blended, dry, combined materials for shotcrete shall conform to ASTM C1480.

(d) Documentation of shotcrete mixture characteristics shall be submitted for review by the licensed design professional before the mixture is used and before making changes to mixtures already in use. Evidence of the ability of the proposed shotcrete mixture to comply with the concrete mixture requirements in the construction documents shall be included in the documentation.

Comment: ACI 318-19 includes material and mixture requirements not addressed in the 2018 IBC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. No increase to initial cost of construction. This change removes antiquated criteria for the International Building Code (IBC) and simply refers to updated, but comparable, criteria in American Concrete Institute Building Code Requirements for Structural Concrete and Commentary (ACI 318). The provisions of ACI 318 are more inclusive of design and construction methods conditions and provide increase flexibility for designers and contractors. In many instances this increased flexibility has the potential to reduce costs.

Proposal # 4539

S155-19

S156-19

IBC: 2109.2.4.8, 2109.2.4.8.1 (New), 2109.2.4.8.2 (New), 2109.2.4.8.3 (New), 2109.2.4.8.4 (New), 2109.2.4.8.5 (New), 2109.2.4.8.6 (New)

Proponent: K. Ben Loescher, AIA, Loescher Meachem Architects, representing Self (bloescher@lmarchitectsinc.com); Martin Hammer, representing Martin Hammer, Architect (mfhammer@pacbell.net); David Eisenberg, representing DCAT (strawnet@gmail.com)

2018 International Building Code

Delete and substitute as follows:

~~**2109.2.4.8 Exterior finish.** Exterior walls constructed of unstabilized adobe units shall have their exterior surface covered with not fewer than two coats of Portland cement plaster having a minimum thickness of $\frac{3}{4}$ inch (19.1 mm) and conforming to ASTM C926. Lathing shall comply with ASTM C1063. Fasteners shall be spaced at 16 inches (406 mm) on center maximum. Exposed wood surfaces shall be treated with an approved wood preservative or other protective coating prior to lath application.~~

2109.2.4.8 Exterior finish. Exterior finishes applied to adobe masonry walls shall be of any type permitted by this code, and shall comply with the provisions of this section and with Chapter 14, except where stated otherwise in this section.

Add new text as follows:

2109.2.4.8.1 Purpose, and type. Unstabilized adobe masonry walls shall be finished on their exterior with a plaster of any type in this section to provide protection from weather in accordance with this code.

2109.2.4.8.2 Vapor retarders and vapor permeance. Class I and II vapor retarders shall not be used on any adobe masonry wall, nor shall any other material be used that has a vapor permeance rating of less than 5 perms.

2109.2.4.8.3 Plaster thickness and coats. Plaster applied to adobe masonry shall be not less than 7/8" (22 mm) and not greater than 2 inches (51 mm) thick. Plaster shall be applied in not less than two coats.

2109.2.4.8.4 Plaster application. Plaster shall be applied directly to adobe masonry walls without any type of membrane to facilitate transpiration of moisture from the masonry units, and to secure a mechanical bond between the masonry and plaster.

2109.2.4.8.5 Lath for plaster. Lath shall be provided for all plasters, except as otherwise not required in this section. Fasteners shall be spaced at 16 inches (406mm) on center maximum. Metal lath shall comply with ASTM C1063, as modified by this section, and shall be corrosion resistant. Plastic lath shall comply with ASTM C1788, as modified by this section.

2109.2.4.8.6 Cement plaster. Cement plaster shall conform to ASTM C926 and shall comply with Chapter 25, except that the proportion of lime in plaster coats shall not be less than 1 part lime to 6 parts cement to allow a minimum acceptable vapor permeability. The combined thickness of plaster coats shall not be more than 1 inch (25mm).

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken PA 19428-2959

C1788-14: Standard Specification for Non Metallic Plaster Bases (Lath) Used with Portland Cement Based Plaster in Vertical Wall Applications

Reason: Even more than wood frame or conventional masonry structures, adobe walls require vapor permeable finishes to ensure appropriate performance and service life; moisture that is trapped within adobe wall assemblies can cause failures due to finish separation, salt attack, coving and freeze-thaw related spalling. Although it is accepted that earthen walls require vapor permeable finishes to adequately manage moisture in the assembly and prevent various structural and finish pathologies, existing code language remains based on legacy language that predates current building science. Notably, while stabilized adobes do not require any exterior finishes, unstabilized adobes are required to be finished with conventional cement stucco, a finishing system that without modification has been shown to be insufficiently permeable. Research has shown that simply increasing the lime proportion in ordinary cement plasters can increase vapor permeability to acceptable levels.

Other comments related to this proposal:

- *Necessity: Unstabilized adobe masonry walls are subject to erosion from precipitation. As most of Section 2109 presumes that adobe masonry is used in structural applications, protective finishes are required to prevent structural failures from erosion, coving, and freeze/thaw related spalling.*
- *It is accepted that earthen building materials require exterior finishes that are vapor permeable in order to facilitate drying from moisture that may enter the wall assembly through roof or finish defects, condensation, plumbing failures, flooding, and capillary action from adjacent construction. In the presence of moisture and in the absence of vapor permeable finishes, earthen wall systems are subject to failure due to loss of integrity of the clay/sand matrix, liquification and/or salt-attack. (ASTM E2392)*
- *Plaster Thickness: The 7/8" minimum thickness requirement is identical to one that has existed successfully in the New Mexico Earthen*

Building Materials Code. Limits on the maximum thickness of applied plasters are required to ensure that the applied renders are securely bonded to the substrate. The New Mexico Earthen Building Materials Code includes no limit on the thickness of plasters; the 2" maximum proposed here is identical to that currently existing in IRC Appendix S.

- Vapor Retarders: Class I and II vapor retarders are prohibited here as they are effectively impermeable, having perm ratings of less than 1.
- Minimum Perm Rating: Although in many cases higher permeability would be desirable, for purposes of this proposal a minimum perm rating of 3.5 has been established as it allows the use of a 1:1:6 lime amended cement stucco with an applied siloxane water repellent (3.54 perms at 41 mm of thickness per Straube). 1:1:6 stuccos are applied with the same methods as 1:3 stuccos, at similar cost, and have similar durability. Surface applied siloxane based water repellents are effective at inhibiting water infiltration through plaster skins and desired by industry.
- Direct application is required as intermediate substrates may inhibit the beneficial outward movement of moisture, and introduces questions of mechanical attachment that cannot adequately be addressed within the scope of this proposal.
- Metallic laths are conventionally used for Portland cement based plasters. Requirements and conditions for their use need to be provided.
- ASTM C 1063: "Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster". This is the reference standard used elsewhere in the IBC to describe the material and practice requirements for the installation of metallic lathing.
- ASTM C926: This Standard Specification for the Application of Cement Stucco is the accepted reference standard for the materials and practices associated with cement stuccos.
- Lime requirement: Complimentary to the minimum vapor permeability requirements, this section requires lime to be added to cement stuccos. The constituents of conventional cement stuccos sometimes vary but are typically 1 part cement to 3 parts sand; based on Straube, this formulation yielded only 0.68 perms. The formulation proposed by this section yields 5.13 perms at 35 mm in thickness, or 3.54 perms at 41 mm of thickness when treated with siloxane, providing adequate (but not optimal) permeability while retaining desirable durability characteristics and application procedures of conventional cement stuccos. In both cases, permeability exceeds 5 perms at a 25mm (conventional applied thickness)
- Maximum Thickness: Limits on the thickness of applied plasters are required to ensure that the applied renders are securely bonded to the substrate. the 1 1/2" maximum proposed here is identical to that currently existing in IRC Appendix S, the 1" maximum for cement based plasters is required to achieve permeability of greater than 5 perms.
- Vapor Permeability of various finishes (per Straube):

Sample	t [mm]	Permeance [ng/Pa s m ²]	Permeability [ng/Pa s m]	US Perms
Cement :Sand				
1:3 datum	43.5	39	1.7	0.68
1:3 elastomeric coating	39.5	40	--	0.70
1:3 siloxane	41.0	40	1.7	0.70
Cement:Lime:Sand				
1:1:6 datum	35	295	10.3	5.13
1:1:6 linseed	36	223	8.0	3.89
1:1:6 elastomeric	32.5	244	--	4.25
1:1:6 siloxane	41	203	8.3	3.54
1:1:6 calcium stearate	53.5	81	4.3	1.42
1:1:6 calcium stearate	44	142	6.2	2.47
1:1:6 calcium stearate	53.5	41	2.2	0.71
1:1:6 latex paint	36.5	203	--	3.54
1:1:6 oil paint	40	41	--	0.71
Cement:Lime:Sand				
1:2:9 datum	50.5	295	14.9	5.13
1:2:9 linseed	50.5	259	13.1	4.52
Lime:Sand				
1:3 Datum	33.5	565	18.9	9.85
1:3 Datum	35.5	529	18.8	9.22
1:3 Quicklime	32	459	14.7	8.00

Table 2.3: Results of Vapor Permeance Test Results [Straube, 2000]

Bibliography: 2015 New Mexico Earthen Building Materials Code
2015 *International Residential Code Appendix S - Strawbale Construction*

Adobe Conservation: A Preservation Handbook. Compiled by the Technical Staff of Cornerstones Community Partnership. Sunstone Press (Santa Fe, 2006)

ASTM E2392 / E2392M - 10(2016) Standard Guide for Design of Earthen Wall Building Systems

Building with Earth: Design and Technology of Sustainable Architecture. Gernot Minke, Birkhauser (Bern, 2009)

Earth Construction: A Comprehensive Guide. Hugo Houben and Hubert Guillaud, Practical Action Publishing (Rugby, 2008).

Moisture Properties of Plaster and Stucco for Strawbale Buildings. John Straube. (EBNET, 2019)

Sustainable Building with Earth. Horst Schroeder, Springer International Publishing (Switzerland, 2016)

Cost Impact: The code change proposal will decrease the cost of construction

In most cases, the proposed code language expands the options available to design professionals and contractors for the finishing of adobe wall systems without additional cost impact. The inclusion of earthen plasters in particular cases will decrease the cost of construction for some projects.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM C1788-14, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 5352

S156-19

S157-19

IBC: 2109.2.4.8.1 (New), 2109.2.4.8.2 (New)

Proponent: K. Ben Loescher, AIA, Loescher Meachem Architects, representing Self (bloescher@lmarchitectsinc.com); Martin Hammer, representing Martin Hammer, Architect (mfhammer@pacbell.net); David Eisenberg, representing DCAT (strawnet@gmail.com)

2018 International Building Code

2109.2.4.8 Exterior finish. *Exterior walls* constructed of unstabilized adobe units shall have their exterior surface covered with not fewer than two coats of Portland cement plaster having a minimum thickness of $\frac{3}{4}$ inch (19.1 mm) and conforming to ASTM C926. Lathing shall comply with ASTM C1063. Fasteners shall be spaced at 16 inches (406 mm) on center maximum. Exposed wood surfaces shall be treated with an *approved* wood preservative or other protective coating prior to lath application.

Add new text as follows:

2109.2.4.8.1 Conditions where lathing is not required. For unstabilized adobe walls finished with clay-lime plaster, lathing shall be allowed to be omitted at the discretion of the Building Official when evidence of adequate mechanical bonding is demonstrated to and approved by the building official.

2109.2.4.8.2 Lime Plaster. Lime plaster is any plaster with a binder composed of calcium hydroxide, (CaOH) including Type N or S hydrated lime, hydraulic lime, natural hydraulic lime, or slaked quicklime. Hydrated lime shall comply with ASTM C206. Hydraulic lime shall comply with ASTM C1707. Natural hydraulic lime shall comply with ASTM C141 and EN 459. Quicklime shall comply with ASTM C5.

Reason: Even more than wood frame or conventional masonry structures, adobe walls require vapor permeable finishes to ensure appropriate performance and service life; moisture that is trapped within adobe wall assemblies can cause failures due to finish separation, salt attack, coving and freeze-thaw related spalling. Although it is accepted that earthen walls require vapor permeable finishes to adequately manage moisture in the assembly and prevent various structural and finish pathologies, existing code language remains based on legacy language that predates current building science. Notably, while stabilized adobes do not require any exterior finishes, unstabilized adobes are required to be finished with conventional cement stucco, a finishing system that without modification has been shown to be insufficiently permeable. Lime plasters are frequently recommended for use on earthen and other monolithic masonry systems, however they are currently not expressly permitted by the IBC. This proposal includes accepted industry best practices in allowing the use of lime plaster for adobe wall systems.

Other comments related to this proposal:

- **Necessity:** Lime plasters are a desirable finishing system that is relatively durable, vapor permeable, and with somewhat less embodied carbon than conventional cement stuccos. However, as they have different properties from other plasters, specific requirements for this material are necessary.
- **Definition and standards:** Lime plasters have accepted definitions that have been developed by industry associations. Those definitions are included here for purposes of clarity; this text is identical to that included in IRC Appendix S.
- **Omission of lath at Building Official's Discretion:** In some cases and due to the specific characteristics of a plaster, substrate, and the skill of the installer, plaster may be successfully installed over substrates that would ordinarily require lath. This section gives discretion to the building official to permit such installations where evidence of sufficient bonding can be shown.
- **Lath requirements for unstabilized adobe with lime plaster:** The New Mexico Earthen Materials Building code requires, (and conservation practice often recommends) that lath not be used, and instead the head joints of adjacent adobe walls be left open allow keying of the applied plaster and the wall assembly – this practice has detrimental structural implications that cannot be adequately addressed within the scope of this proposal and is not allowed by the proposed language.
- **Permeability of various finished (per Straube):**

Sample	t [mm]	Permeance [ng/Pa s m ²]	Permeability [ng/Pa s m]	US Perms
Cement :Sand				
1:3 datum	43.5	39	1.7	0.68
1:3 elastomeric coating	39.5	40	--	0.70
1:3 siloxane	41.0	40	1.7	0.70
Cement:Lime:Sand				
1:1:6 datum	35	295	10.3	5.13
1:1:6 linseed	36	223	8.0	3.89
1:1:6 elastomeric	32.5	244	--	4.25
1:1:6 siloxane	41	203	8.3	3.54
1:1:6 calcium stearate	53.5	81	4.3	1.42
1:1:6 calcium stearate	44	142	6.2	2.47
1:1:6 calcium stearate	53.5	41	2.2	0.71
1:1:6 latex paint	36.5	203	--	3.54
1:1:6 oil paint	40	41	--	0.71
Cement:Lime:Sand				
1:2:9 datum	50.5	295	14.9	5.13
1:2:9 linseed	50.5	259	13.1	4.52
Lime:Sand				
1:3 Datum	33.5	565	18.9	9.85
1:3 Datum	35.5	529	18.8	9.22
1:3 Quicklime	32	459	14.7	8.00

Table 2.3: Results of Vapor Permeance Test Results [Straube, 2000]

Bibliography: 2015 New Mexico Earthen Building Materials Code
2015 *International Residential Code Appendix S - Strawbale Construction*

Adobe Conservation: A Preservation Handbook. Compiled by the Technical Staff of Cornerstones Community Partnership. Sunstone Press (Santa Fe, 2006)

ASTM E2392 / E2392M - 10(2016) Standard Guide for Design of Earthen Wall Building Systems

Building with Earth: Design and Technology of Sustainable Architecture. Gernot Minke, Birkhauser (Bern, 2009)

Earth Construction: A Comprehensive Guide. Hugo Houben and Hubert Guillaud, Practical Action Publishing (Rugby, 2008).

Moisture Properties of Plaster and Stucco for Strawbale Buildings. John Straube. (EBNET, 2019)

Sustainable Building with Earth. Horst Schroeder, Springer International Publishing (Switzerland, 2016)

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal offers an alternative to portland cement plasters, and as such does not represent an increase or decrease in the cost of construction.

Proposal # 5436

S157-19

S158-19

IBC: 2109.2.4.8.1 (New)

Proponent: Ben Loescher, representing Self (bloescher@lmarchitectsinc.com); Martin Hammer, representing Martin Hammer, Architect (mfhammer@pacbell.net); David Eisenberg, representing DCAT (strawnet@gmail.com)

2018 International Building Code

2109.2.4.8 Exterior finish. *Exterior walls* constructed of unstabilized adobe units shall have their exterior surface covered with not fewer than two coats of Portland cement plaster having a minimum thickness of 3/4 inch (19.1 mm) and conforming to ASTM C926. Lathing shall comply with ASTM C1063. Fasteners shall be spaced at 16 inches (406 mm) on center maximum. Exposed wood surfaces shall be treated with an *approved* wood preservative or other protective coating prior to lath application.

Add new text as follows:

2109.2.4.8.1 Cement-lime plaster. Cement-lime plaster shall be any plaster mix type CL, F or FL, as described in ASTM C926.

Reason: Even more than wood frame or conventional masonry structures, adobe walls require vapor permeable finishes to ensure appropriate performance and service life; moisture that is trapped within adobe wall assemblies can cause failures due to finish separation, salt attack, coving and freeze-thaw related spalling. Although it is accepted that earthen walls require vapor permeable finishes to adequately manage moisture in the assembly and prevent various structural and finish pathologies, existing code language remains based on legacy language that predates current building science.

This proposal includes language for cement-lime finishes and is informed by code provisions and guidance from IRC Strawbale Construction Appendix S, the 2015 *New Mexico Earthen Building Materials Code*, and ASTM 2392-10 *Standard Guide for Design of Earthen Wall Building Systems*. Definitions for Cement-lime plasters shown here are according to accepted industry terminology.

Permeability of various finished (per Straube):

Sample	t [mm]	Permeance [ng/Pa s m ²]	Permeability [ng/Pa s m]	US Perms
Cement :Sand				
1:3 datum	43.5	39	1.7	0.68
1:3 elastomeric coating	39.5	40	--	0.70
1:3 siloxane	41.0	40	1.7	0.70
Cement:Lime:Sand				
1:1:6 datum	35	295	10.3	5.13
1:1:6 linseed	36	223	8.0	3.89
1:1:6 elastomeric	32.5	244	--	4.25
1:1:6 siloxane	41	203	8.3	3.54
1:1:6 calcium stearate	53.5	81	4.3	1.42
1:1:6 calcium stearate	44	142	6.2	2.47
1:1:6 calcium stearate	53.5	41	2.2	0.71
1:1:6 latex paint	36.5	203	--	3.54
1:1:6 oil paint	40	41	--	0.71
Cement:Lime:Sand				
1:2:9 datum	50.5	295	14.9	5.13
1:2:9 linseed	50.5	259	13.1	4.52
Lime:Sand				
1:3 Datum	33.5	565	18.9	9.85
1:3 Datum	35.5	529	18.8	9.22
1:3 Quicklime	32	459	14.7	8.00

Table 2.3: Results of Vapor Permeance Test Results [Straube, 2000]

The cement-lime plaster types allowed in the new section, as described in ASTM 926, each contain between 75-200% as much lime as cement, ensuring a vapor permeance of at least 7 perms.

Bibliography: 2015 New Mexico Earthen Building Materials Code
2015 *International Residential Code Appendix S - Strawbale Construction*

Adobe Conservation: A Preservation Handbook. Compiled by the Technical Staff of Cornerstones Community Partnership. Sunstone Press (Santa Fe, 2006)

ASTM E2392 / E2392M - 10(2016) Standard Guide for Design of Earthen Wall Building Systems

Building with Earth: Design and Technology of Sustainable Architecture. Gernot Minke, Birkhauser (Bern, 2009)

Earth Construction: A Comprehensive Guide. Hugo Houben and Hubert Guillaud, Practical Action Publishing (Rugby, 2008).

Moisture Properties of Plaster and Stucco for Strawbale Buildings. John Straube. (EBNET, 2019)

Sustainable Building with Earth. Horst Schroeder, Springer International Publishing (Switzerland, 2016)

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal offers an alternative to portland cement plasters, and as such does not represent an increase or decrease in the cost of construction.

Proposal # 5435

S158-19

S159-19

IBC: 2109.2.4.8.1 (New), 2109.2.4.8.2 (New), 2109.2.4.8.3 (New), 2109.2.4.8.4 (New), 2109.2.4.8.5 (New), 2109.2.4.8.6 (New)

Proponent: Ben Loescher, representing Self (bloescher@lmarchitectsinc.com); Martin Hammer, representing Martin Hammer, Architect (mfhammer@pacbell.net); David Eisenberg, representing DCAT (strawnet@gmail.com)

2018 International Building Code

2109.2.4.8 Exterior finish. *Exterior walls* constructed of unstabilized adobe units shall have their exterior surface covered with not fewer than two coats of Portland cement plaster having a minimum thickness of 3/4 inch (19.1 mm) and conforming to ASTM C926. Lathing shall comply with ASTM C1063. Fasteners shall be spaced at 16 inches (406 mm) on center maximum. Exposed wood surfaces shall be treated with an *approved* wood preservative or other protective coating prior to lath application.

Add new text as follows:

2109.2.4.8.1 Clay Plaster Clay plaster shall comply with this section.

2109.2.4.8.2 General. Clay plaster shall be any plaster having a clay or clay subsoil binder. Such plaster shall contain sufficient clay to fully bind the sand, fine aggregate or other granular material, and shall be permitted to contain reinforcing fibers. Acceptable reinforcing fibers include chopped straw, sisal, and animal hair.

2109.2.4.8.3 Clay subsoil requirements. The suitability of clay subsoil shall be determined in accordance with the Figure 2 Ribbon Test and the Figure 3 Ball Test in the appendix of ASTM 2392/E2392M.

2109.2.4.8.4 Weather exposed locations Clay plaster exposed to water from direct or wind-driven rain, snow, or irrigation spray shall be finished with a clay-lime plaster, lime plaster, or other approved erosion-resistant finish. The use of clay plasters shall not be permitted on weather exposed parapets.

2109.2.4.8.5 Prohibited finish coat. Plaster containing Portland cement shall not be permitted as a finish over clay plaster.

2109.2.4.8.6 Conditions where lathing is not required. For unstabilized adobe walls finished with unstabilized clay plaster, lathing shall not be required.

Reason: Even more than wood frame or conventional masonry structures, adobe walls require vapor permeable finishes to ensure appropriate performance and service life; moisture that is trapped within adobe wall assemblies can cause failures due to finish separation, salt attack, coving and freeze-thaw related spalling. Although it is accepted that earthen walls require vapor permeable finishes to adequately manage moisture in the assembly and prevent various structural and finish pathologies, existing code language remains based on legacy language that predates current building science.

This proposal includes language allowing limited use of clay plasters in exterior applications. This language is based on provisions that have been successfully used in New Mexico, and are somewhat more restrictive than those found in the 2015 New Mexico Earthen Building Materials Code, the bulk of which have been in use in that State since the 1980s.

Notes related to this proposal:

- **Necessity:** Clay plasters are a desirable finishing system that is readily available, low cost, low-embodied carbon, and vapor permeable. However, due to the susceptibility of clay plasters to erosion, specific requirements for this material are necessary.
- **Constituents:** As clay plasters are for the most part made by the applicator from available materials of varying properties, some guidance on these constituent elements is required.
- **Clay content:** This language asserts that clay plasters must use clay as a binder, rather than some other material that would have different qualities and might have different requirements.
- **Reinforcing Fibers:** Reinforcing fibers are frequently added to clay plasters to improve their fabric strength as well as to inhibit and control cracking. This proposal includes frequently used fibers also referenced in IRC Appendix S (chopped straw being the most common pervasive of these), but does not restrict the use of other fibers. Additionally, as clay plasters may be successfully installed without reinforcing fiber (dependent on the material qualities of the clay/sand/aggregate mix), this proposal does not require them.
- **Clay subsoil requirements:** Some relatively rare types of clay are not suitable for use in clay plasters as they are too expansive, or do not provide sufficient binding characteristics. This section proposes the use of a simple field test from ASTM-2392 to assess suitability.
- **Thickness and coats:** A minimum thickness is required to provide the desired weather protection benefits anticipated elsewhere in this code section. The 7/8" Minimum matches industry practice and is minimum thickness is used in the New Mexico Earthen Materials Building Code.
- **Weather exposed locations:** When directly exposed to weather, clay plasters are susceptible to erosion. This section prescribes minimum requirements for protection of clay plasters within these conditions. This section is adapted from language in IRC Appendix S. Lime plasters and linseed oil surface applications have been successfully used to inhibit the erosion of rain exposed clay plasters.
- **Use prohibition on parapets:** Adobe parapet walls are more susceptible to weather damage than other building surfaces due to their exposed location, more complicated detailing and potential for contact with embanked snow. Lime and linseed oil treated clay plasters do not provide

sufficient protection for these conditions; as such use of clay plasters in these locations is prohibited.

- Prohibited finish coat: Cement plasters, including soil cement plasters, have not been demonstrated to perform adequately when applied over clay plasters - their use is prohibited here.
- Permeability of various finished (per Straube) follows, noting: "Earth plasters are generally more permeable than even lime plasters. The addition of straw increases the permeability further. A 38 mm (1.5") thick earth plaster can have a permeance of over 1200 metric perms (over 20 US Perms), in the same order as building papers and housewraps."

Sample	t [mm]	Permeance [ng/Pa s m ²]	Permeability [ng/Pa s m]	US Perms
Cement :Sand				
1:3 datum	43.5	39	1.7	0.68
1:3 elastomeric coating	39.5	40	--	0.70
1:3 siloxane	41.0	40	1.7	0.70
Cement:Lime:Sand				
1:1:6 datum	35	295	10.3	5.13
1:1:6 linseed	36	223	8.0	3.89
1:1:6 elastomeric	32.5	244	--	4.25
1:1:6 siloxane	41	203	8.3	3.54
1:1:6 calcium stearate	53.5	81	4.3	1.42
1:1:6 calcium stearate	44	142	6.2	2.47
1:1:6 calcium stearate	53.5	41	2.2	0.71
1:1:6 latex paint	36.5	203	--	3.54
1:1:6 oil paint	40	41	--	0.71
Cement:Lime:Sand				
1:2:9 datum	50.5	295	14.9	5.13
1:2:9 linseed	50.5	259	13.1	4.52
Lime:Sand				
1:3 Datum	33.5	565	18.9	9.85
1:3 Datum	35.5	529	18.8	9.22
1:3 Quicklime	32	459	14.7	8.00

Table 2.3: Results of Vapor Permeance Test Results [Straube, 2000]

Bibliography: 2015 New Mexico Earthen Building Materials Code
2015 *International Residential Code Appendix S - Strawbale Construction*

Adobe Conservation: A Preservation Handbook. Compiled by the Technical Staff of Cornerstones Community Partnership. Sunstone Press (Santa Fe, 2006)

ASTM E2392 / E2392M - 10(2016) Standard Guide for Design of Earthen Wall Building Systems

Building with Earth: Design and Technology of Sustainable Architecture. Gernot Minke, Birkhauser (Bern, 2009)

Earth Construction: A Comprehensive Guide. Hugo Houben and Hubert Guillaud, Practical Action Publishing (Rugby, 2008).

Moisture Properties of Plaster and Stucco for Strawbale Buildings. John Straube. (EBNET, 2019)

Sustainable Building with Earth. Horst Schroeder, Springer International Publishing (Switzerland, 2016)

Cost Impact: The code change proposal will decrease the cost of construction

This proposal offers an less expensive alternative to portland cement plasters for specific building conditions and exposures, and as such will in some cases represent a decrease in the cost of construction.

S160-19

IBC@: 2205.2.1.1, 2205.2.1.2, AISC Chapter 35 (New)

Proponent: Jon-Paul Cardin, American Iron and Steel Institute, representing American Institute of Steel Construction (JCardin@steel.org)

2018 International Building Code

Revise as follows:

2205.2.1.1 Seismic Design Category B or C. Structures assigned to *Seismic Design Category* B or C shall be of any construction permitted in Section 2205. Where a response modification coefficient, R , in accordance with ASCE 7, Table 12.2-1, is used for the design of structures assigned to *Seismic Design Category* B or C, the structures shall be designed and detailed in accordance with the requirements of AISC 341. Beam-to-column moment connections in special moment frames and intermediate moment frames shall be prequalified in accordance with AISC 341 Section K1, qualified by testing in accordance with AISC 341 Section K2, or shall be prequalified in accordance with AISC 358.

Exception: The response modification coefficient, R , designated for "Steel systems not specifically detailed for seismic resistance, excluding cantilever column systems" in ASCE 7, Table 12.2-1, shall be permitted for systems designed and detailed in accordance with AISC 360, and need not be designed and detailed in accordance with AISC 341.

2205.2.1.2 Seismic Design Category D, E or F. Structures assigned to *Seismic Design Category* D, E or F shall be designed and detailed in accordance with AISC 341, except as permitted in ASCE 7, Table 15.4-1. Beam-to-column moment connections in special moment frames and intermediate moment frames shall be prequalified in accordance with AISC 341 Section K1, qualified by testing in accordance with AISC 341 Section K2, or shall be prequalified in accordance with AISC 358.

Add new text as follows:

AISC

American Institute of Steel
130 East Randolph Street, Suite 2000
Chicago IL 60601-6219

358-16/s1-18: Prequalified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications, Including Supplement No. 1

Reason: The purpose of this proposal is to introduce a new reference to an existing AISC standard in Section 2205. First issued in 2005, AISC 358 includes specific requirements for a number of prequalified connections for intermediate special moment frames and special moment frames. In years past, it has been acceptable for AISC 358 to be a direct reference in AISC 341. However, supplements are now being processed for AISC 358 more frequently than new editions of AISC 341. This has the net effect of not recognizing these newer supplements in the building code, thus leading to confusion for building officials, registered design professionals and manufacturers of the prequalified connections. Introduction of a direct reference in the IBC permits the most up-to-date edition of the standard to be referenced.

This proposal adopts a new supplement for AISC 358, which is not recognized by AISC 341-16. AISC 358-16 Supplement 1(2018) adds a new prequalified moment connection, the proprietary SlottedWeb Moment Connection, in a new Chapter 14. Additionally, Chapter 11 covering the SidePlate Moment Connection has been expanded to include HSS columns and to permit bolted connections. Finally, Chapter 10 covering the ConXtech CONXL Moment Connection has been revised to address a manufacturing safety issue.

AISC standards are free and can be downloaded from: <https://www.aisc.org/>.

Bibliography: AISC (2018), *Prequalified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications, including Supplement No. 1*, ANSI/AISC 358-16/S1-18, American Institute of Steel Construction, Chicago, IL.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This code change proposal provides a direct reference within the IBC to a standard that was previously a secondary reference via AISC 341. The addition of AISC 358 as a direct reference will provide building officials, designers and manufacturers with access to the most recent edition of the standard, and provide additional options for prequalified connections.

Staff Analysis: A review of the standard proposed for inclusion in the code, AISC 358-16/S1-18, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 4709

S160-19

S161-19

IBC: [BS] 202, 202 (New), 1705.12.7, 2209.1, 2209.2

Proponent: Cheryl Burwell, City of Seattle, representing City of Seattle (cheryl.burwell@seattle.gov)

2018 International Building Code

Revise as follows:

[BS] STORAGE RACKS, RACKS, STEEL. Cold-formed or hot-rolled steel structural members which are formed into steel storage racks, including pallet storage racks, movable-shelf racks, rack-supported systems, automated storage and retrieval systems (stacker racks), push-back racks, pallet-flow racks, case-flow racks, pick modules and rack-supported platforms. Other types of racks, such as drive-in or drive-through racks, cantilever racks, portable racks or racks made of materials other than steel, are not considered storage racks for the purpose of this code.

Add new text as follows:

202 DEFINITIONS [BS] STORAGE RACKS, STEEL CANTILEVERED A framework or assemblage comprised of cold-formed or hot-rolled steel structural members, primarily in the form of vertical columns, extended bases, horizontal arms projecting from the faces of the columns, and longitudinal (down-aisle) bracing between columns. There may be shelf beams between the arms, depending on the products being stored; this definition does not include other types of racks such as pallet storage racks, drive-in racks, drive-through racks, or racks made of materials other than steel.

Revise as follows:

2209.1 Storage-Steel storage racks. The design, testing and utilization of steel storage racks made of cold-formed or hot-rolled steel structural members shall be in accordance with RMI ANSI/MH 16.1. Where required by ASCE 7, the seismic design of steel storage racks shall be in accordance with Section 15.5.3 of ASCE 7.

2209.2 Cantilevered steel-Steel cantilevered storage racks. The design, testing, and utilization of steel cantilevered storage racks made of cold-formed or hot-rolled steel structural members shall be in accordance with RMI ANSI/MH 16.3. Where required by ASCE 7, the seismic design of steel cantilevered steel storage racks shall be in accordance with Section 15.5.3 of ASCE 7.

1705.12.7 Storage racks. *Periodic special inspection* is required for the anchorage of steel storage racks and steel cantilevered storage racks that are 8 feet (2438 mm) or greater in height in structures assigned to *Seismic Design Category* D, E or F.

Reason: These code changes align definitions in IBC section 202 and ASCE 7-16 section 11.2 concerning steel storage racks. Adding the term "steel" to "storage racks" emphasizes that the racks must be made of steel, not wood, or another material. The addition of the *steel cantilevered storage rack* definition acknowledges that this common type of storage rack has different loading and design requirements than a simple steel storage rack. The proposed definition for *steel cantilevered storage racks* is identical to the one found in ASCE 7-16 section 11.2. Since IBC section 2209.2 specifically addresses the design of *steel cantilevered storage racks*, it makes sense to add the corresponding definition in this section of the code.

The changes in IBC 1705.12.7 Storage racks clarify that periodic special inspection is required for steel storage racks, regular or cantilevered, that are 8 feet or greater in height in Seismic Design Categories D, E, or F.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The code change is simply a clarification of what requirements apply to steel storage racks, not a change in requirements.

Proposal # 4397

S161-19

S162-19

IBC: SECTION 2209, 2209.2, 2209.3 (New), 2209.4 (New), 2209.5 (New), MHI Chapter 35 (New)

Proponent: Paul Armstrong, MHI, representing MHI

2018 International Building Code

Revise as follows:

SECTION 2209 STEEL STORAGE RACKS MATERIAL HANDLING STRUCTURES

2209.1 Storage racks. The design, testing and utilization of *storage racks* made of cold-formed or hot-rolled steel structural members shall be in accordance with RMI ANSI/MH 16.1. Where required by ASCE 7, the seismic design of *storage racks* shall be in accordance with Section 15.5.3 of ASCE 7.

2209.2 Cantilevered steel storage racks. The design, testing, and utilization of cantilevered storage racks made of cold-formed or hot-rolled steel structural members shall be in accordance with RMI ANSI/MH 16.3. Where required by ASCE 7, the seismic design of cantilevered steel storage racks shall be in accordance with Section 15.5.3 of ASCE 7.

Add new text as follows:

2209.3 Industrial boltless steel shelving. The design and utilization of industrial boltless steel shelving shall be in accordance with ANSI/MH28.2.

2209.4 Industrial steel work platforms The design and utilization of industrial steel work platforms shall be in accordance with ANSI/MH28.3.

2209.5 Stairs, ladders and guards. The design and utilization of stairs, ladders and open edge guards for use with material handling structures shall be in accordance with ANSI/MH32.1.

MHI

Material Handling Institute
8720 Red Oak Blvd. Suite 201
Charlotte NC 28217

MH28.3-2018: Design, Testing and Utilization of Industrial Steel Work Platforms

MHI

Material Handling Institute
8720 Red Oak Blvd. Suite 201
Charlotte NC 28217

MH28.2-2018: Design, Testing and Utilization of Industrial Boltless Steel Shelving

MHI

Material Handling Institute
8720 Red Oak Blvd. Suite 201
Charlotte NC 28217

MH32.1-2018: Stairs, Ladders, and Open-Edge Guards for Use with Material Handling Structures

Reason: SMA has developed new standards for the design, testing and installation of both steel work platforms and boltless steel shelving structures. They are ANSI accredited now and are included for review.

Cost Impact: The code change proposal will decrease the cost of construction. These standards will reduce the cost of construction by providing a uniform set of code regulations for the design and installation of such structures. Currently the imposed regulations seem to change based on the jurisdiction and/or plan reviewer.

Staff Analysis: A review of the standard proposed for inclusion in the code, MHI MH28.2-2018, MH28.3-2018 and MH32.1-2018, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 5183

S162-19

S163-19

IBC: 2210.1.1.1, 2210.1.1.1, 2210.1.1.2, 2210.1.1.3, 2210.1.1.4 (New)

Proponent: L. Christian Snidow, representing VBCOA (sni@henrico.us)

2018 International Building Code

2210.1.1 Steel decks. The design and construction of cold-formed steel decks shall be in accordance with this section.

2210.1.1.1 Noncomposite steel floor decks. Noncomposite steel floor decks shall be permitted to be designed and constructed in accordance with ANSI/SDI-NC1.0.

2210.1.1.2 Steel roof deck. Steel roof decks shall be permitted to be designed and constructed in accordance with ANSI/SDI-RD1.0.

2210.1.1.3 Composite slabs on steel decks. Composite slabs of concrete and steel deck shall be permitted to be designed and constructed in accordance with SDI-C.

Add new text as follows:

2210.1.1.4 Construction documents. The construction documents for steel decks shall include the following information:

1. The deck type, profile, and number of spans.
2. The slab depth and metal thickness.
3. Whether deck is galvanized.
4. Deck attachment to supports:
 1. Attachment pattern for welds and screws.
 2. Size of welds and screws.
 3. Deck side lap attachments

Reason: Information concerning Metal Decks and their attachment to supporting framing are of critical importance in determining the response of buildings to their intended loads. Not only does it indicate the capacity for support of gravity loads, but also the strength and serviceability of diaphragms within buildings to resist lateral loads. Therefore, this information needs to be included on the Construction Documents to assist Juristictions in evaluating Code Compliance.

Bibliography: Chris Snidow is Professional Engineer and is also a Commercial Plan Reviewer for the County of Henrico.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The purpose of this proposal is nothing more than a requirement for additional information on the Construction Documents. The information merely describes the work that is to be done and therefore has no impact on the Cost of Construction."

Proposal # 4668

S163-19

S164-19

IBC®: 2211.1

Proponent: Jon-Paul Cardin, American Iron and Steel Institute, representing American Iron and Steel Institute (JCardin@steel.org)

2018 International Building Code

Revise as follows:

2211.1 Structural framing. For cold-formed steel light-frame construction, the design, ~~manufacture, installation,~~ and ~~installation quality~~ of the following structural framing systems, including their members and connections, shall be in accordance with AISI S240, and Sections 2211.1.1 through 2211.1.3, as applicable:

1. Floor and roof systems.
2. Structural walls.
3. Shear walls, strap-braced walls and diaphragms that resist in-plane lateral loads.
4. Trusses.

Reason: The intent of this code change proposal is to update the charging language of Section 2211 to more accurately reflect the content of the section and the scope of AISI S240. The updated language provides the user more clarification regarding the subject matter of the section and the reference document.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This code change proposal does not make any technical changes to the provisions of the IBC. It simply serves to provide clarification to the user.

Proposal # 5599

S164-19

S165-19

IBC: 2303.1.9, 2303.1.9.3 (New), 2303.2, 2303.2.5, 2306.1.3

Proponent: David P Tyree, American Wood Council, representing American Wood Council (dtyree@awc.org); Paul Coats, representing American Wood Council (pcoats@awc.org)

2018 International Building Code

2303.1.9 Preservative-treated wood. Lumber, timber, plywood, piles and poles supporting permanent structures required by Section 2304.12 to be preservative treated shall conform to AWPA U1 and M4. Lumber and plywood used in permanent wood foundation systems shall conform to Chapter 18.

Add new text as follows:

2303.1.9.3 Strength Adjustments. Design values for preservative-treated wood in accordance with Section 2303.1.9 do not need adjustment for the type of preservative used. Other adjustments in accordance with AWC NDS shall apply. Load duration factors for structural members pressure-treated with water-borne preservatives shall not exceed 1.6.

Revise as follows:

2303.2 Fire-retardant-treated wood. *Fire-retardant-treated wood* is any wood product that, when impregnated with chemicals by a pressure process or other means during manufacture, shall have, when tested in accordance with ASTM E84 or UL 723, a *listed* flame spread index of 25 or less and show no evidence of significant progressive combustion when the test is continued for an additional 20-minute period. Additionally, the flame front shall not progress more than 10¹/₂ feet (3200 mm) beyond the centerline of the burners at any time during the test.

2303.2.5 Strength adjustments. Design values for untreated lumber and wood structural panels, as specified in Section 2303.1, shall be adjusted for *fire-retardant-treated wood*. Adjustments to design values, including fastener values, shall be based on an *approved* method of investigation that takes into consideration the effects of the anticipated temperature and humidity to which the *fire-retardant-treated wood* will be subjected, the type of treatment and redrying procedures. Other adjustments in accordance with AWC NDS shall apply. Load duration factors for structural members pressure-treated with fire retardant chemicals shall not exceed 1.6.

Delete without substitution:

~~**2306.1.3 Treated wood stress adjustments.** The allowable unit stresses for *preservative-treated wood* need not be adjusted for treatment, but are subject to other adjustments.~~

~~The allowable unit stresses for *fire-retardant-treated wood*, including fastener values, shall be developed from an *approved* method of investigation that considers the effects of anticipated temperature and humidity to which the *fire-retardant-treated wood* will be subjected, the type of treatment and the redrying process. Other adjustments are applicable except that the impact load duration shall not apply.~~

Reason: Section 2306.1.3 is redundant with Section 2303.2.5 and can be deleted. Location of design value information in 2303.2.5 as opposed to 2306 on Allowable Stress Design is preferable as information in 2305 is generally applicable and addresses use for both ASD and LRFD. Portions of 2306.1.3 not addressed by 2303.2.5 are moved to 2303.2.5 and a new section (2303.1.9.3) on strength adjustments for preservative treated wood. Additional description of specific revisions follows:

Section 2303.1.9.3. Sentence 1 clarifies that no adjustment is associated with the type of preservative used. The second sentence is consistent with AWC NDS Table 2.3.2 in which load duration adjustment is not to exceed 1.6 for structural members pressure treated with water-borne preservatives and is a smaller adjustment than the factor of 2.0 associated with impact load duration.

Section 2303.2.5. The second sentence is consistent with AWC NDS Table 2.3.2 in which load duration adjustment is not to exceed 1.6 for structural members pressure treated with fire-retardant chemicals and is a smaller adjustment than the factor of 2.0 associated with impact load duration.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Clarification of current requirements and referenced standards.

Proposal # 4275

S165-19

S166-19

IBC®: 2303.2

Proponent: Marcelo M Hirschler, GBH International, representing GBH International (mmh@gbhint.com)

2018 International Building Code

Revise as follows:

2303.2 Fire-retardant-treated wood. *Fire-retardant-treated wood* is any wood product that, when impregnated with chemicals by a pressure process or other means during manufacture, shall have, when tested in accordance with ASTM E84 or UL 723, a *listed* flame spread index of 25 or less, ~~and show no evidence of significant progressive combustion when the test is continued.~~ Additionally, the ASTM E84 or UL 723 test shall be continued for an additional 20-minute period. ~~Additionally, and~~ the flame front shall not progress more than 10¹/₂ feet (3200 mm) beyond the centerline of the burners at any time during the ~~test.~~ extended 30-minute test.

Reason: This issue has been under discussion for many years at the ICC codes, as well as at ASTM and at NFPA, but can now be resolved in the IBC code. Fire test labs have been surveyed and they all agree that there are only two fire test requirements: a flame spread index of not more than 25 in the standard ASTM E84 test and a flame front that does not progress more than 10 1/2 feet beyond the centerline of the burners when the ASTM E84 test is extended for a total test time of 30 minutes.

The ASTM E5 committee, responsible for ASTM E84, has now, for the first time, accepted incorporating requirements for conducting a 30 minute test. Until this change ASTM E84 did not contain any information other than that it is a 10 minute test. Consequently, until this change ASTM E84 did not provide any details on how to assess either "no evidence of significant progressive combustion" or "the flame front shall not progress more than 10 1/2 feet (3200 mm) beyond the centerline of the burners". The information for how to determine both of those characteristics is contained in ASTM E2768. The committee agreed that the next edition of ASTM E84 will state that a 30 minute test is to be conducted per ASTM E2768. In turn, ASTM E2768 explains that "no significant progressive combustion" is evidenced by lack of flame front progress beyond 10 1/2 feet. In fact ASTM E2768 states: "The flame front shall not progress more than 10.5 ft (3.2 m) beyond the centerline of the burners at any time during the 30 min test period. This is considered evidence of no significant progressive combustion in this test method." This IBC proposal incorporates the requirements from the ASTM E84 test into the IBC and ensures that the code does not require a duplicate (and confusing) measurement.

It is likely that information will be presented stating that "no significant progressive combustion" has been in the code since the legacy codes and that the flame front progress requirement was added later. That is exactly the reason that ASTM E2768 was developed to ensure that everyone understands what is to be measured, and that is what the testing laboratories have been doing for many years now.

This change appears to alter requirements but in fact simply recognizes what the ASTM E84 standard states and what the labs are doing (and have been doing for years) and, therefore, is really clarification.

The committee E05 (on fire standards) agreed at the December 2018 meeting that the scope of ASTM E84 should read as follows:

1. Scope

1.1 This fire-test-response standard for the comparative surface burning behavior of building materials is applicable to exposed surfaces such as walls and ceilings. The test is conducted with the specimen in the ceiling position with the surface to be evaluated exposed face down to the ignition source. The material, product, or assembly shall be capable of being mounted in the test position during the test. Thus, the specimen shall either be self-supporting by its own structural quality, held in place by added supports along the test surface, or secured from the back side.

1.2 Test Method E84 is a 10-minute fire-test response method. The following standards address testing of materials in accordance with test methods that are applications or variations of the test method or apparatus used for Test Method E84:

1.2.1 Materials required by the user to meet an extended 30-min duration tunnel test shall be tested per Test Method E2768.

1.2.2 Wires and cables for use in air-handling spaces shall be tested per NFPA 262.

1.2.3 Pneumatic tubing for control systems shall be tested per UL 1820.

1.2.4 Combustible sprinkler piping shall be tested per UL 1887.

1.2.5 Optical fiber and communications raceways for use in air handling spaces shall be tested per UL 2024.

1.3 The purpose of this test method is to determine the relative burning behavior of the material by observing the flame spread along the specimen. Flame spread and smoke developed index are reported. However, there is not necessarily a relationship between these two measurements.

1.4 The use of supporting materials on the underside of the test specimen has the ability to lower the flame spread index from those which might be

obtained if the specimen could be tested without such support. These test results do not necessarily relate to indices obtained by testing materials without such support.

1.5 Testing of materials that melt, drip, or delaminate to such a degree that the continuity of the flame front is destroyed, results in low flame spread indices that do not relate directly to indices obtained by testing materials that remain in place.

1.6 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.7 The text of this standard references notes and footnotes that provide explanatory information. These notes and footnotes, excluding those in tables and figures, shall not be considered as requirements of the standard.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal recognizes what the fire test labs have been doing for years and what ASTM committee E05 has recently agreed to do in the scope of ASTM E84.

Proposal # 4251

S166-19

S167-19

IBC: 2303.2.3, 2303.3.2.3.1 (New)

Proponent: Marcelo M Hirschler, GBH International, representing GBH International (mmh@gbhint.com)

2018 International Building Code

Revise as follows:

~~2303.2.3 Testing. For wood products produced by other means during manufacture, other than a pressure process, all sides fire retardant treated wood products the front and back faces of the wood product shall be tested in accordance with and produce the results required in Section 2303.2. Wood structural panels shall be permitted to test only the front and back faces.~~

Add new text as follows:

2303.2.3.1 Fire testing of wood structural panels Wood structural panels shall be tested with a ripped or cut longitudinal gap of 1/8 inch (3.2 mm).

Reason: Note that the sections above require that fire retardant treated wood be "impregnated with chemicals" and provide permanent protection. That requirement applies to all FRTW products, whether produced by a pressure process or produced by other means during manufacture. Section 2303.2.2 is also explicit in stating that the use of paints or coatings is not an approved method to comply with this section. This proposal thus eliminates the requirement to test a particular type of fire retardant treated wood on "all sides", since the testing is never actually conducted on all sides (as pointed out often by multiple testifiers in previous code cycles) because all sides really means front and back (you literally cannot test the edges in the ASTM E84 other than by putting multiple edge pieces into the tunnel to make up the 24 feet by 2 feet specimen). In order to test "all sides" of a lumber product it would be necessary to fasten 864 small pieces together to make one specimen, which is not realistic. The proposed new subsection will add fire safety because it recognizes an issue that was highlighted in the previous code cycle, and was also brought up in committee ASTM E05 and at the IWUIC: wood structural panels are typically installed in the field following industry practice. Industry recommendations for wood structural panels require a gap to accommodate dimensional changes caused by swelling due to changing moisture conditions. Therefore, installation in the field requires cutting and ripping of the panels and this results in the creation of "non-factory edges". Therefore, it is important to test wood structural panels with a rip or gap to ensure that the required fire test results from the charging paragraph are achieved when the interior of the panel is exposed.

Note that the IWUIC requires such a rip or gap for ignition resistant structural panels, and it sends FRTW products to this IBC section.

Cost Impact: The code change proposal will increase the cost of construction

This proposal will add fire safety and will require more testing for wood structural panels. The proposal will also require more testing for other FRTW products manufactured by a pressure process but apparently less testing for FRTW products that are manufactured by other means, except that typically just the front and back faces are tested anyway.

Proposal # 4821

S167-19

S168-19

IBC: 202 (New), 2303.4.1.1, 2303.4.1.2, 2303.4.1.2.1 (New), 2303.4.1.3, FIGURE 2303.4.1.2 (New)

Proponent: Larry Wainright, Qualtim, Inc., representing Structural Building Components Association (lwainright@qualtim.com); John Grenier, representing National Council of Structural Engineers' Associations (NCSEA) (jgrenier@greniereng.com)

2018 International Building Code

Add new definition as follows:

PERMANENT INDIVIDUAL TRUSS MEMBER RESTRAINT (PITMR) Restraint that is used to prevent local buckling of an individual truss chord or web member because of the axial forces in the individual truss member.

PERMANENT INDIVIDUAL TRUSS MEMBER DIAGONAL BRACING (PITMDB) Structural member or assembly intended to permanently stabilize the *PITMR*s.

INDIVIDUAL TRUSS MEMBER A truss chord or truss web.

Revise as follows:

2303.4.1.1 Truss design drawings. The written, graphic and pictorial depiction of each individual truss shall be provided to the *building official* for approval prior to installation. Truss design drawings shall be provided with the shipment of trusses delivered to the job site. Truss design drawings shall include, at a minimum, the following information:

1. Slope or depth, span and spacing.
2. Location of all joints and support locations.
3. Number of plies if greater than one.
4. Required bearing widths.
5. Design loads as applicable, including:
 - 5.1. Top chord live load.
 - 5.2. Top chord dead load.
 - 5.3. Bottom chord live load.
 - 5.4. Bottom chord dead load.
 - 5.5. Additional loads and locations.
 - 5.6. Environmental design criteria and loads (such as wind, rain, snow, seismic).
6. Other lateral loads, including drag strut loads.
7. Adjustments to wood member and metal connector plate design value for conditions of use.
8. Maximum reaction force and direction, including maximum uplift reaction forces where applicable.
9. Joint connection type and description, such as size and thickness or gage, and the dimensioned location of each joint connector except where symmetrically located relative to the joint interface.
10. Size, species and grade for each wood member.
11. Truss-to-truss connections and truss field assembly requirements.
12. Calculated span-to-deflection ratio and maximum vertical and horizontal deflection for live and total load as applicable.
13. Maximum axial tension and compression forces in the truss members.
14. Required permanent individual truss member restraint location and the method and details of restraint ~~and diagonal~~ bracing to be used in accordance with Section 2303.4.1.2.

2303.4.1.2 Permanent individual truss member restraint(PITMR) and permanent individual truss member diagonal bracing (PITMDB).

Where permanent restraint of truss members is required on the truss design drawings designate the need for permanent individual truss member restraint, it shall be accomplished by one of the following methods:

1. ~~Permanent individual truss member restraint/bracing shall be PITMR and PITMDB installed using standard industry lateral restraint / and diagonal bracing details in accordance with generally TPI 1 section 2.3.3.1.1, accepted engineering practice, or Figures 2303.4.1.2(1a), (2a), and (3). Locations for lateral restraint shall be identified on the truss design drawing.~~
2. Individual truss member reinforcement in place of the specified lateral restraints (i.e., buckling reinforcement such as T-reinforcement, L-reinforcement, proprietary reinforcement, etc.) such 2-The trusses shall be designed so that the buckling of any individual truss member is resisted internally by the individual truss through suitable means (for example, buckling reinforcement by T-reinforcement or L-reinforcement, proprietary reinforcement)- truss. The buckling reinforcement of *individual truss members* of the ~~trusses~~ shall be installed as shown on the truss design drawing or on supplemental truss member buckling reinforcement details provided by the truss ~~designer, designer or in accordance with Figures 2303.4.1.2 (1b) and (2b).~~
3. A project-specific ~~permanent individual truss member restraint/bracing design shall be permitted to be specified PITMR and PITMDB design provided by any registered design professional.~~

Add new text as follows:

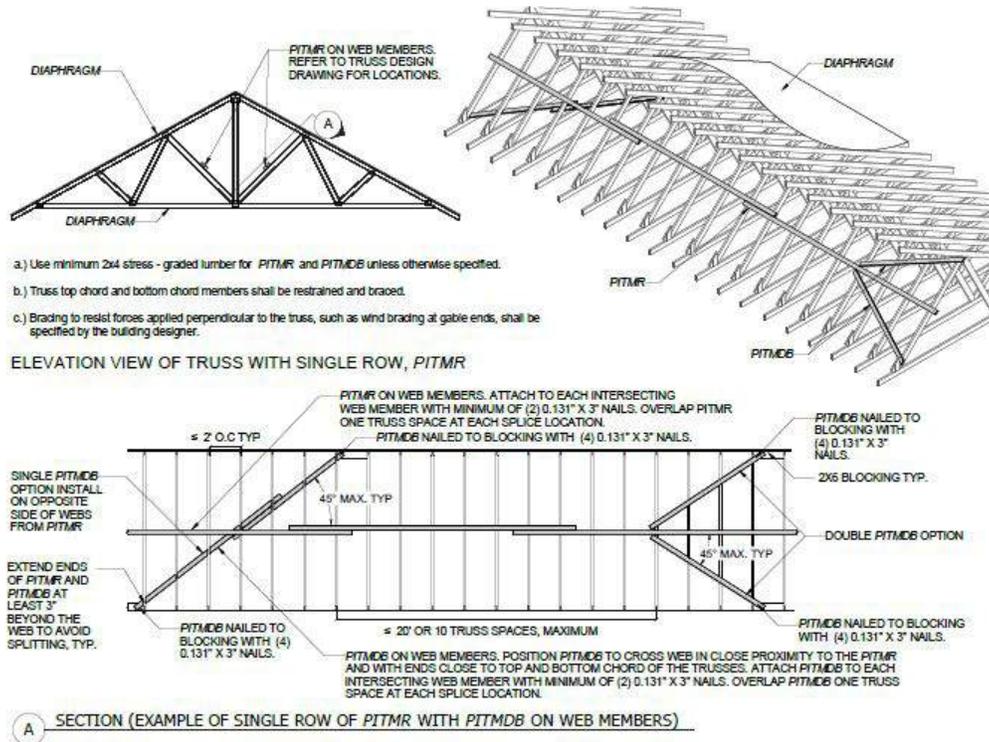
2303.4.1.2.1 New Code Section Trusses installed without a diaphragm on the top or bottom chord shall require a project specific PITMR and PITMDB design prepared by a registered design professional.

Exception: Group U occupancies.

Revise as follows:

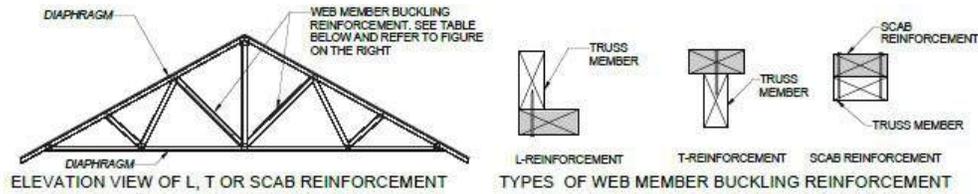
2303.4.1.3 Trusses spanning 60 feet or greater. The *owner* or the *owner's* authorized agent shall contract with any qualified *registered design professional* for the design of the temporary installation restraint ~~and diagonal~~ bracing and the ~~permanent individual truss member restraint/bracing~~ *PITMR* and *PITMDB* for all trusses with clear spans 60 feet (18 288 mm) or greater.

Add new text as follows:



2303.4.1.2

FIGURE 2303.4.1.2.(1a) PITMR AND PITMDB FOR TRUSS WEB MEMBERS REQUIRING ONE ROW OF PITMR



ELEVATION VIEW OF L, T OR SCAB REINFORCEMENT

TYPES OF WEB MEMBER BUCKLING REINFORCEMENT

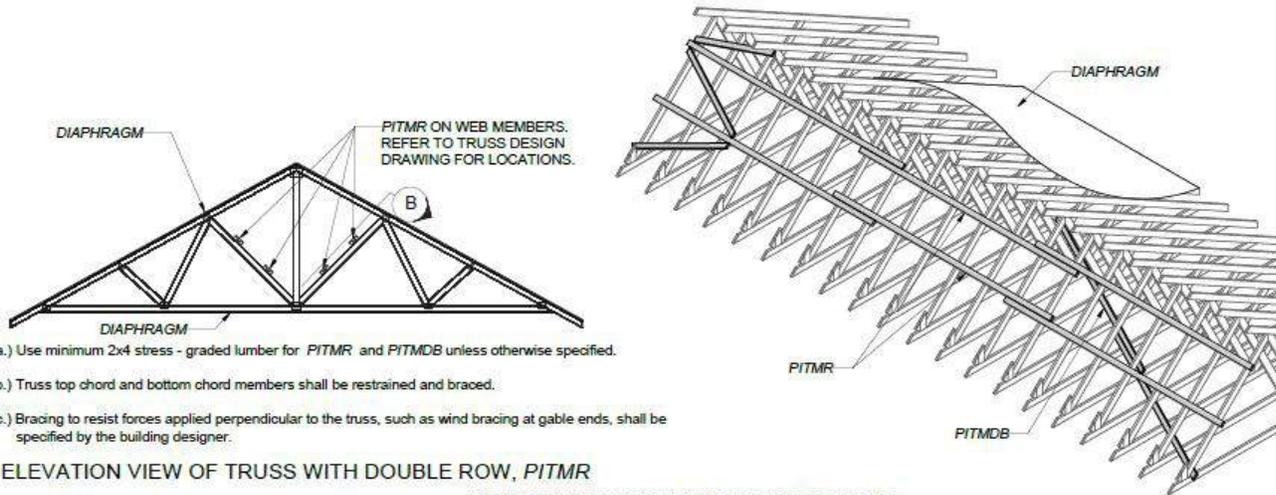
- a.) Truss top chord and bottom chord members shall be restrained and braced.
- b.) Bracing to resist forces applied perpendicular to the truss, such as wind bracing at gable ends, shall be specified by the building designer.
- c.) Use the table below unless project specific web member reinforcement is provided on the truss design drawing or supplemental truss buckling reinforcement details are provided by the truss designer.

NUMBER OF ROWS OF PITMR SPECIFIED ON WEB MEMBER	SIZE OF TRUSS WEB	TYPE AND SIZE OF WEB REINFORCEMENT ¹ FOR T, L OR SCAB ²	GRADE OF WEB REINFORCEMENT	MINIMUM LENGTH OF WEB REINFORCEMENT	MINIMUM CONNECTION OF WEB REINFORCEMENT TO WEB
ONE	2x4	2x4	Same species and grade or better than web member	90% of web or extend to within 6" of end of web member, whichever is greater	(0.131" x 3") nails at 6" on-center ²
	2x6	2x6			
	2x8	2x8			

¹Maximum allowable web length is 14'
²Attach Scab reinforcement to web with two rows of minimum 0.131" x 3" nails at 6" on-center

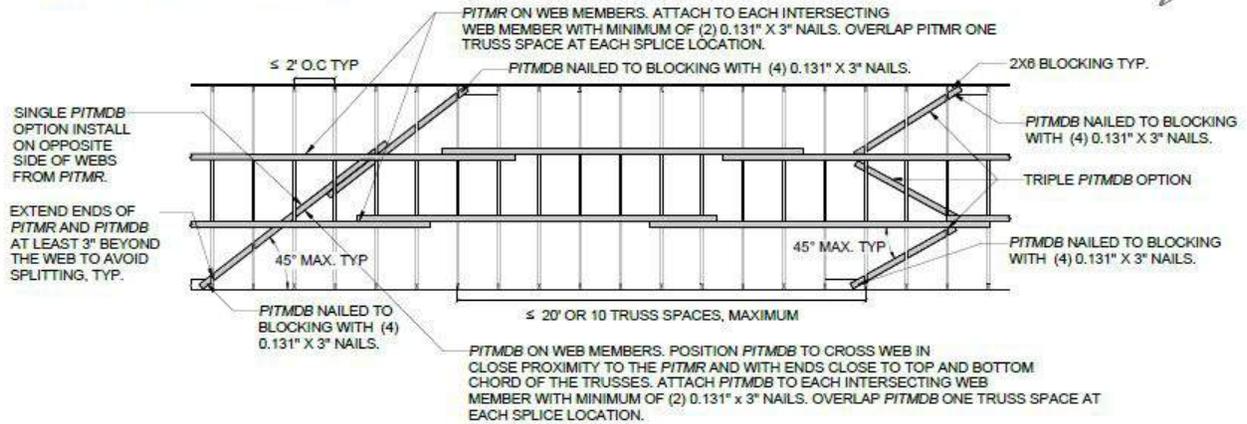
2303.4.1.2

FIGURE 2303.4.1.2.(1b) ALTERNATIVE INSTALLATION USING BUCKLING REINFORCEMENT FOR TRUSS WEB MEMBERS IN LIEU OF ONE ROW OF PITMR



- a.) Use minimum 2x4 stress - graded lumber for PITMR and PITMDB unless otherwise specified.
- b.) Truss top chord and bottom chord members shall be restrained and braced.
- c.) Bracing to resist forces applied perpendicular to the truss, such as wind bracing at gable ends, shall be specified by the building designer.

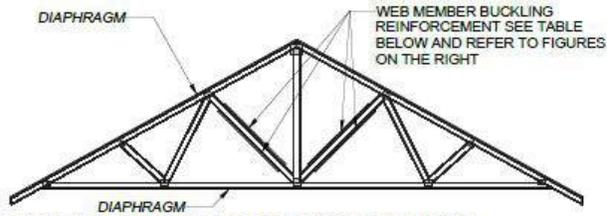
ELEVATION VIEW OF TRUSS WITH DOUBLE ROW, PITMR



B SECTION (EXAMPLE OF DOUBLE ROW OF PITMR WITH PITMDB ON WEB MEMBERS)

2303.4.1.2

FIGURE 2303.4.1.2.(2a) PITMR AND PITMDB FOR TRUSS WEB MEMBERS REQUIRING TWO ROWS OF PITMR



ELEVATION VIEW OF I OR U REINFORCEMENT

TYPES OF WEB MEMBER BUCKLING REINFORCEMENT

a.) Truss top chord and bottom chord members shall be restrained and braced.

b.) Bracing to resist forces applied perpendicular to the truss, such as wind bracing at gable ends, shall be specified by the building designer.

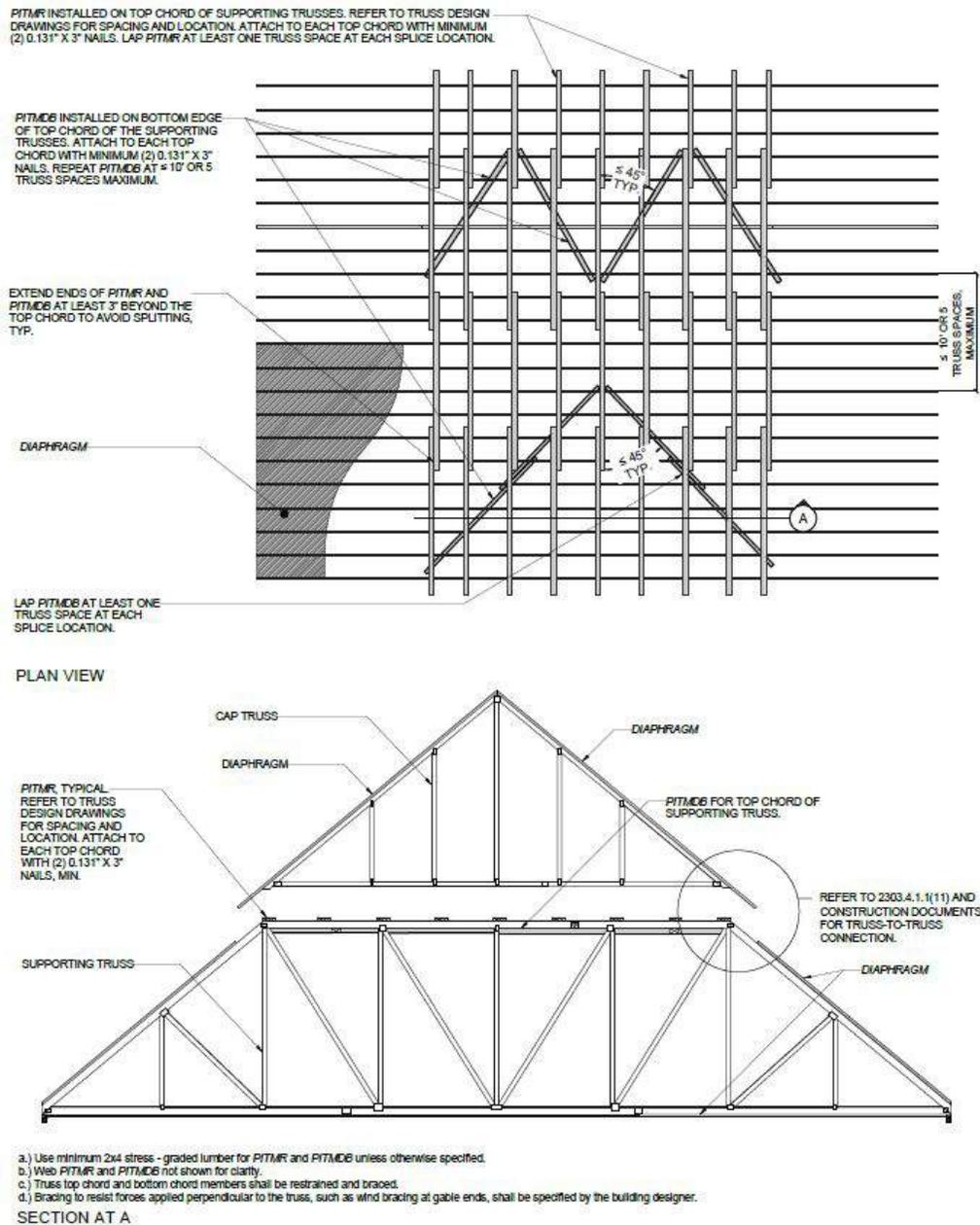
c.) Use the table below unless project specific web member reinforcement is provided on the truss design drawing or supplemental truss buckling reinforcement details are provided by the truss designer.

NUMBER OF ROWS OF PITMR SPECIFIED ON WEB MEMBER	SIZE OF TRUSS WEB	TYPE AND SIZE OF WEB FOR I OR U REINFORCEMENT*	GRADE OF WEB REINFORCEMENT	MINIMUM LENGTH OF WEB REINFORCEMENT	MINIMUM CONNECTION OF WEB REINFORCEMENT TO WEB
TWO	2x4	(2) -2x4	Same species and grade or better than web member	90% of web or extend to within 6" of end of web member, whichever is greater	(0.131" x 3") nails at 6" on-center
	2x6	(2) -2x6			
	2x8	(2) -2x8			

*Maximum allowable web length is 14'

2303.4.1.2

FIGURE 2303.4.1.2.(2b) ALTERNATIVE INSTALLATION USING BUCKLING REINFORCEMENT FOR TRUSS WEB MEMBERS IN LIEU OF TWO ROWS OF PITMR



2303.4.1.2

FIGURE 2303.4.1.2 (3) PITMR AND PITMDB FOR FLAT PORTION OF TOP CHORD IN A PIGGYBACK ASSEMBLY

Reason: The purpose of this proposal is to bring clarity on how to physically install permanent individual truss member restraint and diagonal bracing of wood truss members.

The current predominant industry standard of care for the installation of permanent individual truss member restraint and diagonal bracing of both wood top chords and webs, is to have the truss installer (framer) rely on "standard industry details". This is understood to mean; and is stated as such in TPI 1, section 2.3.3.1.1; to be the use of Building Component Safety Information (BCSI) – B3: Permanent Restrain/Bracing of Chords & Web Members. The reality in the field however, and has been documented by practicing structural engineers, is the truss installers / framers are: a) not familiar with BCSI-B3; b) are sometimes not provided a copy of that document with the trusses; and c) do not have the technical expertise required to interpret the various conditions and options listed in the BCSI – B3 document. The Owner, the Building Designer; the Truss Designer, the Truss Manufacturer and the Building Official are all relying on the ability of the Truss Installer / framer to accurately and completely interpret when, where and how to install the required restraint bracing and diagonal bracing whenever pre-engineered wood trusses are used. There is sufficient concern in the industry that the current practice is deficient and could lead to truss failures.

To remedy this situation, the Structural Building Components Association (SBCA), along with the National Council of Structural Engineers' Associations (NCSEA), with input from the Truss Plate Institute (TPI) and the National Framers Alliance, have collaboratively prepared this Code Change Proposal as outlined below.

1. Definitions for an Individual Truss Member; a Permanent Individual Truss Member Restraint (PITMR); and Permanent Individual Truss Member Diagonal Bracing (PITMDB) are proposed. This will eliminate some current confusion within both the design community and on the job site with respect to what the specific members are to be called and what their purpose is. Currently terms such as bracing; bridging; continuous lateral brace (CLB); x-bracing; etc. are used and do not necessarily mean the same thing to everyone.

2. We are proposing to add some clarification figures into the Code to assist both the Truss Installers and Building Inspectors to more clearly and easily understand when and how PITMR's and PITMDB's are to be installed.

3. The figures and associated connections are prescriptive, and the consensus among the groups preparing this CCP is that having these in the code is better than what is currently being used. The following are some engineering analysis items that need to be discussed to fully understand the rationale that went into the preparation of these figures:

a) There is a mutually understood, open question regarding "what is the actual lateral restraint force required to brace a web member that is in compression?". The range of answers is from the traditional (albeit conservative) 2% of the axial compression force in the member; to 1% (currently used by AISI in light gage truss design), to even a possible value less than 1% depending on the end fixity provided by the top and bottom chords and associated diaphragms. To more accurately determine what the actual lateral restraint force is, there will need to be testing and further analysis required.

b) The overwhelming consensus among the group involved in this CCP, was that having something installed was better than nothing, and we therefore strived to be consistent with the current field practices being used, but at the same time trying to provide a logical load path. By utilizing a minimum of (4) 10d (0.131 x 3") nails connected to blocking each end that would go "into compression and bearing against adjacent trusses" would create a considerable lateral restraint capacity, and at the same time is a very similar to what a framer is currently installing.

c) The vast majority of projects utilizing wood trusses will have both a plywood / OSB roof diaphragm, and a gypsum board ceiling diaphragm. It was agreed that with a roof and ceiling diaphragm installed, it allows us to limit this CCP to addressing web members only.

d) For specialty projects where there is no diagram on the top or bottom chords, a project specific PITMR and PITMDB design will be required. This is critical for projects with spans less than 60 feet that have dropped ceilings and thus no ceiling diaphragm (schools, offices, etc.). While we acknowledge this will add some additional cost to those types of projects, the occupancy exposure clearly justifies the effort to make sure the trusses are properly installed. We also have provided an exception for Group U Occupancies that will allow industry standard details to still be used for those low risk projects.

For Building Departments that have experienced and trained field inspectors familiar with wood trusses, this CCP does not change their current process and ability to allow the use BCSI – B3. For smaller jurisdictions with limited personnel however, this CCP will provide more information and a tool to assist the Building Official in inspecting the truss installation.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The cost of construction will not change for typical projects, since permanent individual truss member restraint and diagonal bracing of wood truss members is already required by the Code. For certain projects without ceiling diaphragms the cost of construction will increase slightly by the amount of the project specific design, but this increased cost is minimal and justified based on the occupancy risk typically associated with these types of projects.

S169-19

IBC®: 2303.7

Proponent: James Smith, American Wood Council, representing American Wood Council (jsmith@awc.org)

2018 International Building Code

Revise as follows:

2303.7 Shrinkage. Consideration shall be given in design ~~to for the possible effect effects of wood~~ cross-grain dimensional changes ~~considered vertically that may occur in lumber fabricated in a green condition~~ as a result of changes in the wood moisture content after installation.

Reason: This change removes the existing language “fabricated in a green condition” and clarifies that consideration is to be given to effects of cross-grain dimensional change resulting from changes in moisture content after installation. The proposed change broadens applicability beyond “lumber fabricated in a green condition” (i.e. where “green condition” is associated with lumber moisture content greater than 19% at time of installation) because design considerations for dimensional change in reference design documents apply for both “green” and “dry” material. Examples of design and detailing criteria are in documents such as AITC 104, NDS, the Forest Products Laboratory Wood Handbook - Wood as an Engineering Material (General Technical Report FPL-GTR-190) and manufacturer’s literature for engineered wood products. These documents include information on detailing at connections, adjustment factors for connection design, and guidance on consideration of shrinkage effects to facilitate level top edge surface after drying.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The proposal is not intended to change how shrinkage considerations are handled so there is no cost impact.

Proposal # 4289

S169-19

S170-19

IBC: 2304.10.1 (New)

Proponent: Stephen DiGiovanni, representing ICC Ad Hoc Committee on Tall Wood Buildings (TWB) (TWB@iccsafe.org)

2018 International Building Code

Add new text as follows:

2304.10.1 Connection fire resistance rating. Fire resistance ratings for connections in Type IV-A, IV-B, or IV-C construction shall be determined by one of the following:

1. Testing in accordance with Section 703.2 where the connection is part of the fire resistance test.
2. Engineering analysis that demonstrates that the temperature rise at any portion of the connection is limited to an average temperature rise of 250° F (139° C), and a maximum temperature rise of 325° F (181° C), for a time corresponding to the required fire resistance rating of the structural element being connected. For the purposes of this analysis, the connection includes connectors, fasteners, and portions of wood members included in the structural design of the connection.

Reason: IBC Sections 704.2 and 704.3 require connections of columns and other primary structural members to be protected with materials that have the required fire-resistance rating. This proposed change provides two options for demonstrating compliance with this requirement for connections in Types IV-A, IV-B and IV-C construction: a testing option and a calculation option.

Types IV-A, IV-B and IV-C construction utilize mass timber elements that have inherent fire resistance. The new provisions which added these construction types have explicit fire-resistance ratings and protection requirements. Option 1 allows connections that are part of a successful ASTM E119 fire resistance test to be considered acceptable evidence of meeting the requirements of Sections 704.2 and 704.3.

Some connections used in Types IV-A, IV-B and IV-C construction are not part of the mass timber element or assembly testing. For those connections, an engineering analysis is required. Analysis procedures have been developed that allow the protection of these connections to be designed based on test results of E119 fire tests from protection configurations using the wood member outside of the connection, additional wood cover, and/or gypsum board. The analysis procedures must demonstrate that the protection will limit the temperature rise at any portion of the connection, including the metal connector, the connection fasteners, and portions of the wood member that are necessary for the structural design of the connection. The average temperature rise limit of 250° F (139° C) and maximum temperature rise limit of 325° F (181° C) represent the fire separation and thermal protection requirements for wall and floor assemblies tested per ASTM E119 and ensure that the connection retains most of its initial strength throughout the fire-resistance rating time. Please note the Celsius values in parentheses are for temperature rise calculated as the difference between the final temperature and the initial temperature, not a direct conversion of a Fahrenheit temperature.

IBC 722 permits structural fire-resistance ratings of wood members to be determined using Chapter 16 of the National Design Specification® (NDS®) for Wood Construction. Where a wood connection is required to be fire-resistance rated, NDS Section 16.3 requires all components of the wood connection, including the steel connector, the connection fasteners, and the wood needed in the structural design of the connection, to be protected for the required fire-resistance rating time. NDS permits the connection to be protected by wood, gypsum board or other approved materials. AWC publication Technical Report 10: Calculating the Fire Resistance of Wood Members and Assemblies (<https://www.awc.org/codes-standards/publications/tr10>), which is referenced in the NDS Commentary to Chapter 16, has been specifically updated to provide guidance on and examples of connection designs meeting the requirements of IBC 704 and NDS 16.3.

The Ad Hoc Committee for Tall Wood Buildings (AHC-TWB) was created by the ICC Board of Directors to explore the building science of tall wood buildings with the scope to investigate the feasibility of and take action on developing code changes for these buildings. Members of the AHC-TWB were appointed by the ICC Board of Directors. Since its creation in January 2016, the AHC-TWB has held 8 open meetings and numerous Work Group conference calls. Four Work Groups were established to address over 80 issues and concerns and review over 60 code proposals for consideration by the AHC-TWB. Members of the Work Groups included AHC-TWB members and other interested parties. Related documentation and reports are posted on the AHC-TWB website at <https://www.iccsafe.org/codes-tech-support/cs/icc-ad-hoc-committee-on-tall-wood-buildings/>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

Since all the code proposals related to Mass Timber products are to address new types of building construction, in theory this will not increase the cost of construction, but rather provides design options not currently provided for in the code. The committee took great care to not change the requirements of the pre-existing construction types, and our changes do not increase the cost of construction using those pre-existing construction types.

Proposal # 4369

S170-19

S171-19

IBC: 2304.10, 2304.10.8 (New)

Proponent: Terry Kozlowski, representing Southern Nevada Chapter; Amanda Moss, representing SN-ICC Member; Cassidy Wilson, representing SN-ICC Member; Valarie Evans, representing Southern Nevada Chapter

2018 International Building Code

Revise as follows:

2304.10 Connectors and fasteners. Connectors and fasteners shall comply with the applicable provisions of Sections 2304.10.1 through ~~2304.10.7~~; 2304.10.8.

Add new text as follows:

2304.10.8 Bottom (sill) plate anchorage. Where field conditions preclude the placement of the minimum bottom plate anchors specified in Table 2304.10.1, a registered design professional shall provide a design for the attachment in accordance with accepted engineering practice.

Reason: Bottom plate is preferentially referenced in lieu of sill plate to match that same evolution in the IBC and AF&PA references. In residential construction many times there are short length wall framing for door openings, exterior built-up columns and post framing and similar construction where it is impractical to comply with the 2308.3 completely. The exception is provided to explicitly allow a design professional the ability to design appropriate attachment for these conditions. Insertion within the General Construction Requirements, section 2304 is to clarify that this change applies to both designed and conventional construction.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal simply adds an additional accepted method of attachment by allowing a registered design professional to determine placement of foundation anchorage based on field conditions.

Proposal # 4408

S171-19

S172-19

IBC@: 2304.9, 2304.9.1, 2304.9.2

Proponent: David P Tyree, American Wood Council, representing American Wood Council (dtyree@awc.org); Paul Coats, American Wood Council, representing American Wood Council (pcoats@awc.org)

2018 International Building Code

Revise as follows:

2304.9 Lumber decking. Lumber decking shall be designed and installed in accordance with the general provisions of this code and Sections 2304.9.1 through 2304.9.5.3. Other lumber decking patterns and connection designs shall be substantiated through engineering analysis.

2304.9.1 General. Each piece of lumber decking shall be square-end trimmed. Where random lengths are furnished, each piece shall be square end trimmed across the face so that not less than 90 percent of the pieces are within 0.5 degrees (0.00873 rad) of square. The ends of the pieces shall be permitted to be beveled up to 2 degrees (0.0349 rad) from the vertical with the exposed face of the piece slightly longer than the opposite face of the piece. Tongue-and-groove decking shall be installed with the tongues up on sloped or pitched roofs with pattern faces down.

2304.9.2 Layup patterns. Lumber decking is permitted to be laid up following one of five standard patterns as defined in Sections 2304.9.2.1 through 2304.9.2.5. ~~Other patterns are permitted to be used provided that they are substantiated through engineering analysis.~~

Reason: The proposed addition is intended to clarify that both alternative layup patterns as well as alternative fastening options which are substantiated by engineering analysis can be permitted. A current general statement indicating this is slightly modified and moved from Section 2304.9.2 to the charging language for the entire section on lumber decking, Section 2304.9. In this way, it is made clear that it applies to all the subsections, including, for instance, fastening prescribed in 2304.9.3.2 and Table 2304.9.3.2, not just to layup patterns. Alternative design can always be used in accordance with Section 104.11 if substantiated by engineering analysis and approved by the code official.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The proposal adds a clarifying statement indicated alternative designs substantiated by engineering analysis may be accepted.

Proposal # 4259

S172-19

S173-19

IBC@: TABLE 2304.10.1

Proponent: James Smith, American Wood Council, representing American Wood Council (jsmith@awc.org)

2018 International Building Code

Revise as follows:

**TABLE 2304.10.1
FASTENING SCHEDULE**

Portions of table not shown remain unchanged.

DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER	SPACING AND LOCATION	
		Edges (inches)	Intermediate supports (inches)
Wood structural panels (WSP), subfloor, roof and interior wall sheathing to framing and particleboard wall sheathing to framing ^a			
30. $\frac{3}{8}$ " – $\frac{1}{2}$ "	6d common or deformed ($2" \times 0.113"$) (subfloor and wall)	6	12
	8d common or deformed ($2\frac{1}{2}" \times 0.131"$) (roof) or RSRS-01 ($2\frac{3}{8}" \times 0.113"$) nail (roof) ^d	6 ^e	12 6 ^e
	$2\frac{3}{8}" \times 0.113"$ nail (subfloor and wall)	6	12
	$1\frac{3}{4}"$ 16 gage staple, $\frac{7}{16}"$ crown (subfloor and wall)	4	8
	$2\frac{3}{8}" \times 0.113"$ nail (roof)	4 3 ^f	8 3 ^f
	$1\frac{3}{4}"$ 16 gage staple, $\frac{7}{16}"$ crown (roof)	3 ^f	6 ^{3f}
31. $\frac{19}{32}"$ – $\frac{3}{4}"$	8d common ($2\frac{1}{2}" \times 0.131"$); or 6d deformed ($2" \times 0.113"$)(subfloor and wall)	6	12
	8d common or deformed ($2\frac{1}{2}" \times 0.131"$) (roof) or RSRS-01 ($2\frac{3}{8}" \times 0.113"$) nail (roof) ^d	6 ^e	12 6 ^e
	$2\frac{3}{8}" \times 0.113"$ nail; or 2" 16 gage staple, $\frac{7}{16}"$ crown	4	8
32. $\frac{7}{8}"$ – $1\frac{1}{4}"$	10d common ($3" \times 0.148"$); or 8d deformed ($2\frac{1}{2}" \times 0.131"$)	6	12

For SI: 1 inch = 25.4 mm.

- Nails spaced at 6 inches at intermediate supports where spans are 48 inches or more. For nailing of wood structural panel and particleboard diaphragms and shear walls, refer to Section 2305. Nails for wall sheathing are permitted to be common, box or casing.
- Spacing shall be 6 inches on center on the edges and 12 inches on center at intermediate supports for nonstructural applications. Panel supports at 16 inches (20 inches if strength axis in the long direction of the panel, unless otherwise marked).
- Where a rafter is fastened to an adjacent parallel ceiling joist in accordance with this schedule and the ceiling joist is fastened to the top plate in accordance with this schedule, the number of toenails in the rafter shall be permitted to be reduced by one nail.
- RSRS-01 is a Roof Sheathing Ring Shank nail meeting the specifications in ASTM F1667.
- Tabulated fastener requirements apply where the ultimate design wind speed is less than 140 mph. For wood structural panel roof sheathing attached to gable end roof framing and to intermediate supports within 48 inches of roof edges and ridges, nails shall be spaced at 4 inches on center where the ultimate design wind speed is greater than 130 mph in Exposure B or greater than 110 mph in Exposure C.
- Where the ultimate design wind speed is less than or equal to 110 mph, roof sheathing attachment using the specified fasteners shall be installed 3 inches on center at all supports.

Reason: AWC is submitting a proposal to update roof sheathing nailing in Table 2304.10.1 to be based on ASCE7-16 wind loads and to agree with roof sheathing nailing in the 2018 Wood Frame Construction Manual. Wind uplift nailing requirements for common species of roof framing with specific gravities of 0.42 or greater (e.g. SPF, Hem-Fir) are the basis of the proposed nail spacing requirements in Table 2304.10.1 to meet the wind uplift loading requirements per ASCE 7-16 without being overly complex in specification of roof sheathing nailing. The basic nailing proposed is 6" o.c. at panel edges and 6" o.c. at intermediate supports in the field of the panel. As shown in the boxed cells of 2018 WFCM, Table 3.10A for the common case of roof framing spaced at 24 inches on center, nailing at intermediate supports in the interior portions of the roof is 6" o.c. for wind speeds within the scope of IBC 2308. The 6" o.c. spacing is also appropriate for edge zones except where ultimate wind speeds equal or exceed 130 mph in Exposure B and 110 mph in Exposure C where 4" o.c. nailing is needed. These special cases are addressed by the proposed modification to footnote "e".

To update the alternative fastening to uplift loading requirements per ASCE 7-16 without being overly complex in specification of roof sheathing attachment schedules, footnote "f" was added. The reference calculation leading to use of 3" o.c. spacing at all locations is based on the 0.113" diameter nail shank withdrawal from wood framing with specific gravity equal to 0.42 and pre-calculated wind uplift loads in WFCM Table 3.10. The use of a single 3" spacing at all supports was extended to staples based on the assumption that the ASCE 7-16 load increase would similarly require reduced spacing. This assumption was applied to staples because a withdrawal value is not available for staples in the NDS.

Table 3.10A Roof Sheathing Attachment Requirements for Wind Loads (7/16", PANEL SG=0.50) Exposure B
(Prescriptive Alternative to Table 3.10)

Wind Speed 3-second gust (mph) (See Figure 1.1)			90	95	100	105	110	115	120	130	140	150	160	170	180	195
STRUCTURAL SHEATHING																
Sheathing Location ¹	Rafter/Truss Framing Specific Gravity, G	Rafter/Truss Spacing (in.)	E	F	E	F	E	F	E	F	E	F	E	F	E	F
			Maximum Nail Spacing for 8d Common Nails, or 10d Box Nails (inches, o.c.) ^{2,4}													
Interior Zone	0.49	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12
		16	6	12	6	12	6	12	6	12	6	12	6	12	6	12
		19.2	6	12	6	12	6	12	6	12	6	12	6	12	6	12
		24	6	12	6	12	6	12	6	12	6	12	6	6	6	6
	0.42	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12
		16	6	12	6	12	6	12	6	12	6	12	6	12	6	12
Perimeter Edge Zone	0.49	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12
		16	6	12	6	12	6	12	6	12	6	12	6	12	6	12
		19.2	6	12	6	12	6	12	6	12	6	12	6	12	6	12
		24	6	12	6	12	6	12	6	12	6	6	6	6	6	6
	0.42	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12
		16	6	12	6	12	6	12	6	12	6	12	6	12	6	12
Gable Endwall Rake or Rake Truss with up to 9" Rake Overhang	0.49	-	6	6	6	6	6	6	6	6	6	6	6	6	4	4
	0.42	-	6	6	6	6	6	6	6	6	6	4	4	4	3	3
BOARD SHEATHING																
Sheathing Size	Rafter/Truss Spacing (in.)	Minimum Number of 8d Common Nails Per Support ⁴														
1x6 or 1x8 Sheathing	12-19.2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
1x10 or Larger Sheathing	12-19.2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

- E - Nail spacing at panel edges (in.)
- F - Nail spacing at intermediate supports in the panel field (in.)
- 1 For roof sheathing within 4 feet of the perimeter edge of the roof, including 4 feet on each side of the roof peak, the 4 foot perimeter edge zone attachment requirements shall be used.
- 2 For wind speeds greater than 130 mph, blocking is required which transfers lateral load to two additional joists (3 joists total).
- 3 See Table 3.10 for other fastener and sheathing combinations.
- 4 Tabulated values for 8d common and 10d box nails are applicable to carbon steel nails (bright or galvanized).

Table 3.10A Roof Sheathing Attachment Requirements for Wind Loads (7/16", PANEL G=0.50)

Exposure C

(Prescriptive Alternative to Table 3.10)

Wind Speed 3-second gust (mph) (See Figure 1.1)			90	95	100	105	110	115	120	130	140	150	160	170	180	195	
STRUCTURAL SHEATHING																	
Sheathing Location ¹	Rafter/Truss Framing Specific Gravity, G	Rafter/Truss Spacing (in.)	Maximum Nail Spacing for 8d Common Nails, or 10d Box Nails (inches, o.c.) ^{2,4}														
			E	F	E	F	E	F	E	F	E	F	E	F	E	F	
Interior Zone	0.49	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	
		16	6	12	6	12	6	12	6	12	6	12	6	12	6	6	6
		19.2	6	12	6	12	6	12	6	12	6	12	6	12	6	6	6
	0.42	24	6	12	6	12	6	12	6	12	6	12	6	6	6	6	Exceeds 7/16" ³
		12	6	12	6	12	6	12	6	12	6	12	6	12	6	6	6
		16	6	12	6	12	6	12	6	12	6	12	6	12	6	6	6
Perimeter Edge Zone	0.49	19.2	6	12	6	12	6	12	6	12	6	12	6	6	6	6	6
		24	6	12	6	12	6	6	6	6	6	6	6	6	6	6	Exceeds capacity of 7/16" sheathing ³
		12	6	12	6	12	6	12	6	12	6	6	6	6	6	6	6
	0.42	16	6	12	6	12	6	12	6	12	6	6	6	6	6	6	6
		19.2	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
		24	6	6	6	6	6	6	6	6	6	6	6	6	6	6	Exceeds capacity of 7/16" sheathing ³
Gable Endwall Rake or Rake Truss with up to 9" Rake Overhang	0.49	-	6	6	6	6	6	6	6	6	6	4	4	4	3	3	
	0.42	-	6	6	6	6	6	6	6	4	4	4	3	3	3	-	
BOARD SHEATHING																	
Sheathing Size	Rafter/Truss Spacing (in.)	Minimum Number of 8d Common Nails Per Support ⁴															
1x6 or 1x8 Sheathing	12-19.2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
1x10 or Larger Sheathing	12-19.2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	

- E - Nail spacing at panel edges (in.)
- F - Nail spacing at intermediate supports in the panel field (in.)
- 1 For roof sheathing within 4 feet of the perimeter edge of the roof, including 4 feet on each side of the roof peak, the 4 foot perimeter edge zone attachment requirements shall be used.
- 2 For wind speeds greater than 130 mph, blocking is required which transfers lateral load to two additional joists (3 joists total).
- 3 See Table 3.10 for other fastener and sheathing combinations.
- 4 Tabulated values for 8d common and 10d box nails are applicable to carbon steel nails (bright or galvanized).

Cost Impact: The code change proposal will increase the cost of construction. The change in the spacing of the nails for the small portions of roofs will result in an increase in the cost due to the increased number of nails and the time to install them, but that cost should be negligible when considering the overall cost for the construction of even a modest commercial building.

S174-19

IBC: TABLE 2304.10.1

Proponent: Rick Allen, International Staple, Nail and Tool Association, representing International Staple, Nail and Tool Association (rallen@isanta.org)

2018 International Building Code

Revise as follows:

**TABLE 2304.10.1
FASTENING SCHEDULE**

DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER	SPACING AND LOCATION
Roof		
1. Blocking between ceiling joists, rafters or trusses to top plate or other framing below	4-8d box (2½" x 0.113"); or 3-8d common (2½" x 0.131"); or 3-10d box (3" x 0.128"); or 3-3" x 0.131" nails; or 3-3" 14 gage staples, 7/16" crown	Each end, toenail
Blocking between rafters or truss not at the wall top plate, to rafter or truss	2-8d common (2½" x 0.131") 2-3" x 0.131" nails 2-3" 14 gage staples	Each end, toenail
	2-16 d common (3½" x 0.162") 3-3" x 0.131" nails 3-3" 14 gage staples	End nail
Flat blocking to truss and web filler	16d common (3½" x 0.162") @ 6" o.c. 3" x 0.131" nails @ 6" o.c. 3" x 14 gage staples @ 6" o.c	Face nail
2. Ceiling joists to top plate	4-8d box (2½" x 0.113"); or 3-8d common (2½" x 0.131"); or 3-10d box (3" x 0.128"); or 3-3" x 0.131" nails; or 3-3" 14 gage staples, 7/16" crown <u>Stainless Steel Fasteners are not applicable in this connection</u>	Each joist, toenail
3. Ceiling joist not attached to parallel rafter, laps over partitions (no thrust) (see Section 2308.7.3.1, Table 2308.7.3.1)	3-16d common (3½" x 0.162"); or 4-10d box (3" x 0.128"); or 4-3" x 0.131" nails; or 4-3" 14 gage staples, 7/16" crown	Face nail
4. Ceiling joist attached to parallel rafter (heel joint) (see Section 2308.7.3.1, Table 2308.7.3.1)	Per Table 2308.7.3.1	Face nail
5. Collar tie to rafter	3-10d common (3" x 0.148"); or 4-10d box (3" x 0.128"); or 4-3" x 0.131" nails; or 4-3" 14 gage staples, 7/16" crown	Face nail
6. Rafter or roof truss to top plate (See Section 2308.7.5, Table 2308.7.5)	3-10 common (3" x 0.148"); or 3-16d box (3½" x 0.135"); or 4-10d box (3" x 0.128"); or 4-3" x 0.131 nails; or 4-3" 14 gage staples, 7/16" crown <u>Stainless Steel Fasteners are not applicable in this connection</u>	<u>2 toenails on one side and 1 toenail on opposite side of rafter or truss</u> Toenail
7. Roof rafters to ridge valley or hip rafters; or roof rafter to 2-inch ridge beam	2-16d common (3½" x 0.162"); or 3-16d box (3½" x 0.135"); or 3-10d box (3" x 0.128"); or 3-3" x 0.131" nails; or 3-3" 14 gage staples, 7/16" crown; or	End nail
	3-10d common (3½" x 0.148"); or 4-16d box (3½" x 0.135"); or 4-10d box (3" x 0.128"); or 4-3" x 0.131" nails; or 4-3" 14 gage staples, 7/16" crown	Toenail
Wall		
8. Stud to stud (not at braced wall panels)	16d common (3½" x 0.162");	24" o.c. face nail
	10d box (3" x 0.128"); or 3" x 0.131" nails; or 3-3" 14 gage staples, 7/16" crown	16" o.c. face nail
9. Stud to stud and abutting studs at intersecting wallcorners (at braced wall panels)	16d common (3½" x 0.162"); or	16" o.c. face nail
	16d box (3½" x 0.135"); or	12" o.c. face nail
	3" x 0.131" nails; or 3-3" 14 gage staples, 7/16" crown	12" o.c. face nail

10. Built-up header (2" to 2" header)	16d common (3 ¹ / ₂ " x 0.162"); or	16" o.c. each edge, face nail
	16d box (3 ¹ / ₂ " x 0.135")	12" o.c. each edge, face nail
11. Continuous header to stud	4-8d common (2 ¹ / ₂ " x 0.131"); or 4-10d box (3" x 0.128"); or <u>5-8d box (2¹/₂" x 0.113)</u>	Toenail
12. Top plate to top plate	16d common (3 ¹ / ₂ " x 0.162"); or	16" o.c. face nail
	10d box (3" x 0.128"); or 3" x 0.131" nails; or 3" 14 gage staples, ⁷ / ₁₆ " crown	12" o.c. face nail
13. Top plate to top plate, at end joints	8-16d common (3 ¹ / ₂ " x 0.162"); or 12-16d box (3 ¹ / ₂ " x 0.135"); or 12-10d box (3" x 0.128"); or 12-3" x 0.131" nails; or 12-3" 14 gage staples, ⁷ / ₁₆ " crown	Each side of end joint, face nail (minimum 24" lap splice length each side of end joint)
14. Bottom plate to joist, rim joist, band joist or blocking (not at braced wall panels)	16d common (3 ¹ / ₂ " x 0.162"); or	16" o.c. face nail
	16d box (3 ¹ / ₂ " x 0.135"); or 3" x 0.131" nails; or 3" 14 gage staples, ⁷ / ₁₆ " crown	12" o.c. face nail
15. Bottom plate to joist, rim joist, band joist or blocking at braced wall panels	2-16d common (3 ¹ / ₂ " x 0.162"); or 3-16d box (3 ¹ / ₂ " x 0.135"); or 4-3" x 0.131" nails; or 4-3" 14 gage staples, ⁷ / ₁₆ " crown	16" o.c. face nail
16. Stud to top or bottom plate	<u>3-16d box (3¹/₂" x 0.135"); or 4-8d common (2¹/₂" x 0.131"); or 4-10d box (3" x 0.128"); or 4-3" x 0.131" nails; or 4-8d box (2¹/₂" x 0.113"); or 4-3" 14 gage staples, ⁷/₁₆" crown; or</u>	Toenail
	2-16d common (3 ¹ / ₂ " x 0.162"); or 3-16d box (3 ¹ / ₂ " x 0.135"); or 3-10d box (3" x 0.128"); or 3-3" x 0.131" nails; or 3-3" 14 gage staples, ⁷ / ₁₆ " crown	End nail
17. Top plates, laps at corners and intersections	2-16d common (3 ¹ / ₂ " x 0.162"); or 3-10d box (3" x 0.128"); or 3-3" x 0.131" nails; or 3-3" 14 gage staples, ⁷ / ₁₆ " crown	Face nail
18. 1" brace to each stud and plate	<u>3-8d box (2¹/₂" x 0.113"); or 2-8d common (2¹/₂" x 0.131"); or 2-10d box (3" x 0.128"); or 2-3" x 0.131" nails; or 2-3" 14 gage staples, ⁷/₁₆" crown</u> <u>Stainless Steel Fasteners are not applicable in this connection</u>	Face nail
19. 1" x 6" sheathing to each bearing	<u>3-8d box (2¹/₂" x 0.113"); or 2-8d common (2¹/₂" x 0.131"); or 2-10d box (3" x 0.128"); or 2-1³/₄" 16 gage staples, 1" crown</u> <u>Stainless Steel Fasteners are not applicable in this connection</u>	Face nail
20. 1" x 8" and wider sheathing to each bearing	3-8d common (2 ¹ / ₂ " x 0.131"); or <u>3-8d box (2¹/₂" x 0.113"); or 2-10d box (3" x 0.128"); or 3-1³/₄" 16 gage staples, 1" crown</u> <u>Stainless Steel Fasteners are not applicable in this connection</u>	Face nail
	<u>Wider than 1" x 8"</u>	
	3-8d common (2 ¹ / ₂ " x 0.131"); or 4-8d box (2 ¹ / ₂ " x 0.113"); or 3-10d box (3" x 0.128"); or 4-1 ³ / ₄ " 16 gage staples, 1" crown <u>Stainless Steel Fasteners are not applicable in this connection</u>	
Floor		
21. Joist to sill, top plate, or girder	4-8d box (2 ¹ / ₂ " x 0.113"); or 3-8d common (2 ¹ / ₂ " x 0.131"); or floor 3-10d box (3" x 0.128"); or 3-3" x 0.131" nails; or 3-3" 14 gage staples, ⁷ / ₁₆ " crown	Toenail
22. Rim joist, band joist, or blocking to top plate, sill or other framing below	4-8d box (2 ¹ / ₂ " x 0.113)	4" o.c. toenail
	8d common (2 ¹ / ₂ " x 0.131"); or 10d box (3" x 0.128"); or 3" x 0.131" nails; or 3" 14 gage staples, ⁷ / ₁₆ " crown	6" o.c. toenail

23. 1" x 6" subfloor or less to each joist	3-8d box (2½" x 0.113"); or 2-8d common (2½" x 0.131"); or 2 3-10d box (3" x 0.128"); <u>or 2-1¾" 16 gage staples 1" crown</u> Stainless Steel Fasteners are not applicable in this connection	Face nail	
24. 2 subfloor to joist or girder	3-16d box (3½" x 0.135"); or 2-16d common (3½" x 0.162")	Blind and Face nail	
25. 2" planks (plank & beam – floor & roof)	3-16d box (3½" x 0.135"); or 2-16d common (3½" x 0.162")	Each bearing, face nail	
26. Built-up girders and beams, 2" lumber layers	20d common (4" x 0.192")	32" o.c., face nail at top and bottom staggered on opposite sides	
	10d box (3" x 0.128"); or 3" x 0.131" nails; or 3" 14 gage staples, 7/16" crown	24" o.c. face nail at top and bottom staggered on opposite sides	
	And: 2-20d common (4" x 0.192"); or 3-10d box (3" x 0.128"); or 3-3" x 0.131" nails; or 3-3" 14 gage staples, 7/16" crown	Ends and at each splice, face nail	
27. Ledger strip supporting joists or rafters	3-16d common (3½" x 0.162"); or 4-16d box (3½" x 0.135"); or 4-10d box (3" x 0.128"); or 4-3" x 0.131" nails; or 4-3" 14 gage staples, 7/16" crown	Each joist or rafter, face nail	
28. Joist to band joist or rim joist	3-16d common (3½" x 0.162"); or 4-10d box (3" x 0.128"); or 4-3" x 0.131" nails; or 4-3" 14 gage staples, 7/16" crown	End nail	
29. Bridging or blocking to joist, rafter or truss	2-8d common (2½" x 0.131"); or 2-10d box (3" x 0.128"); or 2-3" x 0.131" nails; or 2-3" 14 gage staples, 7/16" crown	Each end, toenail	
Wood structural panels (WSP), subfloor, roof and interior wall sheathing to framing and particleboard wall sheathing to framing ^a			
		Edges (inches)	Intermediate supports (inches)
30. 3/8" – 1/2"	6d common or deformed (2" x 0.113"); or 2¾" x 0.113" nail (subfloor and wall)	6	12
	8d common or deformed (2½" x 0.131") (roof) or RSRS-01 (2¾" x 0.113") nail (roof) ^d	6	12
	2¾" x 0.113" nail (subfloor and wall)	6	12
	1¾" 16 gage staple, 7/16" crown (subfloor and wall)	4	8
	2¾" x 0.113" nail (roof)	4	8
	1¾" 16 gage staple, 7/16" crown (roof)	3	6
31. 19/32" – 3/4"	8d common (2½" x 0.131"); or 6d deformed (2" x 0.113") (subfloor and wall)	6	12
	8d common or deformed (2½" x 0.131") (roof) or RSRS-01 (2¾" x 0.113") nail (roof) ^d	6	12
	2¾" x 0.113" nail; or 2" 16 gage staple, 7/16" crown	4	8
32. 7/8" – 1¼"	10d common (3" x 0.148"); or 8d deformed (2½" x 0.131")	6	12
Other exterior wall sheathing			
33. 1/2" fiberboard sheathing ^b	1½" x 0.120" galvanized roofing nail (7/16" head diameter); or 1¼" 16 gage staple with 7/16" or 1" crown	3	6
34. 25/32" fiberboard sheathing ^b	1¾" x 0.120" galvanized roofing nail (7/16" diameter head); or 1½" 16 gage staple with 7/16" or 1" crown	3	6
Wood structural panels, combination subfloor underlayment to framing			
35. 3/4" and less	8d common (2½" x 0.131"); or 6d deformed (2" x 0.113") or deformed 2" x 0.120"	6	12
36. 7/8" – 1"	8d common (2½" x 0.131"); or 8d deformed (2½" x 0.131"); or deformed 2½" x 0.120"	6	12
37. 1 1/8" – 1 1/4"	10d common (3" x 0.148"); or 8d deformed (2½" x 0.131"); or deformed 2½" x 0.120"	6	12
Panel siding to framing			

38. 1/2" or less	6d corrosion-resistant siding (1 7/8" x 0.106"); or 6d corrosion-resistant casing (2" x 0.099")	6	12
39. 5/8"	8d corrosion-resistant siding (2 3/8" x 0.128"); or 8d corrosion-resistant casing (2 1/2" x 0.113")	6	12
Wood structural panels (WSP), subfloor, roof and interior wall sheathing to framing and particleboard wall sheathing to framing ^a			
		Edges (inches)	Intermediate supports (inches)
Interior paneling			
40. 1/4"	4d casing (1 1/2" x 0.080"); or 4d finish (1 1/2" x 0.072")	6	12
41. 3/8"	6d casing (2" x 0.099"); or 6d finish (2" x 0.092") (Panel supports at 24 inches)	6	12

For SI: 1 inch = 25.4 mm.

- a. Nails spaced at 6 inches at intermediate supports where spans are 48 inches or more. For nailing of wood structural panel and particleboard diaphragms and shear walls, refer to Section 2305. Nails for wall sheathing are permitted to be common, box or casing.
- b. Spacing shall be 6 inches on center on the edges and 12 inches on center at intermediate supports for nonstructural applications. Panel supports at 16 inches (20 inches if strength axis in the long direction of the panel, unless otherwise marked).
- c. Where a rafter is fastened to an adjacent parallel ceiling joist in accordance with this schedule and the ceiling joist is fastened to the top plate in accordance with this schedule, the number of toenails in the rafter shall be permitted to be reduced by one nail.
- d. RSRS-01 is a Roof Sheathing Ring Shank nail meeting the specifications in ASTM F1667.

Reason: IBC Table 2304.10.1 and IRC Table R602.3(1) are essentially the same table in structural connections 1 through 39. Although the descriptions are closely align, there are fasteners prescribed in the IBC table that are not in the IRC table and fasteners prescribed in the IRC table that are not in the IBC table.

This proposal is written to harmonize the fasteners between the two tables. In addition, where additional information exists in one table and not the other, this too is being harmonized.

For connections # 2,6,18,19, 20 & 23 there was a code change proposal RB272-13 entered in by the American Wood Council and adopted for the 2015 IRC. The reference nail values for the nailing schedule in these connections were based on Reference Lateral Values and Reference Withdrawal values. All other connections in the table were based on Reference Lateral Design Values. In the 2018 NDS, the reference withdrawal values for stainless steel nails were tabulated in a new NDS table (12.2D). The withdrawal values for stainless steel are lower than the values for carbon steel (bright or galvanized) nails of equivalent diameters.

As such, the lower stainless steel withdrawal values combined with the publication date of the 2018 NDS and the 2015 code proposal date would indicate that the basis of the original code proposal is relevant to only carbon steel nails and not to stainless steel nails. The added note to these connections is to exclude stainless steel from these connections based on the lower withdrawal values.

Connection 1:

Added 8d box nails to match IRC R602.3(1)

Connection 2:

Added note regarding stainless steel fasteners

Added 8d box nails from IRC R602.3(1)

Connection 6:

Added note regarding stainless steel fasteners

Changed Fastener Spacing and Location note to match IRC R602.3(1)

Connection 7:

Added 16d Box nails to match IRC R602.3(1)

Connection 11

Added 8d Box nails to match IRC R602.3(1)

Connection 13

Added 16d Box nails to match IRC R602.3(1)

Connection 16

Added 16d Box and 8d Box nails to match IRC R602.3(1)

Connection 18

Added note regarding stainless steel fasteners

Added 8d Box nails to match IRC R602.3(1)

Connection 19

Added note regarding stainless steel fasteners

Added 8d Box nails to match IRC R602.3(1)

Added 16 gage staples to match IRC R602.3(1)

Connection 20

Added note regarding stainless steel fasteners

Added 8d Box nails to match IRC R602.3(1)

Added 16 gage staples to match IRC R602.3(1)

Added subcategory "wider than 1" x 8" to match IRC R602.3(1)

Connection 21

Added 8d Box nails to match IRC R602.3(1)

Connection 22

Added a subcategory of 4' o.c. to match IRC R602.3(1)

Connection 23

Added note regarding stainless steel fasteners

Added 8d Box nails to match IRC R602.3(1)

Added 16 gage staples to match IRC R602.3(1)

Connection 24

Added 16d box nails to match IRC R602.3(1)

Changed Spacing and Location notation to match IRC R602.3(1)

Connection 25

Added 16d box nails to match IRC R602.3(1)

Connection 27

Added 16d box nails to match IRC R602.3(1)

Connection 30:

All 6 and 12 subfloor and wall fasteners were moved into one line

Connection 31:

The description **6d deformed (2" x 0.113")** is an incorrect description. ASTM F1667 does not have a classification for 6d deformed nails. The correct description is deformed (2" x 0.113")

Connection 32:

The description **8d deformed (2" x 0.131")** is an incorrect description. ASTM F1667 does not have a classification for 8d deformed nails. The correct description is deformed (2½" x 0.131")

Connections 33 & 34:

The current nail description is incomplete and is missing a shank diameter. Addition of the diameters match AWC SDPWS

Connections 35:

The description **6d deformed (2" x 0.113")** is an incorrect description. ASTM F1667 does not have a classification for 6d deformed nails. The correct description is deformed (2" x 0.113")

Connection 36 & 37:

The description **8d deformed (2" x 0.131")** is an incorrect description. ASTM F1667 does not have a classification for 8d deformed nails. The correct description is deformed (2½" x 0.131")

Connection 41:

Dimension of a 6d finish nail has been added to be consistent

Cost Impact: The code change proposal will not increase or decrease the cost of construction listing of additional fasteners should have no effect on cost of construction

S175-19

IBC: 2304.12.1

Proponent: Paul Coats, representing American Wood Council (pcoats@awc.org)

2018 International Building Code

Revise as follows:

2304.12.1 Locations requiring waterborne preservatives or naturally durable wood. Wood used above ground in the locations specified in Sections 2304.12.1.1 through 2304.12.1.5, ~~2304.12.3~~ and ~~2304.12.5~~ shall be naturally durable wood or *preservative-treated wood* using waterborne preservatives, in accordance with AWPA U1 for above-ground use.

2304.12.1.1 Joists, girders and subfloor. Wood joists or wood structural floors that are closer than 18 inches (457 mm) or wood girders that are closer than 12 inches (305 mm) to the exposed ground in crawl spaces or unexcavated areas located within the perimeter of the building foundation shall be of naturally durable or *preservative-treated wood*.

2304.12.1.2 Wood supported by exterior foundation walls. Wood framing members, including wood sheathing, that are in contact with exterior foundation walls and are less than 8 inches (203 mm) from exposed earth shall be of naturally durable or *preservative-treated wood*.

2304.12.1.3 Exterior walls below grade. Wood framing members and furring strips in direct contact with the interior of exterior masonry or concrete walls below grade shall be of naturally durable or *preservative-treated wood*.

2304.12.1.4 Sleepers and sills. Sleepers and sills on a concrete or masonry slab that is in direct contact with earth shall be of naturally durable or *preservative-treated wood*.

2304.12.1.5 Wood siding. Clearance between wood siding and earth on the exterior of a building shall be not less than 6 inches (152 mm) or less than 2 inches (51 mm) vertical from concrete steps, porch slabs, patio slabs and similar horizontal surfaces exposed to the weather except where siding, sheathing and wall framing are of naturally durable or *preservative-treated wood*.

2304.12.2 Other locations. Wood used in the locations specified in Sections 2304.12.2.1 through 2304.12.2.5 shall be naturally durable wood or *preservative-treated wood* in accordance with AWPA U1. *Preservative-treated wood* used in interior locations shall be protected with two coats of urethane, shellac, latex epoxy or varnish unless waterborne preservatives are used. Prior to application of the protective finish, the wood shall be dried in accordance with the manufacturer's recommendations.

2304.12.2.1 Girder ends. The ends of wood girders entering exterior masonry or concrete walls shall be provided with a $\frac{1}{2}$ -inch (12.7 mm) airspace on top, sides and end, unless naturally durable or *preservative-treated wood* is used.

2304.12.2.2 Posts or columns. Posts or columns supporting permanent structures and supported by a concrete or masonry slab or footing that is in direct contact with the earth shall be of naturally durable or *preservative-treated wood*.

Exception: Posts or columns that meet all of the following:

1. Are not exposed to the weather, or are protected by a roof, eave, overhang, or other covering if exposed to the weather.
2. Are supported by concrete piers or metal pedestals projected not less than 1 inch (25 mm) above the slab or deck and are separated from the concrete pier by an impervious moisture barrier.
3. Are located not less than 8 inches (203 mm) above exposed earth.

2304.12.2.3 Supporting member for permanent appurtenances. Naturally durable or *preservative-treated wood* shall be utilized for those portions of wood members that form the structural supports of buildings, balconies, porches or similar permanent building appurtenances where such members are exposed to the weather without adequate protection from a roof, eave, overhang or other covering to prevent moisture or water accumulation on the surface or at joints between members.

Exception: Buildings located in a geographical region where experience has demonstrated that climatic conditions preclude the need to use durable materials where the structure is exposed to the weather.

2304.12.2.4 Laminated timbers. The portions of glued-laminated timbers that form the structural supports of a building or other structure and are exposed to weather and not fully protected from moisture by a roof, eave or similar covering shall be pressure treated with preservative or be manufactured from naturally durable or *preservative-treated wood*.

2304.12.2.5 Supporting members for permeable floors and roofs. Wood structural members that support moisture-permeable floors or roofs that are exposed to the weather, such as concrete or masonry slabs, shall be of naturally durable or *preservative-treated wood* unless separated from such floors or roofs by an impervious moisture barrier. The impervious moisture barrier system protecting the structure supporting floors shall provide positive drainage of water that infiltrates the moisture-permeable floor topping.

2304.12.2.6 Ventilation beneath balcony or elevated walking surfaces. Enclosed framing in exterior balconies and elevated walking surfaces that are exposed to rain, snow or drainage from irrigation shall be provided with openings that provide a net free cross-ventilation area not less than $\frac{1}{150}$ of the area of each separate space.

2304.12.3 Wood in contact with the ground or fresh water. Wood used in contact with exposed earth shall be naturally durable for both decay and termite resistance or preservative treated in accordance with AWPA U1 for soil or fresh water use.

Exception: Untreated wood is permitted where such wood is continuously and entirely below the ground-water level or submerged in fresh water.

2304.12.3.1 Posts or columns. Posts and columns that are supporting permanent structures and embedded in concrete that is exposed to the weather or in direct contact with the earth shall be of *preservative-treated wood*.

2304.12.4 Termite protection. In geographical areas where hazard of termite damage is known to be very heavy, wood floor framing in the locations specified in Section 2304.12.1.1 and exposed framing of exterior decks or balconies shall be of naturally durable species (termite resistant) or preservative treated in accordance with AWPA U1 for the species, product preservative and end use or provided with *approved* methods of termite protection.

2304.12.5 Wood used in retaining walls and cribs. Wood installed in retaining or crib walls shall be preservative treated in accordance with AWPA U1 for soil and fresh water use.

Reason: The only change is to Section 2304.12.1. The other sections are shown for context only. References to sections 2304.12.3 and 2304.12.5 for locations requiring waterborne preservatives are unnecessary. AWPA has several oil-borne preservatives approved for use in ground contact applications (UC4A and higher) that could be used in these locations. When used in interior locations, Section 2304.12.2 requires them to be protected with two coats of urethane, shellac, latex epoxy or varnish when not treated with waterborne preservative.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Any cost differences depend on the choice of products for their application; the proposal adds flexibility and therefore may decrease cost in some circumstances.

Proposal # 4298

S175-19

S176-19

IBC@: 2304.12.2.3, 2304.12.2.4

Proponent: Paul Coats, representing American Wood Council (pcoats@awc.org)

2018 International Building Code

Revise as follows:

2304.12.2.3 Supporting member for permanent appurtenances. Naturally durable or *preservative-treated wood* shall be utilized for those portions of wood members that form the structural supports of buildings, balconies, porches or similar permanent building appurtenances where such members are exposed to the weather without adequate protection from a roof, eave, overhang or other covering to prevent moisture or water accumulation on the surface or at joints between members.

Exception: ~~Buildings~~ Sawn lumber in buildings located in a geographical region where experience has demonstrated that climatic conditions preclude the need to use durable materials where the structure is exposed to the weather.

Delete without substitution:

~~**2304.12.2.4 Laminated timbers.** The portions of glued-laminated timbers that form the structural supports of a building or other structure and are exposed to weather and not fully protected from moisture by a roof, eave or similar covering shall be pressure treated with preservative or be manufactured from naturally durable or *preservative-treated wood*.~~

Reason: Having a separate section for laminated timbers is unnecessary since they are required to be protected as for all other wood members in the locations described in the subsections of 2304.12.1 (locations requiring waterborne preservatives or naturally durable wood) and 2304.12.2 (other locations). Currently 2304.12.2.3 and 2304.12.2.4 duplicate each other except for the exception in 2304.12.2.3, which does not apply to laminated timber and presumably should not apply to any engineered wood product using adhesives. Therefore, the proposed modification of the exception to 2304.12.2.3 to exclude engineered wood products makes the separate section on laminated timbers unnecessary. This will also solve the problem of interpreting the current code as prohibiting glued-laminated timbers from being used in the locations described in 2304.12.1. Glued-laminated timber can be used in those locations as long as they are treated with water-borne preservatives or protected in accordance with 2304.12.2 for oil-borne preservatives used in interior locations.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Manufacturers of engineered wood products typically recommend their protection when exposed to the weather, regardless of climate or geographic location. The current code requirements are retained for sawn lumber and glued laminated timber specifically. Therefore there is no anticipated cost increase or decrease.

Proposal # 5051

S176-19

S177-19

IBC: 2304.12.2, 2304.12.3, 2304.12.3.1, 2304.12.4, 2304.12.5, 2304.12.6, 2304.12.7

Proponent: Paul Coats, representing American Wood Council (pcoats@awc.org)

2018 International Building Code

Revise as follows:

2304.12.2 Other locations. Wood used in the locations specified in Sections 2304.12.2.1 through ~~2304.12.2.5~~ 2304.12.2.9 shall be naturally durable wood or *preservative-treated* wood in accordance with AWPA U1. *Preservative-treated* wood used in interior locations shall be protected with two coats of urethane, shellac, latex epoxy or varnish unless waterborne preservatives are used. Prior to application of the protective finish, the wood shall be dried in accordance with the manufacturer's recommendations.

2304.12.2.1 Girder ends. The ends of wood girders entering exterior masonry or concrete walls shall be provided with a 1/2-inch (12.7 mm) airspace on top, sides and end, unless naturally durable or *preservative-treated wood* is used.

2304.12.2.2 Posts or columns. Posts or columns supporting permanent structures and supported by a concrete or masonry slab or footing that is in direct contact with the earth shall be of naturally durable or *preservative-treated wood*.

Exception: Posts or columns that meet all of the following:

1. Are not exposed to the weather, or are protected by a roof, eave, overhang, or other covering if exposed to the weather.
2. Are supported by concrete piers or metal pedestals projected not less than 1 inch (25 mm) above the slab or deck and are separated from the concrete pier by an impervious moisture barrier.
3. Are located not less than 8 inches (203 mm) above exposed earth.

2304.12.2.3 Supporting member for permanent appurtenances. Naturally durable or *preservative-treated wood* shall be utilized for those portions of wood members that form the structural supports of buildings, balconies, porches or similar permanent building appurtenances where such members are exposed to the weather without adequate protection from a roof, eave, overhang or other covering to prevent moisture or water accumulation on the surface or at joints between members.

Exception: Buildings located in a geographical region where experience has demonstrated that climatic conditions preclude the need to use durable materials where the structure is exposed to the weather.

2304.12.2.4 Laminated timbers. The portions of glued-laminated timbers that form the structural supports of a building or other structure and are exposed to weather and not fully protected from moisture by a roof, eave or similar covering shall be pressure treated with preservative or be manufactured from naturally durable or *preservative-treated wood*.

2304.12.2.5 Supporting members for permeable floors and roofs. Wood structural members that support moisture-permeable floors or roofs that are exposed to the weather, such as concrete or masonry slabs, shall be of naturally durable or *preservative-treated wood* unless separated from such floors or roofs by an impervious moisture barrier. The impervious moisture barrier system protecting the structure supporting floors shall provide positive drainage of water that infiltrates the moisture-permeable floor topping.

2304.12.2.6 Ventilation beneath balcony or elevated walking surfaces. Enclosed framing in exterior balconies and elevated walking surfaces that are exposed to rain, snow or drainage from irrigation shall be provided with openings that provide a net free cross-ventilation area not less than 1/150 of the area of each separate space.

~~2304.12.3~~ **2304.12.2.7 Wood in contact with the ground or fresh water.** Wood used in contact with exposed earth shall be naturally durable for both decay and termite resistance or preservative treated in accordance with AWPA U1 for soil or fresh water use.

Exception: Untreated wood is permitted where such wood is continuously and entirely below the ground-water level or submerged in fresh water.

~~2304.12.3.1~~ **2304.12.2.7.1 Posts or columns.** Posts and columns that are supporting permanent structures and embedded in concrete that is exposed to the weather or in direct contact with the earth shall be of *preservative-treated wood*.

~~2304.12.4~~ **2304.12.2.8 Termite protection.** In geographical areas where hazard of termite damage is known to be very heavy, wood floor framing in the locations specified in Section 2304.12.1.1 and exposed framing of exterior decks or balconies shall be of naturally durable species (termite resistant) or preservative treated in accordance with AWPA U1 for the species, product preservative and end use or provided with *approved* methods of termite protection.

~~2304.12.5~~ **2304.12.2.9 Wood used in retaining walls and cribs.** Wood installed in retaining or crib walls shall be preservative treated in accordance with AWPA U1 for soil and fresh water use.

~~2304.12.6~~ 2304.12.3 **Attic ventilation.** For *attic* ventilation, see Section 1202.2.2.

~~2304.12.7~~ 2304.12.4 **Under-floor ventilation (crawl space).** For under-floor ventilation (crawl space), see Section 1202.4.

Reason: This is a proposed renumbering of the subsections without changing the content. There does not seem to be any reason why current subsections 2304.12.3 through 2304.12.5 (Wood in contact with the ground or fresh water, posts and columns embedded in concrete in direct contact with the earth, wood needing termite protection, and retaining walls and crib walls) are not subsections of 2304.12.2 as locations requiring protection. In addition, there seems to be no reason why oil-borne treatments used in these locations should not also be protected as prescribed in 2304.12.2 when used in interior locations. This renumbering cleans up the section and brings appropriate provisions under the charging language of 2304.12.2 for that protection.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is a renumbering of subsections only and does not affect the normal application of the code, since the protection provisions of 2304.12.2 are broad and not necessarily limited to only locations listed in the current subsections of that section.

Proposal # 4299

S177-19

S178-19

IBC@: 2304.12.2.6

Proponent: Rebecca Baker, Jefferson County CO, representing the Colorado Chapter ICC (bbaker@co.jefferson.co.us)

2018 International Building Code

Revise as follows:

2304.12.2.6 Ventilation beneath balcony or elevated walking surfaces. Enclosed framing in exterior balconies and elevated walking surfaces that ~~are exposed to rain, snow or drainage from irrigation~~ have weather-exposed surfaces shall be provided with openings that provide a net free cross-ventilation area not less than $\frac{1}{150}$ of the area of each separate space.

Reason: The term irrigation was added to the 2018 and goes beyond the scope of previous editions of the code. To verify compliance, landscape irrigation plans would need to become part of the construction documents. The proposed language uses a defined terms which will increase consistency and satisfy the intent.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal will help standardize the application of the code.

Proposal # 4462

S178-19

S179-19

IBC@: 2306.1, ASABE Chapter 35 (New)

Proponent: Andy Williams, Association Management Center, representing National Frame Building Association (afwilliams@Connect2amc.com)

2018 International Building Code

Revise as follows:

2306.1 Allowable stress design. The design and construction of wood elements in structures using *allowable stress design* shall be in accordance with the following applicable standards:

American Society of Agricultural and Biological Engineers.

ASABE S618 Post Frame Building System Nomenclature

(Portions of standards not shown remain unchanged)

Add new text as follows:

ASABE

American Society of Agricultural and
Biological Engineers
2950 Niles Road
St. Joseph MI 49085

S618 DEC2010 (R2016): Post Frame Building System Nomenclature

Reason: Post frame construction continues to grow in popularity. Design guidance is provided through the ASABE Engineering Practices identified in Section 2306.1. A number of the terms used in these engineering practices and in post frame design overall are specific to the industry and a clear understanding of terms is critical. This standard provides that clarity of terms through a combination of text and figures for all aspects of post frame construction. This proposal adds reference to ASABE S618 in Section 2306.1 and in Chapter 35.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This standard provides definitions and figures showing the critical elements of post frame construction. There are no procedures or additional design considerations included in this document.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASABE S168 Dec2010 (R2016), with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 4743

S179-19

S180-19

IBC®: TABLE 2306.1.4

Proponent: Dennis Richardson, representing American Wood Council (drichardson@awc.org)

2018 International Building Code

Revise as follows:

TABLE 2306.1.4
ALLOWABLE LOADS FOR LUMBER DECKING

Portions of table not shown remain unchanged.

PATTERN	ALLOWABLE AREA LOAD ^{a, b}	
	Flexure	Deflection
3-inch and 4-inch decking	$\sigma_b = \frac{8 F_b' d^2}{3 l^2}$	$\sigma_\Delta = \frac{116 \Delta E' d^3}{l^4 12}$

For SI: 1 inch = 25.4 mm.

- a. σ_b = Allowable total uniform load limited by bending.
 σ_Δ = Allowable total uniform load limited by deflection.
- b. d = Actual decking thickness.

l = Span of decking.

F_b' = Allowable bending stress adjusted by applicable factors.

E = Modulus of elasticity adjusted by applicable factors.

Reason: Correct the flexure equation for 3-inch and 4-inch decking to be consistent with lumber decking design documents WCD2 and AITC 112. The equation in its current form was introduced through code change S170-04/05. This equation erroneously incorporated a 2/3 factor applied to the moment of inertia used for controlled random layup patterns of 2-inch and mechanically laminated decking, rather than the 0.8 factor specified in WCD2 and AITC 112 for controlled random layup patterns of 3-inch and 4-inch decking. The revised equation incorporates a 0.8 factor in the flexure equation, consistent with use of the 0.8 factor implemented in the existing deflection equation. The equations used for flexure and deflection for controlled random layup decking assumes a 3 equal-span uniformly loaded baseline condition modified by either the 2/3 or 0.8 adjustment factors described above.

Bibliography: WCD2 – Wood Construction Data for Tongue and Groove Roof Decking, AF&PA 2003, <https://awc.org/codes-standards/publications/wcd2> .

AITC 112 – American Institute of Timber Construction Standard for Tongue-and-Groove Heavy Timber Roof Decking, AITC 1993, <http://www.aitc-glulam.org/Shopcart/index.asp> .

Cost Impact: The code change proposal will decrease the cost of construction

This correction to the flexure-based allowable load limit for 3-inch and 4-inch controlled random layup decking will decrease the cost of construction because it will result in higher allowable loads than the incorrect equation that is currently provided within this particular cell of Table 2306.1.4.

Proposal # 4421

S180-19

S181-19

IBC®: 2306.1.4, TABLE 2306.1.4

Proponent: Dennis Richardson, representing American Wood Council (drichardson@awc.org)

2018 International Building Code

Revise as follows:

2306.1.4 Lumber decking. The capacity of lumber decking arranged according to the patterns described in Section 2304.9.2 shall be the lesser of the capacities determined for flexure moment and deflection according to the formulas in Table 2306.1.4.

**TABLE 2306.1.4
ALLOWABLE LOADS FOR LUMBER DECKING**

PATTERN	ALLOWABLE AREA LOAD ^{a,b}	
	Moment <u>Flexure</u>	Deflection
Simple span	$\sigma_b w_b = \frac{8F_b' d^2}{l^2 6}$	$\sigma_b w_\Delta = \frac{384\Delta E' d^3}{5 l^4 12}$
Two-span continuous	$\sigma_b w_b = \frac{8F_b' d^2}{l^2 6}$	$\sigma_b w_\Delta = \frac{185\Delta E' d^3}{l^4 12}$
Combination simple- and two-span continuous	$\sigma_b w_b = \frac{8F_b' d^2}{l^2 6}$	$\sigma_b w_\Delta = \frac{131\Delta E' d^3}{l^4 12}$
Cantilevered piecesintermixed	$\sigma_b w_b = \frac{20F_b' d^2}{3 l^2 6}$	$\sigma_b w_\Delta = \frac{105\Delta E' d^3}{l^4 12}$
Controlled random layout		
Mechanically laminated decking	$\sigma_b w_b = \frac{20F_b' d^2}{3 l^2 6}$	$\sigma_b w_\Delta = \frac{100\Delta E' d^3}{l^4 12}$
2-inch decking	$\sigma_b w_b = \frac{20F_b' d^2}{3 l^2 6}$	$\sigma_b w_\Delta = \frac{100\Delta E' d^3}{l^4 12}$
3-inch and 4-inch decking	$\sigma_b w_b = \frac{20F_b' d^2}{3 l^2 6}$	$\sigma_b w_\Delta = \frac{116\Delta E' d^3}{l^4 12}$

For SI: 1 inch = 25.4 mm.

a. $\sigma_b w_b$ = Allowable total uniform load limited by bending moment.

b. $\sigma_b w_\Delta$ = Allowable total uniform load limited by deflection.

d = Actual decking thickness.

l = Span of decking.

F_b' = Allowable bending stress adjusted by applicable factors.

E = Modulus of elasticity adjusted by applicable factors.

Reason: Notation for allowable uniform load is changed from the Greek letter sigma to "w" in order to match notation more commonly used to express uniform loads. Also, the term "flexure" is changed to "moment" to more accurately express the moment capacity basis of this limit and distinguish it from the deflection-based limit. The term moment also more clearly addresses the basis of the equations in lieu of terms bending and flexure which might be incorrectly construed as also addressing shear in members subject to bending and flexure. Definitions for all notation are combined under Footnote a as there does not appear to be a need to divide the listing of notations into two separate footnotes.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. These revisions to the notation and terminology provided in Section 2306.1.4 are for clarification only, and do not affect the cost of construction.

S182-19

IBC: TABLE 2306.3(3)

Proponent: Rick Allen, International Staple, Nail and Tool Association, representing International Staple, Nail and Tool Association (rallen@isanta.org)

2018 International Building Code

Revise as follows:

TABLE 2306.3(3)

ALLOWABLE SHEAR VALUES FOR WIND OR SEISMIC FORCES FOR SHEAR WALLS OF LATH AND PLASTER OR GYPSUM BOARD WOOD FRAMED WALL ASSEMBLIES UTILIZING STAPLES

Portions of table not shown remain unchanged.

TYPE OF MATERIAL	THICKNESS OF MATERIAL	WALL CONSTRUCTION	STAPLE SPACING ^b MAXIMUM (inches)	SHEAR VALUE ^{a, c} (plf)	MINIMUM STAPLE SIZE ^{f, g}	
4. Gypsum board, gypsum veneer base or water-resistant gypsum backing board	1/2"	Unblocked ^d	7	75	No. 16 gage galv. staple, 1 1/2" long	
		Unblocked ^d	4	110		
		Unblocked	7	100		
		Unblocked	4	125		
		Blocked ^e	7	125		
		Blocked ^e	4	150		
	5/8"	Unblocked ^d		7	115	No. 16 gage galv. staple, 1 1/2" legs, 1 5/8" long
				4	145	
		Blocked ^e		7	145	
				4	175	
	Blocked ^e Two-ply	Base ply: 9 Face ply: 7		250	No. 16 gage galv. staple 1 5/8" long No. 15 gage galv. staple, 2 1/4" long	

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per foot = 14.5939 N/m.

- a. These shear walls shall not be used to resist loads imposed by masonry or concrete walls (see AWC SDPWS). Values shown are for short-term loading due to wind or seismic loading. Walls resisting seismic loads shall be subject to the limitations in Section 12.2.1 of ASCE 7. Values shown shall be reduced 25 percent for normal loading.
- b. Applies to fastening at studs, top and bottom plates and blocking.
- c. Except as noted, shear values are based on a maximum framing spacing of 16 inches on center.
- d. Maximum framing spacing of 24 inches on center.
- e. All edges are blocked, and edge fastening is provided at all supports and all panel edges.
- f. Staples shall have a minimum crown width of 7/16 inch, measured outside the legs, and shall be installed with their crowns parallel to the long dimension of the framing members.
- g. Staples for the attachment of gypsum lath and woven-wire lath shall have a minimum crown width of 3/4 inch, measured outside the legs.

Reason: Material Type 4 Gypsum board, gypsum veneer base or water-resistant gypsum backing board 5/8" thick Unblocked and Blocked

There are 2 staple lengths shown. The 1 5/8" will be the most conservative length.

Cost Impact: The code change proposal will not increase or decrease the cost of construction There is no cost impact. There were two fastener lengths shown and the shorter one was removed.

S183-19 Part I

PART I — IBC: 2308.5.6

PART II — IRC@: R602.9

Proponent: Robert Rice C.B.O., representing Southern Oregon Chapter-ICC (RobertR@nwcodepros.com)

2018 International Building Code

Revise as follows:

2308.5.6 Cripple walls. Foundation cripple walls shall be framed of studs that are not less than the size of the studding ~~above and~~. Exterior cripple wall studs shall be not less than 14 inches (356 mm) in length, or shall be framed of solid blocking. Where exceeding 4 feet (1219 mm) in height, such walls shall be framed of studs having the size required for an additional *story*. See Section 2308.6.6 for cripple wall bracing.

Proposal # 4089

S183-19 Part I

S183-19 Part II

IRC@: R602.9

Proponent: Robert Rice C.B.O., representing Southern Oregon Chapter-ICC (RobertR@nwcodepros.com)

2018 International Residential Code

Revise as follows:

R602.9 Cripple walls. Foundation cripple walls shall be framed of studs not smaller than the studding above. Where exceeding 4 feet (1219 mm) in height, such walls shall be framed of studs having the size required for an additional ~~story~~. ~~Cripple~~ Exterior cripple walls with a stud height less than 14 inches (356 mm) shall be continuously sheathed on one side with wood structural panels fastened to both the top and bottom plates in accordance with Table R602.3(1), or the cripple walls shall be constructed of solid blocking.

Cripple walls shall be supported on continuous foundations.

Reason: Both the IRC and the IBC require foundation cripple wall studs less than 14 inches to be "continuously-sheathed". (Note: This requirement is not related to wall bracing which is covered elsewhere in the codes.)

Per the Code Commentaries, the requirement for continuous sheathing on cripple wall studs 14 inches and less (or solid-blocking) is intended to ensure the integrity of the studs when nails are end-nailed into the studs (face-nailed through the top and bottom plates). The IRC Commentary states;

"The minimum length of 14 inches (356 mm) for cripple wall studs provides sufficient clear space for required nailing of the framing."

In regions with shallow frost-depth it is common to have shallow crawlspaces. With an 18 inch minimum crawlspace, an interior cripple wall on a continuous 6 inch thick concrete footing is as short as 12 inches. With a top and bottom plate, the studs would be as short as 9 inches.

Field observations have shown that these short studs typically do not present a problem when installed in this situation. Continuously-sheathing these short walls in a crawlspace is costly and very labor-intensive without justifiable benefit. It can also present additional adverse effects with ventilation, under-floor mechanical systems, plumbing and access. There are other effective methods of connecting the studs to the top and bottom plates such as toe-nailing, mechanical fasteners and plywood gussets. The fact is, poorly installed/damaged studs could, and should, be replaced whether in a full-height wall or in a cripple wall and the inspector is qualified to make that determination and has the authority to require correction of defective materials.

Also, cripple wall studs are used in other places in the code for load-bearing application such as above/below window and door headers (e.g. See IRC Figures R602.3(2) and R602.7.1). This existing limitation of 14 inches does not apply to those conditions even though they are also subject to gravity loads which in some cases may be significantly greater (e.g. long-span pre-engineered trusses) than interior cripple walls under the floor. In those cases, an inspector would be competent enough, and authorized, to require replacement of any split or damaged cripple studs if they did exist. It makes sense that the same would apply to cripple walls in the floor system.

In addition, it needs to be clarified that the continuous sheathing mentioned in this section is not for "wall bracing" even though it is often misunderstood to be so. The additional sentence that is added to the IRC makes this clear by referencing section R602.10.10 for the cripple wall bracing requirements. The IBC section already has a sentence that references the wall bracing section.

These pictures are indicative of typical crawl-space construction in areas of minimal (e.g. 12 inch) frost depth.



Cost Impact: The code change proposal will decrease the cost of construction. This code proposal eliminates the requirement to apply sheathing (e.g. OSB, Plywood, etc.) to interior foundation cripple walls which commonly occur in shallow crawlspaces. Therefore, there is a savings on the material and labor costs to install the sheathing that is currently required in these code sections.

S184-19 Part I

PART I — IBC®: 2308.5.9, 2308.5.10; IFGC®: [BS] 302.3.3; IPC®: [BS] C101.2, [BS] C101.3

PART II — IRC®: R602.6

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Building Code

Revise as follows:

2308.5.9 Cutting and notching. In exterior walls and bearing partitions, ~~a wood studs are permitted to stud shall not~~ be cut or notched to a depth not exceeding 25 percent of the width of the stud. Cutting or notching of studs to a depth not greater than 40 percent of the width of the stud is permitted in nonbearing partitions not supporting in excess of 25 percent of its depth. In nonbearing partitions that do not support loads other than the weight of the partition, ~~a stud shall not be cut or notched in excess of 40 percent of its depth.~~

2308.5.10 Bored holes. ~~Bored holes not greater than~~ The diameter of bored holes in wood studs shall not exceed 40 percent of the stud width ~~are permitted to be bored in any wood stud. Bored holes not greater than~~ depth. The diameter of bored holes in wood studs shall not exceed 60 percent of the stud width ~~are permitted in nonbearing partitions or depth in nonbearing partitions. The diameter of bored holes in wood studs shall not exceed~~ 60 percent of the stud depth in any wall where each ~~bored~~ stud is doubled, provided that not more than two such successive doubled studs are so bored. The edge of ~~a the~~ bored hole shall not be ~~nearer~~ closer than 5/8 inch (15.9 mm) to the edge of the stud. Bored holes shall not be located at the same section of stud as a cut or notch.

2018 International Fuel Gas Code

[BS] 302.3.3 Stud cutting and notching. In exterior walls and bearing partitions, ~~any a wood stud is permitted to shall not~~ be cut or notched to a depth not exceeding in excess of 25 percent of its width. Cutting or notching of studs to a depth not greater than 40 percent of the width of the stud is permitted in nonload-bearing partitions supporting no loads other than the weight of the partition. ~~depth. In nonbearing partitions that do not support loads other than the weight of the partition, a stud shall not be cut or notched in excess of 40 percent of its depth.~~

2018 International Plumbing Code

[BS] C101.2 Stud cutting and notching. In exterior walls and bearing partitions, ~~any a wood stud is permitted to shall not~~ be cut or notched to a depth not exceeding in excess of 25 percent of its width. Cutting or notching of studs to a depth not greater than 40 percent of the width of the stud is permitted in nonbearing partitions supporting no ~~depth. In nonbearing partitions that do not support loads other than the weight of the partition.~~ partition, a stud shall not be cut or notched in excess of 40 percent of its depth.

[BS] C101.3 Bored holes. The diameter of bored holes in wood studs shall not exceed 40 percent of the stud depth. The diameter of bored holes in wood studs shall not exceed 60 percent of the stud depth in nonbearing partitions. The diameter of bored holes in wood studs shall not exceed 60 percent of the stud depth in any wall where each stud is doubled, provided that not more than two such successive doubled studs are so bored. The edge of the bored hole shall ~~be not be~~ closer than 5/8 inch (15.9 mm) to the edge of the stud. Bored holes shall be not located at the same section of stud as a cut or notch.

Proposal # 4065

S184-19 Part I

S184-19 Part II

IRC®: R602.6

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

R602.6 Drilling and notching of studs. Drilling and notching of studs shall be in accordance with the following:

1. Notching. ~~Any A stud in an exterior wall or bearing partition shall be permitted to not be cut or notched to a depth not exceeding 25 percent of its width- depth. Studs in nonbearing partitions shall be permitted to not be notched to a depth not to exceed exceeding 40 percent of a single stud width- depth.~~
2. Drilling. ~~Any stud shall be permitted to be bored or drilled, provided that the diameter of the resulting hole is not more than 60 Boring. The diameter of bored holes in studs shall not exceed 60 percent of the stud width depth, the edge of the hole is shall not more be less than 5/8 inch (16 mm) to from the edge of the stud, and the hole is shall not be located in the same section as a cut or notch. Studs Where the diameter of a bored hole in a stud located in exterior walls or bearing partitions drilled is over 40 percent and up to 60 percent such stud shall be doubled with and not more than two successive doubled studs shall be so bored. See Figures R602.6(1) and R602.6(2).~~

Exception: ~~Use of Where approved stud shoes is permitted where they are installed in accordance with the manufacturer's recommendations- instructions.~~

Reason: The current text uses the word width, when actually it is the depth that is meant. The depth of a stud is the plane in which a hole is bored. Holes are not bored in the width (1 ½ inches) of a stud. This revision also gets rid of unenforceable permissive language. The current text says that any stud is permitted to be notched to a depth not exceeding 25%. This is stating a permitted limit; not a mandatory limit. A highway speed limit is not permitted to be 55 miles per hour, rather it is an absolute limit of 55. If the stud is permitted to be notched to not exceed 25%, then it also permitted to be notched to not exceed other percentages. Lastly, this proposal corrects a flaw where the text said that the edge of the hole cannot be more than 5/8 inch to the edge of the stud. The intent is exactly the opposite. The edge of the hole must not be less than 5/8 inch to the edge of the stud. This language currently exists in the IMC. Similar changes are being proposed in the IBC, IFGC and IPC to coordinate the terms between I-codes. This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/building-code-action-committee-bcac/>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal will not increase the cost of construction as it is a clarification of terms and current requirements only.

Proposal # 4118

S184-19 Part II

S185-19

IBC®: 2308.6.6.2

Proponent: Kelly Cobeen, Wiss Janney Elstner Associates, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (KCobeen@wje.com); Julie Furr, Rimkus Consulting Group, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (jfurr@rimkus.com); Michael Mahoney, representing Federal Emergency Management Agency (mike.mahoney@fema.dhs.gov)

2018 International Building Code

Revise as follows:

2308.6.6.2 Cripple wall bracing in Seismic Design Categories D and E. For the purposes of this section, cripple walls in *Seismic Design Categories D and E* ~~having shall not have~~ a stud height exceeding 14 inches (356 mm) ~~shall be considered to be a story and~~ and studs shall be braced solid blocked in accordance with Table 2308.6.1. ~~Where interior braced wall lines occur without a continuous foundation below, the length of parallel exterior cripple wall bracing shall be one and one-half times the lengths required by Table 2308.6.1. Where the cripple wall sheathing type used is Method WSP or DWB and this additional length of bracing cannot be provided, the capacity of WSP or DWB sheathing shall be increased by reducing the spacing of fasteners along the perimeter of each piece of sheathing to 4 inches (102 mm) on center. Section 2308.5.6 for the full dwelling perimeter and for the full length of interior braced walls lines supported on foundations, excepting ventilation and access openings.~~

Reason: This change proposal makes clear the restrictions already imposed by Section 2308.6.6.2 and Table 2308.6.1 by deleting unnecessary and contradictory language. Permitted in SDC D and E are one-story buildings with slab on grade construction and one-story buildings over solid blocked cripple walls, with studs 14 inches or less in height. IBC Section 2308 provisions do not allow for prescriptive bracing of cripple walls in Seismic Design Categories D and E. This is because Table 2308.6.1 is limited to one-story buildings and cripple walls over 14 inches in height are considered an additional story, turning a one-story building over cripple walls into a prohibited two-story building. Language is added clarifying the extent of solid blocking of the studs as the solid blocking will be providing seismic and wind bracing.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal is an editorial clarification of current provisions and does not have any cost impact.

Proposal # 4576

S185-19

S186-19

IBC: TABLE 2308.6.3(1)

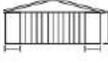
Proponent: Rick Allen, representing International Staple, Nail and Tool Association (rallen@isanta.org)

2018 International Building Code

Revise as follows:

**TABLE 2308.6.3(1)
BRACING METHODS**

Portions of table not shown remain unchanged.

METHODS, MATERIAL	MINIMUM THICKNESS	FIGURE	CONNECTION CRITERIA ^a	
			Fasteners	Spacing
PCP Portland cement plaster	Section 2510 to studs at maximum of 16" o.c.		1 1/2" long, 11 gage, 0.120" dia., 7/16" dia. head nails or 7/8" long, 16 gage staples	6" o.c. on all framing members

For SI: 1 foot = 304.8 mm, 1 degree = 0.01745 rad.

- a. Method LIB shall have gypsum board fastened to one or more side(s) with nails or screws

Reason: ASTM F1667-18 requires that when gage is used as a diameter for nails, a decimal equivalent must also be shown. This requirement was put in place because of the multiple and conflicting wire gage tables that are used in the manufacturing of nails.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal will not change the cost of production. It only provides clarification required by ASTM F1667-18

Proposal # 4084

S186-19

S187-19

IBC®: TABLE 2308.7.3.1

Proponent: Dennis Richardson, American Wood Council, representing American Wood Council (drichardson@awc.org); Philip Line (pline@awc.org)

2018 International Building Code

Revise as follows:

TABLE 2308.7.3.1
RAFTER TIE CONNECTIONS ^{a, d}

RAFTER-SLOPE	TIE SPACING (inches)	NO SNOW LOAD		GROUND SNOW LOAD (pound per square foot)											
						30 pounds per square foot					50 pounds per square foot				
		Roof span (feet)													
		12	20	28	36	12	20	28	36	12	20	28	36		
Required number of 16d common (3 ¹ / ₂ " x 0.162") nails ^{a, b} per connection ^{c, d, e, f}															
3:12	12	4	6	8	10	4	6	8	11	5	8	12	15		
	16	5	7	10	13	5	8	11	14	6	11	15	20		
	24	7	11	15	19	7	11	16	21	9	16	23	30		
	32	10	14	19	25	10	16	22	28	12	27	30	40		
	48	14	21	29	37	14	32	36	42	18	32	46	60		
4:12	12	3	4	5	6	3	5	6	8	4	6	9	11		
	16	3	5	7	8	4	6	8	11	5	8	12	15		
	24	4	7	10	12	5	9	12	16	7	12	17	22		
	32	6	9	13	16	8	12	16	22	10	16	24	30		
	48	8	14	19	24	10	18	24	32	14	24	34	44		
5:12	12	3	3	4	5	3	4	5	7	3	5	7	9		
	16	3	4	5	7	3	5	7	9	4	7	9	12		
	24	4	6	8	10	4	7	10	13	6	10	14	18		
	32	5	8	10	13	6	10	14	18	8	14	18	24		
	48	7	11	15	20	8	14	20	26	12	20	28	36		
7:12	12	3	3	3	4	3	3	4	5	3	4	5	7		
	16	3	3	4	5	3	4	5	6	3	5	7	9		
	24	3	4	6	7	3	5	7	9	4	7	10	13		
	32	4	6	8	10	4	8	10	12	6	10	14	18		
	48	5	8	11	14	6	10	14	18	9	14	20	26		
9:12	12	3	3	3	3	3	3	3	4	3	3	4	5		
	16	3	3	3	4	3	3	4	5	3	4	5	7		
	24	3	3	5	6	3	4	6	7	3	6	8	10		
	32	3	4	6	8	4	6	8	10	5	8	10	14		
	48	4	6	9	11	5	8	12	14	7	12	16	20		
12:12	12	3	3	3	3	3	3	3	3	3	3	3	4		
	16	3	3	3	3	3	3	3	4	3	3	4	5		
	24	3	3	3	4	3	3	4	6	3	4	6	8		
	32	3	3	4	5	3	5	6	8	4	6	8	10		
	48	3	4	6	7	4	7	8	12	6	8	12	16		

RAFTER SLOPE	TIE SPACING (inches)	NO SNOW LOAD ^a		GROUND SNOW LOAD (pound per square foot)						
				30 pounds per square foot			50 pounds per square foot			
		Roof span (feet)								
		12	24	36	12	24	36	12	24	36
Required number of 16d common (3-1/2" x 0.162") nails per connection ^{a,b,c,d,e,f,h}										
3:12	12	3	5	8	3	6	9	5	9	13
	16	4	7	10	4	8	12	6	12	17
	19.2	4	8	12	5	10	14	7	14	21
	24	5	10	15	6	12	18	9	17	26
	32	7	13	20	8	16	24	12	23	34
	48	10	20	29	12	24	35	17	34	51
4:12	12	3	4	6	3	5	7	4	7	10
	16	3	5	8	3	6	9	5	9	13
	19.2	3	6	9	4	7	11	6	11	16
	24	4	8	11	5	9	13	7	13	19
	32	5	10	15	6	12	18	9	17	26
	48	8	15	22	9	18	26	13	26	38
5:12	12	3	3	5	3	4	6	3	6	8
	16	3	4	6	3	5	7	4	7	11
	19.2	3	5	7	3	6	9	5	9	13
	24	3	6	9	4	7	11	6	11	16
	32	4	8	12	5	10	14	7	14	21
	48	6	12	18	7	14	21	11	21	31
7:12	12	3	3	4	3	3	4	3	4	6
	16	3	3	5	3	4	5	3	5	8
	19.2	3	4	5	3	4	6	3	6	9
	24	3	5	7	3	5	8	4	8	11
	32	3	6	9	4	7	10	5	10	15
	48	5	9	13	5	10	15	8	15	22
9:12	12	3	3	3	3	3	3	3	3	5
	16	3	3	4	3	3	4	3	4	6
	19.2	3	3	4	3	4	5	3	5	7
	24	3	4	5	3	4	6	3	6	9
	32	3	5	7	3	6	8	4	8	12
	48	4	7	10	4	8	12	6	12	17
12:12	12	3	3	3	3	3	3	3	3	4
	16	3	3	3	3	3	3	3	3	5
	19.2	3	3	3	3	3	4	3	4	6
	24	3	3	4	3	3	5	3	5	7
	32	3	4	5	3	4	6	3	6	9
	48	3	5	8	3	6	9	5	9	13

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 47.8 N/m².

a. 40d box (5" x 0.162") or 16d sinker (3 1/4" x 0.148") nails are 10d common (3" x 0.148") nails shall be permitted to be substituted for 16d common (3 1/2" x 0.162") nails where the required number of nails is taken as 1.2 times the required number of 16d common nails.

b. Nailing requirements are permitted to be reduced 25 percent if nails are clinche

e.b. Rafter tie heel joint connections are not required where the ridge is supported by a load-bearing wall, header or ridge beam.

e.c. Where intermediate support of the rafter is provided by vertical struts or purlins to a load-bearing wall, the tabulated heel joint connection requirements are permitted to be reduced proportionally to the reduction in span.

e.d. Equivalent nailing patterns are required for ceiling joist to ceiling joist lap splices.

e.e. Connected members shall be of sufficient size to prevent splitting due to nailing.

e.f. For snow loads less than 30 pounds per square foot, the required number of nails is permitted to be reduced by multiplying by the ratio of actual snow load plus 10 divided by 40, but not less than the number required for no snow load.

e.g. Applies to roof live load of 20 psf or less.

e.h. Tabulated heel joint connection requirements assume that ceiling joists or rafter ties are located at the bottom of the attic space. Where ceiling joists or rafter ties are located higher in the attic, heel joint connection requirements shall be increased by the following factors:

H_C/H_R	Heel Joint Connection Adjustment Factor
1/3	1.5
1/4	1.33
1/5	1.25
1/6	1.2
1/10 or less	1.11

where:

H_C = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls.

H_R = Height of roof ridge measured vertically above the top of the rafter support walls.

i. Tabulated requirements are based on 10 psf roof dead load in combination with the specified roof snow load and roof live load.

Reason: Replace Table 2308.7.3.1 to be consistent with calculation basis of 2018 Wood Frame Construction Manual (WFCM) heel joint nailing requirements based on the 2018 National Design Specification for Wood Construction (NDS) provisions for nailed connections. The reduced number of 16d common nails required in rafter tie connections, by approximately 15%, are due to changes in penetration factor and load duration assumptions from those used to develop the existing table. The existing table used a 0.77 penetration factor (based on 1991 and 1997 NDS) for 16d common nails with less than 12d penetration in the main member and a load duration factor of 1.25 for all tabulated cells. The proposed revised nailing requirements are based on use of a 1.15 load duration factor for snow cases, 1.25 load duration factor for roof live load cases, and an effective penetration factor equal to 1.0 per 2001 NDS and later editions when nail lateral value calculations are based on the actual penetration in the wood member. The ratio of nail design values for snow cases originally used to develop nailing requirements to the current nail design values for snow cases is $(Z \times 0.77 \times 1.25)/(Z \times 1.0 \times 1.15) = 0.84$ and explains the reduced number of nails required by this proposal. Due to revised nail design provisions in the NDS, the benefit of a longer nail that is clinched is no longer recognized for this application and existing footnote b is removed. A 10d common nail option is added in new footnote "a." based on NDS lateral nail calculations. The table heading clarifies the 10psf dead load basis of the tabulated nailing requirements. Also, adjustment factors for rafter tie height, consistent with WFCM and IRC, are added in footnote "h." to increase connection requirements where the rafter tie not located in the bottom of the attic space (i.e. rafter ties located at the top of the support walls).

Bibliography: 1) 2018 Wood Frame Construction Manual (WFCM) for One- and Two-Family Dwellings. American Wood Council, Leesburg, VA. 2018. <https://awc.org/pdf/codes-standards/publications/wfcm/AWC-WFCM2018-ViewOnly-1711.pdf>
2) 2018 National Design Specification (NDS) for Wood Construction. American Wood Council, Leesburg, VA. 2018. <https://awc.org/pdf/codes-standards/publications/nds/AWC-NDS2018-ViewOnly-171117.pdf>

Cost Impact: The code change proposal will decrease the cost of construction
This code change proposal utilizes fewer nails from the wood frame construction manual at less cost.

S188-19

IBC®: 2401.1 (New)

Proponent: Mike Fischer, Kellen Company, representing The Plastic Glazing Coalition of the American Chemistry Council
(mfischer@kellencompany.com)

2018 International Building Code

Revise as follows:

2401.1 Scope. The provisions of this chapter shall govern the materials, design, construction and quality of glass, light-transmitting ceramic and light-transmitting plastic panels for exterior and interior use in both vertical and sloped applications in buildings and structures. Light-transmitting plastic glazing shall also meet the applicable requirements of Chapter 26.

Reason: While Chapter 24 is titled Glass and Glazing, it specifically includes provisions for plastics in skylights and sloped glazing as well as other uses of light-transmitting plastics. Chapter 24 includes no "materials" section as some other IBC chapters do. Adding a reference to the additional requirements of Chapter 26 connects these chapters to ensure all the provisions are recognized.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The proposal is editorial and makes no technical changes to the code.

Proposal # 2043

S188-19

S189-19

IBC@: 2403.3

Proponent: Tom Zaremba, representing Glazing Industry Code Committee (GICC), a section of the National Glass Association (NGA) (tzaremba@ralaw.com)

2018 International Building Code

Revise as follows:

2403.3 Glass Framing. To be considered firmly supported, the framing members for each individual pane of glass shall be designed so that the deflection of the edge of the glass perpendicular to the glass pane shall not exceed $1/175$ of the glass edge length or $3/4$ inch where the glass edge length is not more than 13 feet 6 inches (4115 mm) or $1/240 + 1/4$ inch (6.4 mm), whichever is less where the glass edge length is greater than 13 feet 6 inches (4115 mm), when subjected to the larger of the positive or negative load where loads are combined as specified in Section 1605.

Reason: Permissible framing deflection is addressed in sections 1604.3.7 and 2403.3 of the IBC. Section 1604.3.7 was modified in the last code development cycle and now provides:

"**1604.3.7. Framing supporting glass.** the deflection of framing members supporting glass subjected to 0.6 times the 'component and cladding' wind loads shall not exceed either of the following:

"1. $1/175$ of the length of span of the framing member, for framing members having a length not more than 13 feet 6 inches (4115 mm).

"2. $1/240$ of the length of span of the framing member + $1/4$ inch (6.4 mm), for framing members having a length greater than 13 feet six inches (4115 mm)."

This proposal updates section 2403.3 to make it consistent with section 1604.3.7. It also deletes the reference to a $3/4$ inch framing deflection from section 2403.3 since it is technically correct only for shorter glass spans and leaving it in would make section 2403.3 inconsistent with section 1604.3.7.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposed change makes section 2403.3 of the IBC consistent with section 1604.3.7. Making these IBC sections consistent will not increase or decrease the cost of construction.

Proposal # 4638

S189-19

S190-19

IBC: 2405.1, 2405.3, 2405.3.1 (New), 2405.3.2 (New), 2405.3.3 (New)

Proponent: Jennifer Hatfield, representing American Architectural Manufacturers Association (jen@jhatfieldandassociates.com)

2018 International Building Code

Revise as follows:

2405.1 Scope. This section applies to the installation of glass and other transparent, translucent or opaque glazing material installed at a slope of more than 15 degrees (0.26 rad) from the vertical plane, including glazing materials in skylights, roofs and sloped walls.

2405.3 Screening. ~~Where used in monolithic glazing systems, heat-strengthened and fully tempered glass shall have screens installed below the glazing material. The screens and their fastenings~~ Broken glass retention screens, where required, shall be: capable of supporting twice the weight of the glazing; firmly and substantially fastened to the framing members; and installed within 4 inches (102 mm) of the glass. The screens shall be constructed of a noncombustible material not thinner than No. 12 B&S gage (0.0808 inch) with mesh not larger than 1 inch by 1 inch (25 mm by 25 mm). In a corrosive atmosphere, structurally equivalent noncorrosive screen materials shall be used. ~~Heat-strengthened glass, fully tempered glass and wired glass, where used in multiple-layer glazing systems as the bottom glass layer over the walking surface, shall be equipped with screening that conforms to the requirements for monolithic glazing systems.~~

Exception: In monolithic and multiple-layer sloped glazing systems, the following applies:

1. ~~Fully tempered glass installed without protective screens where glazed between intervening floors at a slope of 30 degrees (0.52 rad) or less from the vertical plane shall have the highest point of the glass 10 feet (3048 mm) or less above the walking surface.~~
2. ~~Screens are not required below any glazing material, including annealed glass, where the walking surface below the glazing material is permanently protected from the risk of falling glass or the area below the glazing material is not a walking surface.~~
3. ~~Any glazing material, including annealed glass, is permitted to be installed without screens in the sloped glazing systems of commercial or detached noncombustible greenhouses used exclusively for growing plants and not open to the public, provided that the height of the greenhouse at the ridge does not exceed 30 feet (9144 mm) above grade.~~
4. ~~Screens shall not be required in individual dwelling units in Groups R-2, R-3 and R-4 where fully tempered glass is used as single glazing or as both panes in an insulating glass unit, and the following conditions are met:~~
 - 4.1. ~~Each pane of the glass is 16 square feet (1.5 m²) or less in area.~~
 - 4.2. ~~The highest point of the glass is 12 feet (3658 mm) or less above any walking surface or other accessible area.~~
 - 4.3. ~~The glass thickness is $\frac{3}{16}$ inch (4.8 mm) or less.~~
5. ~~Screens shall not be required for laminated glass with a 15-mil (0.38 mm) polyvinyl butyral (or equivalent) interlayer used in individual dwelling units in Groups R-2, R-3 and R-4 within the following limits:~~
 - 5.1. ~~Each pane of glass is 16 square feet (1.5 m²) or less in area.~~
 - 5.2. ~~The highest point of the glass is 12 feet (3658 mm) or less above a walking surface or other accessible area.~~

Add new text as follows:

2405.3.1 Screens under monolithic glazing. Heat-strengthened glass, annealed glass, wired glass and fully tempered glass shall have screens installed below the full area of the glazing material.

2405.3.2 Screens under multiple-layer glazing. Heat-strengthened glass, fully tempered glass, annealed glass and wired glass, glazing used as the bottom glass layer, shall have retention screens installed below the full area of the glazing material.

2405.3.3 Screens not required. For all other types of glazing complying with Section 2405.2, retention screens shall not be required.

Exception: In monolithic and multiple-layer sloped glazing systems, the following apply; which includes laminated glass with a 30-mil interlayer.

1. Fully tempered glass shall not be required to be installed with retention screens where glazed between intervening floors at a slope of 30 degrees (0.52 rad) or less from the vertical plane, and having the highest point of the glass 10 feet (3048 mm) or less above the walking surface.
2. Retention screens shall not be required below any glazing material, including annealed glass, where the walking surface below the glazing material is permanently protected from the risk of falling glass or the area below the glazing material is not a walking surface.
3. Retention screens shall not be required below any glazing material, including annealed glass, the sloped glazing systems of commercial or detached noncombustible greenhouses used exclusively for growing plants and not open to the public, provided

- that the height of the greenhouse at the ridge does not exceed 30 feet (9144 mm) above grade.
4. Retention screens shall not be required in individual dwelling units in Groups R-2, R-3 and R-4 where fully tempered glass is used as single glazing or as both panes in an insulating glass unit, and all of the following conditions are met:
 - 4.1. Each pane of the glass is 16 square feet (1.5 m²) or less in area.
 - 4.2. The highest point of the glass is 12 feet (3658 mm) or less above any walking surface or other accessible area.
 - 4.3. The glass thickness is 3/16 inch (4.8 mm) or less.
 5. Retention screens shall not be required for laminated glass with a 15-mil (0.38 mm) polyvinyl butyral (or equivalent) interlayer used in individual dwelling units in Groups R-2, R-3 and R-4, and both of the following conditions are met:
 - 5.1. Each pane of glass is 16 square feet (1.5 m²) or less in area.
 - 5.2. The highest point of the glass is 12 feet (3658 mm) or less above a walking surface or other accessible area.

Reason: The current code language that states when screens are required below unit skylights and sloped glazing, has frequently been difficult to interpret by jurisdictions, causing consumers and others great concern when they are incorrectly told they need to install a glass retention screen below conforming (30-mil interlayer) laminated glass. Skylight and sloped glazing system manufacturers are asked to intervene far too frequently to ensure that unsightly, unnecessary screens are not installed in these instances. Furthermore, it is believed that many times an optional skylight installation is removed from submitted plans due to misinterpretation at the plan check stage, where the supplier may never know that the issue was raised because the permit applicant may surrender rather than appeal.

The current code language addresses qualifying laminated glass by simple omission from the "screens required" section. It is this omission that seems to create the confusion within the industry, especially considering Exception 5, which mentions that screens may be required when non-qualifying (15-mil interlayer) laminated glass is used.

This proposed code change simply rewrites this section to state clearly that laminated glass with 30-mil interlayer does not require screens. Specifically addressing the inapplicability of screens under laminated glass in the new section 2405.3.3 should reduce the frequency of misinterpretations that have been experienced. Adding the modifier, "broken glass retention" fully describes the screen's purpose. This is to ensure readers do not confuse them with insect screens or fall protection screens, which are physically different and will not serve as effective retention screens.

None of the proposed changes affect the current code requirements; rather, the intent and only expected outcomes of this proposal are simply for better clarity and more consistent enforcement.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposal should have a nominal effect on the cost of construction as the changes presented are not meant to alter the current requirements but simply meant to provide better clarity and more consistent enforcement.

Proposal # 5252

S190-19

S191-19

IBC®: 2405.2

Proponent: Jennifer Hatfield, representing American Architectural Manufacturers Association (jen@jhatfieldandassociates.com)

2018 International Building Code

Revise as follows:

2405.2 Allowable glazing materials and limitations. Sloped glazing shall be any of the following materials, subject to the listed limitations.

1. For monolithic glazing systems, the glazing material of the single light or layer shall be laminated glass with a minimum 30-mil (0.76 mm) polyvinyl butyral (or equivalent) interlayer, wired glass, light-transmitting plastic materials meeting the requirements of Section 2607, heat-strengthened glass or fully tempered glass.
2. For multiple-layer glazing systems, each light or layer shall consist of any of the glazing materials specified in Item 1.

Annealed glass is permitted to be used as specified in Exceptions 2 and 3 of Section 2405.3.

For additional requirements for plastic skylights, see Section 2610.

~~Glass block construction shall conform to the requirements of Section 2110.1.~~

Reason: The removal of the reference in Section 2405.2 to the "Glass block" section is suggested as it removes a non-germane statement. That section contains no provisions that would apply on roofs or sloped walls, and Section 2405 offers no guidance on the use or protections needed for glass block. The reference is out of place here and should be removed. Perhaps there is a better section in Chapter 24 for it to appear, if it is needed at all.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This change will not have an effect on cost as it is not removing the requirements in Section 2110 but just removing the reference that is not germane within Section 2405.

Proposal # 5377

S191-19

S192-19

IBC®: 2407.1, 2407.1.1, 2407.1.2, 2407.1.3, 2407.1.4, 2407.1.4.1, 2407.1.4.2

Proponent: Tom Zaremba, representing Glazing Industry Code Committee (GICC), a section of the National Glass Association (NGA) (tzaremba@ralaw.com)

2018 International Building Code

Revise as follows:

2407.1 Materials. Glass used in a handrail or a *guard* shall be laminated glass constructed of fully tempered or heat-strengthened glass and shall comply with Category II ~~or of~~ CPSC 16 CFR Part 1201 or Class A of ANSI Z97.1. Glazing in ~~railing in-fill panels a handrail or a guard~~ shall be of an *approved* safety glazing material that conforms to the provisions of Section 2406.1.1. For all glazing types, the minimum nominal thickness shall be 1/4 inch (6.4 mm).

Exception: Single fully tempered glass complying with Category II of CPSC 16 CFR Part 1201 or Class A of ANSI Z97.1 shall be permitted to be used in handrails and ~~guardrails~~ *guards* where there is no walking surface beneath them or the walking surface is permanently protected from the risk of falling glass.

2407.1.1 Loads. ~~The panels~~ Glass handrails and *guards* and their support system shall be designed to withstand the loads specified in Section 1607.8. Glass ~~guard elements~~ *handrails and guards* shall be designed using a factor of safety of four.

2407.1.2 Structural Guards with structural glass baluster panels. Guards with structural glass ~~baluster panels~~ *balusters* shall be installed with an attached top rail or handrail. The top rail or handrail shall be supported by not fewer than three glass ~~baluster panels~~ *balusters*, or shall be otherwise supported to remain in place should one glass baluster ~~panel~~ fail.

Exception: An attached top rail or handrail is not required where the glass ~~baluster panels~~ *balusters* are laminated glass with two or more glass plies of equal thickness and of the same glass type. The ~~panels~~ *balusters* shall be tested to remain in place as a barrier following impact or glass breakage in accordance with ASTM E2353.

2407.1.3 Parking garages. Glazing materials shall not be installed in handrails or *guards* in parking garages except for pedestrian areas not exposed to impact from vehicles.

2407.1.4 Glazing in windborne debris regions. Glazing installed in ~~in-fill panels exterior handrails or balusters~~ *guards in windborne debris regions* shall ~~comply with the following:~~ be laminated glass complying with Category II of CPSC 16 CFR 1201 or Class A of ANSI Z97.1. Where the top rail is supported by glass, the assembly shall be tested according to the impact requirements of Section 1609.2 and the top rail shall remain in place after impact.

Delete without substitution:

2407.1.4.1 Balusters and in-fill panels. Glass installed in exterior railing in-fill panels or balusters shall be laminated glass complying with Category II of CPSC 16 CFR Part 1201 or Class A of ANSI Z97.1.

2407.1.4.2 Glass supporting top rail. ~~Where the top rail is supported by glass, the assembly shall be tested according to the impact requirements of Section 1609.2. The top rail shall remain in place after impact.~~

Reason: Changes made in this proposal are not intended to alter any substantive requirements of section 2407. Instead, it is intended to simplify, clarify and make the language of section 2407 consistent with IBC's defined terms.

As written, section 2407 uses a number of undefined terms, such as "panels," "in-fill panels," and "guardrails" that are actually comprehended within, and are replaced in this proposal with, the defined term "guard." A "guard" is defined in IBC section 202 as follows:

"GUARD. A building component or a system of building components located at or near the open sides of elevated walking surfaces that minimizes the possibility of a fall from the walking surface to a lower level."

It is also important to note that the term "handrail" is defined in section 202 of the IBC as follows:

"HANDRAIL. A horizontal or sloping rail intended for grasping by the hand for guidance or support."

Some terms used in section 2407, such as "panels" and "railing in fill panels" are used incorrectly as they should actually refer to both "handrails" and "guards." Where multiple defined terms are intended, they are replaced using those defined terms.

Finally, modifications to section 2407.1.4, including the deletion of subsections 2407.1.4.1 and 2407.1.4.2, are a simplification. All substantive requirements of the deleted subsections are incorporated into 2407.1.4, the main provision that addresses glazing used in windborne debris regions.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposed changes do not change any substantive requirement of section 2407. They are intended merely to simplify, clarify and make the terminology used in section 2407 consistent with defined terms in the code. These changes will not increase or decrease the cost of construction.

Proposal # 4722

S192-19

S193-19

IBC®: 2407.1.1 (New)

Proponent: Anthony Barnes, Trex Commercial Products, representing self (tbarnes@trexcommercial.com); Bryan Wedan, Enclos, representing self

2018 International Building Code

Revise as follows:

2407.1.1 Loads. The ~~glass panels and their support system~~ shall be designed to withstand the loads specified in Section 1607.8. Glass ~~guard elements panels~~ shall be designed using a factor of safety of four ~~applied to the modulus of rupture~~.

Reason: Allowable glass stress is traditionally determined by probabilistic methods (ASTM E1300) given particular load durations. The allowable stress decreases with a longer duration load (thus the factor of safety increases). Therefore the allowable stress calculated per ASTM E1300 effectively contains a factor of safety. This appears to be the intent of section 2407.1.1 and the code commentary does suggest this (see attachments) as it mentions probability of glass breakage and that 4x the load is not to be applied to a railing system. The factor of safety of four should only be applied to glass. All other components supporting glass should be designed using the factors of safety provided in relevant material codes (AISC 360 for steel, etc.). All other glass systems such as skylights and walls are designed in the same manner and carry no less risk than guards.

There are also inconsistencies and ambiguities with the current code language. The factor of safety does not define which supports the factor of safety of 4 is to be applied to (loads must be transferred to ground, so where does glass support end?). The language is inconsistent in that other railing types are not designed with the same factor of safety of 4 even though failure modes could be similar. For example, a factor of safety of 4 may be applied to a steel post-supported glass infill railing system, but if a steel mesh panel infill is substituted for the glass, this panel and its supports would be designed with lower factors of safety per the relevant material codes and thus failure modes (including panels falling out of supports catastrophically) would occur at much lower loads.

In summary, changing this language removes ambiguity, makes guard design more consistent with other similar systems, and saves money by lowering factors of safety for supports (to those that are used by the relevant material codes).

Cost Impact: The code change proposal will decrease the cost of construction

Glass is already designed with factor of safety of 4 per 2407.1.1 so no change there. Factor of safety for steel, stainless steel, aluminum and concrete supports will be per relevant material codes and those factors are generally less than 4 (less costly) and are familiar to designers (less costly).

Proposal # 1864

S193-19

S194-19

IBC®: 2510.6

Proponent: Craig Conner, representing self (craig.conner@mac.com); Joseph Lstiburek, representing self (joe@buildingscience.com)

2018 International Building Code

Revise as follows:

2510.6 Water-resistive barriers. *Water-resistive barriers* shall be installed as required in Section 1403.2 and, where applied over wood-based sheathing, shall include a water-resistive ~~vapor-permeable~~ barrier with a performance water resistance at least equivalent to two layers of *water-resistive barrier* complying with ASTM E2556, Type I. The individual layers shall be installed independently such that each layer provides a separate continuous plane and any flashing (installed in accordance with Section 1404.4) intended to drain to the *water-resistive barrier* is directed between the layers.

Exceptions:

1. Where the water-resistive barrier that is applied over wood-based sheathing has a water resistance equal to or greater than that of a water-resistive barrier complying with ASTM E2556, Type I, and is separated from the stucco by an intervening ~~substantially nonwater-absorbing layer or drainage foam plastic insulating sheathing layer or by a minimum 3/16 inch space.~~
2. Where the *water-resistive barrier* is applied over wood-based sheathing in ~~Climate Zone 1A, 2A or 3A, a ventilated air~~ where the annual mean rainfall as determined by the National Oceanic and Atmospheric Administration (NOAA) exceeds 20 inches, a minimum 3/16 inch space shall be provided between the stucco and *water-resistive barrier*.

Reason: Objective:

1. Define water resistance as the primary functional requirement of the WRB and remove reference to vapor permeable.
2. Enable a single layer of WRB complying with ASTM E2556 Type 1 with a drainage space.
3. Define depth drainage space.

The existing code language gives insufficient guidance for other approved materials. The added language addresses this issue and provides a specific performance requirement for water resistance and provides consistency with other sections of the code that relate specifically to water resistive barriers.

The size of the drainage space needs to be specified. Type 1 is the appropriate water-resistive metric for the specified space. This logic is consistent with the body and intent of the text of Section 2510.6. The specified space and one layer of Type 1 provides equivalent performance to the two layers of Type 1 specified in the body of 2510.6.

Annual mean rainfall is the appropriate metric for risk not humidity.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This change gives better guidance for water-resistance.

Proposal # 5419

S194-19

S195-19

IBC: 2510.6, TABLE 2510.6 (New), 202 (New), ASTM Chapter 35 (New)

Proponent: Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council

2018 International Building Code

Add new definition as follows:

BOND BREAK: A substantially nonwater-absorbing layer placed directly behind stucco to prevent adhesion of the stucco to the surface of the water-resistive barrier, to serve as a protective layer over the water-resistive barrier, to provide a capillary break, and to promote drainage as required.

DRAINAGE SPACE: A separation between cladding and the surface of a water-resistive barrier created by a furred gap, channels, a porous material or matrix, or by other means to provide drainage of water downward to an outlet.

VENTILATED DRAINAGE SPACE: A drainage space that further incorporates the capability to allow outdoor air flow into and back out of the space behind cladding, usually by way of high and low vent inlets and outlets or by way of an air permeable (vented) cladding.

Revise as follows:

2510.6 Water-resistive barriers. *Water-resistive barriers* shall be installed as required in Section 1403.2 and, where applied over wood-based sheathing, shall include ~~a water-resistive vapor-permeable barrier with a performance at least equivalent to two layers of water-resistive barrier complying with ASTM E2556, Type I. The individual~~ the installation shall comply with Table 2510.6. ~~The individual water-resistive barrier and bond break material~~ layers shall be installed independently such that each layer provides a separate continuous plane and any flashing (installed in accordance with Section 1404.4) intended to drain to the water-resistive barrier is directed between the layers.

Exceptions:

1. Where the *water-resistive barrier* that is applied over wood-based sheathing has a water resistance equal to or greater than that of a *water-resistive barrier* complying with ASTM E2556, Type II and is separated from the stucco by an intervening, substantially nonwater-absorbing layer or drainage space.
2. Where the *water-resistive barrier* is applied over wood-based sheathing in Climate Zone 1A, 2A or 3A, a ventilated air space shall be provided between the stucco and *water-resistive barrier*.

Add new text as follows:

TABLE 2510.6

WATER-RESISTIVE BARRIER, BOND BREAK, DRAINAGE, AND VENTILATION REQUIREMENTS FOR EXTERIOR PLASTER (STUCCO)

CLIMATE ZONE	WATER-RESISTIVE BARRIER	BOND BREAK LAYER	DRAINAGE SPACE	VENTILATED DRAINAGE SPACE
APPLICATION: STUCCO OVER ANY SUBSTRATE OTHER THAN WOOD-BASED SHEATHING				
All Climate Zones	Required	Not Required	Not Required	Not Required
APPLICATION: STUCCO OVER WOOD-BASED SHEATHING				
Dry (B)	Required ^a	Required	Not Required	Not Required
Moist (A) and Marine (C), except Warm-Humid	Required ^b	Required	Required ^c	Not Required
Warm-Humid	Required ^b	Required	Required ^{d,e}	

a. Water-resistive barrier complying with Section 1403.2 shall be 10-minute Grade D paper or have a water resistance equal to or greater than one layer of water-resistive barrier complying with ASTM E2556, Type I.

b. Water-resistive barrier complying with Section 1403.2 shall be 60-minute Grade D paper or have a water resistance equal to or greater than one layer of water-resistive barrier complying with ASTM E2556, Type II.

c. Drainage space shall be minimum 1/8-inch (3.2 mm) depth or have a minimum drainage efficiency of 90% as measured in accordance with ASTM E2273 or Annex A2 of ASTM E2925.

d. Ventilated drainage space shall be minimum 3/16-inch (4.8 mm) depth and, where not a clear airspace, have a minimum drainage efficiency of 90% as measured in accordance with ASTM E2273 or Annex A2 of ASTM E2925.

e. Where foam plastic insulating sheathing complying with ASTM C578 or ASTM C1289 is located between the stucco and wood-based sheathing with a drainage space in accordance with footnote 'c', a ventilated drainage space is not required.

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken PA 19428-2959

E2925-17: Standard Specification for Manufactured Polymeric Drainage and Ventilation Materials Used to Provide a Rainscreen Function

Reason: The current minimum requirements for installation of stucco over wood-based sheathing are confusing and also problematic in that they are predominantly aimed at practices that have been successful mainly in drying climates. In more moist climates, these minimum stucco installation requirements, particularly in regard to the WRB layer and lack of sufficient drainage or ventilation or hygric redistribution, has resulted in or contributed to numerous moisture-related problems.

Given the above concerns, this proposal achieves the following:

- 1) First, it **re-formats** the provisions into an easy-to-use tabulated ("look up" table) format as shown in proposed Table 2510.6. This will make it much easier to identify the various installation practices (including those also currently permitted in the code).
- 2) Second, it **clarifies** much of the confusion or ambiguity in this section of code. This is done through definitions and terminology that reflect the primary purpose of various features or materials that are important to an overall stucco installation and proper functioning of the WRB layer. This has also allowed the exceptions to be deleted since they are now incorporated more appropriately within the requirements of Table 2510.6 and the added definition of a "bond break" (replacing current use of "nonwater absorbing layer" is consistent with the intent of the existing exception #1 as explained in the reason statement to proposal S93-03/04 which brought the exception into the 2006 code).
- 3) Third, it provides **enhanced moisture control practices only where needed** for the moist (rainy) and hot/humid climates where rainwater management (drainage) and also ventilation (drying) or hygric redistribution become more important, particularly when used over wood-based sheathing. Thus, these provisions add the enhancements only where needed and only where stucco is used over wood sheathing which is susceptible to moisture (following the current approach to single-out special requirements for application over wood-based sheathing). It does not change requirements where stucco has been performing successfully for decades.

Finally, this proposal provides for **flexibility** in meeting the requirements, including both prescriptive and performance requirements for drainage and ventilation in the footnotes. And, these requirements are consistent with a wide selection of suitable materials currently being used and relies on available (and widely used) consensus standards for measuring performance of those materials or alternatives.

Cost Impact: The code change proposal will increase the cost of construction

This proposal will not increase cost for substrates other than wood-based sheathing. Also, it will not impact cost or change requirements in dry climates where stucco has a very successful performance record. Even where enhanced practices (drainage or ventilation) are required, this will impact cost only where they are not already being used to control risk of moisture damage. For those installations not already using these enhanced provisions in moist/rainy/humid climates, this proposal will likely reduce long term costs to builders, designers, and building owners because it will reduce risk of moisture problems and improve durability.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM E2925-17, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 5632

S195-19

S196-19

IBC: 2510.6, 2510.6.1 (New), 2510.6.2 (New), ASTM Chapter 35 (New)

Proponent: Mike Fischer, representing Self (mfischer@kellencompany.com); Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council

2018 International Building Code

Revise as follows:

2510.6 Water-resistive barriers. *Water-resistive barriers* shall be installed as required in Section 1403.2 and, where applied over wood-based sheathing, shall ~~comply with Section 2510.6.1 or Section 2510.6.2, include a water-resistive vapor-permeable barrier with a performance at least equivalent to two layers of water-resistive barrier complying with ASTM E2556, Type I. The individual layers shall be installed independently such that each layer provides a separate continuous plane and any flashing (installed in accordance with Section 1404.4) intended to drain to the water-resistive barrier is directed between the layers.~~

Exceptions:

- ~~1. Where the *water-resistive barrier* that is applied over wood-based sheathing has a water resistance equal to or greater than that of a *water-resistive barrier* complying with ASTM E2556, Type II and is separated from the stucco by an intervening, substantially nonwater-absorbing layer or drainage space.~~
- ~~2. Where the *water-resistive barrier* is applied over wood-based sheathing in Climate Zone 1A, 2A or 3A, a ventilated air space shall be provided between the stucco and *water-resistive barrier*.~~

Add new text as follows:

2510.6.1 Dry climates. One of the following shall apply for dry (B) climate zones:

1. The *water-resistive barrier* shall be two layers of 10-minute Grade D paper or have a water resistance equal to or greater than two layers of *water-resistive barrier* complying with ASTM E2556, Type I. The individual layers shall be installed independently such that each layer provides a separate continuous plane and any flashing, installed in accordance with Section 1404.4 and intended to drain to the *water-resistive barrier*, is directed between the layers.
2. The *water-resistive barrier* shall be 60-minute Grade D paper or have a water resistance equal to or greater than one layer of *water-resistive barrier* complying with ASTM E2556, Type II. The *water-resistive barrier* shall be separated from the stucco by a layer of foam plastic insulating sheathing or other nonwater absorbing layer.

2510.6.2 Moist or marine climates. In moist (A) or marine (C) climate zones, *water-resistive barrier* shall comply with of one of the following:

1. In addition to complying with Item 1 or 2 of Section 2510.6.1, a minimum 3/16 inch (4.8 mm) space shall be added to the exterior side of the *water-resistive barrier*.
2. In addition to complying with Item 2 of Section 2510.6.1, a space with a minimum drainage efficiency of 90% as measured in accordance with ASTM E2273 or Annex A2 of ASTM E2925 is added to the exterior side of the *water-resistive barrier*.

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken PA 19428-2959

E2925-17: Standard Specification for Manufactured Polymeric Drainage and Ventilation Materials Used to Provide a Rainscreen Function

Reason: The proposal does two things. First, it reorganizes the provisions by deleting two exceptions (which are really a construction options or requirements) and replacing them with subsections that indicate different methods of complying with stucco water-resistive barrier requirements. Second, the proposal properly applies requirements in relation to climate zones (a defined term in Chapter 2) -- something that has been missing in the code and is needed to avoid higher risk of moisture problems in climates that are moist/rainy. The proposal will help resolve problems with stucco performance (e.g., moisture problems over wood-based sheathings) and avoid impacting cost or performance where stucco has a long-standing record of good performance (e.g., dry climates such as the southwestern region of the U.S.).

Cost Impact: The code change proposal will increase the cost of construction

The proposal will not increase cost for substrates other than wood-based sheathing. Also, it will not impact cost or change requirements in dry climates where stucco has a long record of successful performance. This also will not impact cost in moist or marine climates where similar actions are already being taken (e.g., a drainage space) to reduce risk of moisture damage.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM E2925-17, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 5622

S197-19

IBC: 2510.6

Proponent: Benjamin Meyer, representing self (2ben.meyer@gmail.com)

2018 International Building Code

Revise as follows:

2510.6 Water-resistive barriers. *Water-resistive barriers* shall be installed as required in Section 1403.2 and, where applied over wood-based sheathing, shall include a water-resistive vapor-permeable barrier with a performance at least equivalent to two layers of *water-resistive barrier* complying with ASTM E2556, Type I. ~~The individual layers innermost water-resistive barrier shall be installed independently complying with Section 1402.2, such that each layer it provides a separate continuous plane and any flashing, installed in accordance with Section 1404.4, intended to drain to the water-resistive barrier is directed between the layers- integrated with this layer. The outermost water-resistive barrier shall be installed as an intervening layer and shall not impeded drainage to the exterior.~~

Exceptions:

1. Where the *water-resistive barrier* that is applied over wood-based sheathing has a water resistance equal to or greater than that of a *water-resistive barrier* complying with ASTM E2556, Type II and is separated from the stucco by an intervening, substantially nonwater-absorbing layer ~~or~~ and drainage space.
2. Where the *water-resistive barrier* is applied over wood-based sheathing in Climate Zone 1A, 2A or 3A, a ventilated air space shall be provided between the stucco and *water-resistive barrier*.

Reason: Clarifies language regarding the purpose and installation methodology of a two layer WRB system for an adhered cladding system.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Clarification language

Proposal # 2386

S197-19

S198-19

IBC: 2512.1.3 (New)

Proponent: Michael Gardner, M Gardner Services, LLC, representing Wall and Ceiling Alliance (michael@mgardnerservices.com)

2018 International Building Code

Add new text as follows:

2512.1.3. Control Joints Control joints shall be installed in accordance with ASTM C1063.

Exception: Lath shall be permitted to be installed continuous through control joints.

Reason: Proposal seeks to remedy two common exterior plaster application issues.

The proposal clarifies that control joints must be installed in exterior plaster to mitigate the stresses that cause plaster to crack. While the application requirements for control joints are identified in the ASTM C1063 standard that is referenced in Chapter 25 of the IBC, no specific code requirement mandating control joints exists. Lacking such language, the installation of control joints in exterior plaster is often overlooked.

The proposal also modifies an ASTM C1063 requirement that lath must be discontinuous at each control joint by permitting, but not requiring, the lath to run continuous through the control joints.

The placement of control joints is dictated by the maximum spacing requirements contained in the ASTM C1063 standard coupled with aesthetic design considerations. As a result, the final placement of control joints is often not established until after the wall or ceiling is erected and sheathed and the lath has been installed. In such a circumstance, the framed and lathed surfaces often have to be breached and reworked to accommodate control joints, because the C1063 standard requires the lath to be discontinuous. This creates costly re-work and weakens the exterior skin of the building.

The need to discontinue the lath at control joints is historically justified by the belief that the practice reduces plaster cracks; however, no evidence exists to support the theory. To the contrary, a multi-year testing program sponsored by the Wall & Ceiling Conference (WCC) has determined no difference in plaster cracking between continuous and discontinuous lath applications.

Significant practical evidence, created through many decades of successful applications, also indicates that a continuous lath installation does not cause plaster cracking. Continuous lath installation was permitted by the Uniform Building Code, yet there are no indications that jurisdictions enforcing the UBC experienced related plaster cracking issues.

The identified ASTM C1063 requirement should not be mandatory. This proposal seeks to permit the use of an established alternate method for control joint installation.

Cost Impact: The code change proposal will decrease the cost of construction

The proposal will reduce the cost of construction by allowing an alternate method of installation which can eliminate the need for costly re-working of previously installed lath and framing.

Proposal # 4907

S198-19

S199-19

IBC: TABLE 2509.2

Proponent: Patrick Vandergriff, Patrick Vandergriff Code Consulting Services, representing Patrick Vandergriff Code Consulting (pvandergriff@codeconsult.org)

2018 International Building Code

Revise as follows:

**TABLE 2509.2
BACKERBOARD MATERIALS**

MATERIAL	STANDARD
Glass mat gypsum backing panel	ASTM C 1178
<u>Fiber reinforced gypsum panels</u>	<u>ASTM C 1278</u>
Nonasbestos fiber-cement backer board	ASTM or ISO 8336, Category C
Nonasbestos fiber-mat reinforced cementitious backer unit	ASTM C 1325

Reason: ASTM C 1278 is the Standard Specification for Fiber-Reinforced Gypsum panels.

C 1278 has been an allowed standard for tile backer boards since the 2009 edition of International Residential Code. It has not, to date, been included in the International Building Code. When compliant with the standard and the manufacturer's instruction there has not been any issues with the use of this backerboard within residential construction. The serviceability of the products after installation has been of consistently similar quality of those backerboards complying with ASTM C 1178, which has been listed as an acceptable standard for backerboard in both the IRC and IBC.

In addition, a space has been added between the C and the ASTM designation number to match the actual title of the standards listed within this table.

This proposal correlates the two codes and insures more available options for materials to be used by designers and installers.

Cost Impact: The code change proposal will decrease the cost of construction

It is believed that this proposal will have no negative impact to construction costs. If anything, the addition of other competitive products into the mix will help to lower prices for new commercial construction.

Proposal # 571

S199-19

S200-19

IBC: 202 (New), 1609.1.1, 1613.1, 3103.1.1, 3103.5 (New), 3103.6 (New), ASCE Chapter 35 (New), ESTA Chapter 35 (New)

Proponent: Ali Fattah, City of San Diego, representing City of San Diego (afattah@sandiego.gov)

2018 International Building Code

Add new definition as follows:

TEMPORARY SPECIAL EVENT STRUCTURE. Any temporary ground-supported structure, platform, stage, stage scaffolding or rigging, canopy, tower supporting audio or visual effects equipment or similar structures.

Revise as follows:

1609.1.1 Determination of wind loads. Wind loads on every building or structure shall be determined in accordance with Chapters 26 to 30 of ASCE 7. The type of opening protection required, the basic design wind speed, V , and the exposure category for a site is permitted to be determined in accordance with Section 1609 or ASCE 7. Wind shall be assumed to come from any horizontal direction and wind pressures shall be assumed to act normal to the surface considered.

Exceptions:

1. Subject to the limitations of Section 1609.1.1.1, the provisions of ICC 600 shall be permitted for applicable Group R-2 and R-3 buildings.
2. Subject to the limitations of Section 1609.1.1.1, residential structures using the provisions of AWC WFCM.
3. Subject to the limitations of Section 1609.1.1.1, residential structures using the provisions of AISI S230.
4. Designs using NAAMM FP 1001.
5. Designs using TIA-222 for antenna-supporting structures and antennas, provided that the horizontal extent of Topographic Category 2 escarpments in Section 2.6.6.2 of TIA-222 shall be 16 times the height of the escarpment.
6. Wind tunnel tests in accordance with ASCE 49 and Sections 31.4 and 31.5 of ASCE 7.
7. Temporary special event structures complying with Section 3103.5.5.

The wind speeds in Figures 1609.3(1) through 1609.3(8) are basic design wind speeds, V , and shall be converted in accordance with Section 1609.3.1 to *allowable stress design* wind speeds, V_{asd} , when the provisions of the standards referenced in Exceptions 4 and 5 are used.

1613.1 Scope. Every structure, and portion thereof, including nonstructural components that are permanently attached to structures and their supports and attachments, shall be designed and constructed to resist the effects of earthquake motions in accordance with Chapters 11, 12, 13, 15, 17 and 18 of ASCE 7, as applicable. The *seismic design category* for a structure is permitted to be determined in accordance with Section 1613 or ASCE 7.

Exceptions:

1. Detached one- and two-family dwellings, assigned to *Seismic Design Category A, B or C*, or located where the mapped short-period spectral response acceleration, S_S , is less than 0.4 g.
2. The seismic force-resisting system of wood-frame buildings that conform to the provisions of Section 2308 are not required to be analyzed as specified in this section.
3. Agricultural storage structures intended only for incidental human occupancy.
4. Structures that require special consideration of their response characteristics and environment that are not addressed by this code or ASCE 7 and for which other regulations provide seismic criteria, such as vehicular bridges, electrical transmission towers, hydraulic structures, buried utility lines and their appurtenances and nuclear reactors.
5. References within ASCE 7 to Chapter 14 shall not apply, except as specifically required herein.
6. Temporary special event structures complying with Section 3103.5.

3103.1.1 Conformance. Temporary structures and uses shall conform to the structural strength, durability, fire safety, *means of egress*, accessibility, light, *ventilation* and sanitary requirements of this code as necessary to ensure public health, safety and general welfare.

Add new text as follows:

3103.5 Structural. The structural design for temporary structures shall comply with the requirements in Chapter 16. Temporary special event structures erected outdoors for a period of not more than six consecutive weeks shall be designed and erected to comply with requirements ESTA ANSI E1.21 as well as the lateral forces in ASCE 37.

3103.6 Durability and maintenance. A qualified person shall inspect temporary special event structures, including components, when purchased or acquired and at least once per year, based on the requirements in ESTA ANSI E1.21. Inspection records shall be kept and shall be made available for verification by the building official. Additionally, temporary special event structures shall be inspected at regular intervals when in service

to ensure that the structure continues to perform as designed and initially erected.

ASCE/SEI

American Society of Civil
Engineers Structural Engineering Institute
1801 Alexander Bell Drive
Reston VA 20191-4400

37-14: Design Loads on Structures during Construction

ESTA

Entertainment Services and Technology
Association
630 Ninth Avenue, Suite 609
New York NY 10036
US

Add new standard(s) as follows:

ESTA

Entertainment Services and Technology
Association
630 Ninth Avenue, Suite 609
New York NY 10036
US

ANSI E1.21—2013: Entertainment Technology: Temporary Ground Supported Overhead Structures Used to Cover the Stage Areas and Support Equipment in the Production of Outdoor Entertainment Event

Reason: Temporary Special Event Structures are regulated in Section 3105 of the International Fire Code and pose challenges to Building Officials and Fire Code Officials due to their temporary nature and methods of construction. The regular provisions of the IBC and IFC regulate permanent buildings and structures constructed to remain in service for long periods of time and as a consequence it is conceivable that over a 50 to 100 year services live that such buildings and structures can be expected to experience high wind and seismic. As a result when the duration of service is short for 6 weeks for example such as a sporting event, or one day such as in a concert, it is reasonable to assume that the probability of an event will not be high. Furthermore, wind events can be predicted fairly accurately to allow for adjustments or dismantling of temporary structures when an installation may be subjected to winds higher than assumed in the design. As a consequence the entertainment industry developed "ANSI E1.21—2013: Entertainment Technology: Temporary Ground Supported Overhead Structures Used to Cover the Stage Areas and Support Equipment in the Production of Outdoor Entertainment Events" to specifically address the unique issues posed by temporary structures used as a part of special events in light of the duration of use and the reuse of components used to erect the structures. Additionally, these temporary structures may be erected with scaffolding systems that were intended for the construction of permanent buildings.

The definition for Temporary Special Event Structure is proposed to be modified to delete references limiting its application to the IFC.

IFC Section 3105 adopts by reference ANSI E1.21 so this code change merely harmonizes the two codes. It is noteworthy that ANSI E1.21 was last updated in 2013 and includes out of date references to 2010 edition of ASCE 7 as well as the 2002 edition of ASCE 37.

This code change also references ASCE 37-14 Design Loads on Structures during Construction since this standard is referenced in ANSI E1.21 and since by publishing it ASCE recognizes the need for reduced seismic loads adjusted by duration. It is worth noting that ASCE 37 intends to provide the same level of safety as the IBC does through ASCE 7.

Bibliography: ANSI E1.21—2013: Entertainment Technology: Temporary Ground Supported Overhead Structures Used to Cover the Stage Areas and Support Equipment in the Production of Outdoor Entertainment Events
ASCE 37-14 Design Loads on Structures During Construction

Cost Impact: The code change proposal will decrease the cost of construction

Building Official are requested on a regular basis to accept structural designs for concert stages and structures used in sporting events based on load reductions permitted in the two new referenced standards. As a consequence of this code change it is expected that ballast materials used to provide overturning and sliding resistance to be reduced. These standards are already in use in the motion picture and entertainment industry for work not specifically regulated by the Building Official.

Staff Analysis: A review of the standard proposed for inclusion in the code, ESTA ANSI E1.21-2013 and ASCE 37-14, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 5200

S200-19

ICCPC Code Change Proposals

The following code change proposals are labeled as Performance code change proposals because they are proposals for changes to sections in chapters of the International Code Council Performance Code that are designated as the responsibility of the ICCPC Development Committee (see page x of the Introductory pages of this monograph). However the changes included in this Group B code development cycle are to sections of the code that have been prefaced with a [S], meaning that they are the responsibility of a different IBC Code Development Committee—IBC-Structural Committee [S].

The committee assigned for each code change proposal is indicated in a banner statement near the beginning of the proposal.

PC1-19

ICCPC@: [BS] 501.3.4

Proponent: Robert Pekelnicky, Degenkolb Engineers, representing Self (RPekelnicky@degenkolb.com)

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Code Council Performance Code

Revise as follows:

[BS] 501.3.4 Expected loads. Structures, or portions thereof, shall be designed and constructed taking into account expected loads, and combination of loads, associated with the event(s) magnitude(s) that would affect their performance, including, but not limited to:

1. Dead loads.
2. Live loads.
3. Impact loads.
4. Explosion loads.
5. Soil and hydrostatic pressure loads.
6. Flood loads (mean return period).
 - Small: 100 years
 - Medium: 500 years
 - Large: Determined on a site-specific basis
 - Very Large: Determined on a site-specific basis
7. Wind loads (mean return period).
 - Small: ~~50-300~~ years
 - Medium: ~~75-700~~ years
 - Large: ~~100-1,700~~ years
 - Very Large: ~~125-3,000~~ years
8. Windborne debris loads.
9. Snow loads (mean return period).
 - Small: 25 years
 - Medium: 30 years
 - Large: 50 years
 - Very Large: 100 years
10. Rain loads. See Table 501.3.4.
11. Earthquake loads (mean return period).
 - Small: 25 years
 - Medium: 72 years
 - Large: 475 years, but need not exceed two-thirds of the intensity of very large loads
 - Very Large: 2,475 years. At sites where the 2,475-year, 5-percent damped spectral response acceleration at a 0.3-second period exceeds 1.5 g and at a 1-second period exceeds 0.6 g, very large ground shaking demands need not exceed a 5-percent damped response spectrum that at each period is 150 percent of the median spectral response acceleration ordinate resulting from a characteristic earthquake on any known active fault in the region.
12. Ice loads, atmospheric icing (mean return period).
 - Small: 25 years
 - Medium: 50 years
 - Large: 100 years
 - Very Large: 200 years
13. Hail loads.
14. Thermal loads.

Reason: The wind load return periods in the ICCPC are significantly misaligned with ASCE 7-16. The return periods proposed match the return periods in Chapter 26 of ASCE 7 and Figure 1609.3 in the IBC. Since the 2010 edition of ASCE 7, the wind speeds used for design of the main wind resisting force system, components and cladding, and nonstructural components have been based on ultimate wind speeds with a load factor of 1.0. Per ASCE 7-16, as Risk Category II building is supposed to be designed for a wind speed with a mean recurrence interval of 700 years. All structural and nonstructural elements are supposed to be designed elastically for that wind speed based on the applicable material design standards. Such design would likely correlate to the "mild impact" tolerable damage state for structural performance and "moderate impact" for the nonstructural performance. Per the current ICCPC, a designer would only need to consider a 50- or 75-year wind speed. Because performance-based designs commonly use ultimate loads and the ICCPC does not indicate that one should or should not use a load factor, a user attempting a performance-based design could significantly under design a structure under the current ICCPC compared to one designed per the IBC and its reference standards.

Bibliography: American Society of Civil Engineers, 2016, *Minimum Design Loads and Associated Criteria For Buildings And Other Structures* (7-

16), Reston, VA

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This code change proposal is not intended to affect the cost of construction. It is simply aligning the ICCPC wind design provisions with the IBC wind speeds.

Proposal # 5399

PC1-19

PC2-19

ICCPC@: [BS] 501.3.4

Proponent: Robert Pekelnicky, representing Self (RPekelnicky@degenkolb.com)

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Code Council Performance Code

Revise as follows:

[BS] 501.3.4 Expected loads. Structures, or portions thereof, shall be designed and constructed taking into account expected loads, and combination of loads, associated with the event(s) magnitude(s) that would affect their performance, including, but not limited to:

1. Dead loads.
2. Live loads.
3. Impact loads.
4. Explosion loads.
5. Soil and hydrostatic pressure loads.
6. Flood loads (mean return period).
 - Small: 100 years
 - Medium: 500 years
 - Large: Determined on a site-specific basis
 - Very Large: Determined on a site-specific basis
7. Wind loads (mean return period).
 - Small: 50 years
 - Medium: 75 years
 - Large: 100 years
 - Very Large: 125 years
8. Windborne debris loads.
9. Snow loads (mean return period).
 - Small: 25 years
 - Medium: ~~30~~ 50 years
 - Large: ~~50~~ 100 years
 - Very Large: ~~100~~ 500 years
10. Rain loads. See Table 501.3.4.
11. Earthquake loads (mean return period).
 - Small: 25 years
 - Medium: 72 years
 - Large: 475 years, but need not exceed two-thirds of the intensity of very large loads
 - Very Large: 2,475 years. At sites where the 2,475-year, 5-percent damped spectral response acceleration at a 0.3-second period exceeds 1.5 g and at a 1-second period exceeds 0.6 g, very large ground shaking demands need not exceed a 5-percent damped response spectrum that at each period is 150 percent of the median spectral response acceleration ordinate resulting from a characteristic earthquake on any known active fault in the region.
12. Ice loads, atmospheric icing (mean return period).
 - Small: 25 years
 - Medium: 50 years
 - Large: 100 years
 - Very Large: 200 years
13. Hail loads.
14. Thermal loads.

Reason: The snow load return periods in the ICCPC are significantly misaligned with ASCE 7-16. The return periods proposed are based on estimates of what the return periods would be if the snow load factor was 1.0 instead of 1.6. In the IBC, all structural and nonstructural elements are supposed to be designed elastically for a 50-year return period snow load what is factored up by both a load factor and an importance factor based on Risk Category. Such design would likely correlate to the "mild impact" tolerable damage state for structural performance. Per the current ICCPC, a designer would only need to consider a 50-year snow load, without any increase in force. Because performance-based designs commonly use ultimate loads and the ICCPC does not indicate that one should or should not use a load factor, a user attempting a performance-based design could significantly under design a structure under the current ICCPC compared to one designed per the IBC and its reference standards.

Bibliography: American Society of Civil Engineers, 2016, *Minimum Design Loads and Associated Criteria For Buildings And Other Structures (7-16)*, Reston, VA

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This code change proposal is not intended to affect the cost of construction. It is simply aligning the ICCPC snow design provisions with the IBC

snow design provisions.

PC3-19

ICCPC@: [BS] 501.3.4

Proponent: Kelly Cobeen, Wiss Janney Elstner Associates, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (KCobeen@wje.com); Robert Pekelnicky, Degenkolb Engineers, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (rpekelnicky@degenkolb.com); Michael Mahoney, representing Federal Emergency Management Agency (mike.mahoney@fema.dhs.gov)
THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Code Council Performance Code

Revise as follows:

[BS] 501.3.4 Expected loads. Structures, or portions thereof, shall be designed and constructed taking into account expected loads, and combination of loads, associated with the event(s) magnitude(s) that would affect their performance, including, but not limited to:

1. Dead loads.
2. Live loads.
3. Impact loads.
4. Explosion loads.
5. Soil and hydrostatic pressure loads.
6. Flood loads (mean return period).
 - Small: 100 years
 - Medium: 500 years
 - Large: Determined on a site-specific basis
 - Very Large: Determined on a site-specific basis
7. Wind loads (mean return period).
 - Small: 50 years
 - Medium: 75 years
 - Large: 100 years
 - Very Large: 125 years
8. Windborne debris loads.
9. Snow loads (mean return period).
 - Small: 25 years
 - Medium: 30 years
 - Large: 50 years
 - Very Large: 100 years
10. Rain loads. See Table 501.3.4.
11. Earthquake loads (mean return period).
 - Small: ~~25-43~~ years
 - Medium: 72 years
 - Large: 475 years, but need not exceed two-thirds of the intensity of very large loads
 - Very Large: 2,475 years. At sites where the 2,475-year, 5-percent damped spectral response acceleration at a 0.3-second period exceeds 1.5 g and at a 1-second period exceeds 0.6 g, very large ground shaking demands need not exceed a 5-percent damped response spectrum that at each period is 150 percent of the median spectral response acceleration ordinate resulting from a characteristic earthquake on any known active fault in the region.
12. Ice loads, atmospheric icing (mean return period).
 - Small: 25 years
 - Medium: 50 years
 - Large: 100 years
 - Very Large: 200 years
13. Hail loads.
14. Thermal loads.

Reason: This proposal aligns the Small hazard intensity the ICCPC stipulates be used for design for buildings and other structures for earthquake effects with what is used in current performance-based design practice. The 43-year hazard is referenced in the PEER Tall Building Initiative, Version 2 (PEER, 2017) and the Los Angeles Tall Building Structural Design Council document (2018). While these documents were drafted for tall buildings, their procedures have been used for design of other than tall buildings. Without this change, use of the ICCPC would provide a less serviceable building under earthquake loading than current practices has accepted.

Bibliography: PEER, 2017. Guidelines for Performance-Based Seismic Design of Tall buildings, Version 2.03, The Pacific Earthquake Engineering Research Center, Berkeley, California.

Los Angeles Tall Buildings Structural Design Council, 2018. An Alternative Procedure for Seismic Analysis and Design of Tall Buildings Located in

the Los Angeles Region, A Consensus Document, 2017 Edition with 2018 Supplements. Los Angeles Tall Buildings Structural Design Council, Los Angeles, California.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
There will be no cost impact because this change simply aligns the ICCPC with current performance-based design practice.

Proposal # 4582

PC3-19

PC4-19

ICCPC@: [BS] 501.3.4

Proponent: Kelly Cobeen, Wiss Janney Elstner Associates, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (KCobeen@wje.com); Robert Pekelnicky, Degenkolb Engineers, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (rpekelnicky@degenkolb.com); Michael Mahoney, representing Federal Emergency Management Agency (mike.mahoney@fema.dhs.gov)
THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Code Council Performance Code

Revise as follows:

[BS] 501.3.4 Expected loads. Structures, or portions thereof, shall be designed and constructed taking into account expected loads, and combination of loads, associated with the event(s) magnitude(s) that would affect their performance, including, but not limited to:

1. Dead loads.
2. Live loads.
3. Impact loads.
4. Explosion loads.
5. Soil and hydrostatic pressure loads.
6. Flood loads (mean return period).
 - Small: 100 years
 - Medium: 500 years
 - Large: Determined on a site-specific basis
 - Very Large: Determined on a site-specific basis
7. Wind loads (mean return period).
 - Small: 50 years
 - Medium: 75 years
 - Large: 100 years
 - Very Large: 125 years
8. Windborne debris loads.
9. Snow loads (mean return period).
 - Small: 25 years
 - Medium: 30 years
 - Large: 50 years
 - Very Large: 100 years
10. Rain loads. See Table 501.3.4.
11. Earthquake loads (~~mean return period~~).
 - Small: 25 years (mean return period)
 - Medium: 72 years (mean return period)
 - Large: ~~475 years, but need not exceed two-thirds~~ Two-thirds of the intensity of very large loads
 - Very Large: ~~2,475 years. At sites where the 2,475 year, 5 percent damped spectral response acceleration at a 0.3 second period exceeds 1.5 g and at a 1-second period exceeds 0.6 g, very large ground shaking demands need not exceed a 5-percent damped response spectrum that at each period is 150 percent of the median spectral response acceleration ordinate resulting from a characteristic earthquake on any known active fault in the region.~~ The Risk-Targeted Maximum Considered Earthquake defined in Chapter 21 of ASCE 7.
12. Ice loads, atmospheric icing (mean return period).
 - Small: 25 years
 - Medium: 50 years
 - Large: 100 years
 - Very Large: 200 years
13. Hail loads.
14. Thermal loads.

Reason: This code change updates the hazard intensity that ICCPC stipulates be used for design of buildings and other structures for earthquake effects to align with ASCE 7-16, the engineering standard referenced in the 2018 IBC. The definition of Very Large hazard published in the 2018 ICCPC is based on a definition of the Maximum Considered Earthquake from ASCE 7-05. Starting with the 2010 edition of ASCE 7, the Maximum Considered Earthquake definition changed to reflect a risk-targeted probabilistic hazard, as opposed to the uniform hazard defined by the 2,475 year return period. The risk-targeted probabilistic hazard for Large and Very Large earthquakes varies in return period across the country. Additionally, the ASCE 7-16 deterministic cap has changed from 150% of the mean shaking intensity of the characteristic earthquake to a mean plus one standard deviation shaking intensity from the characteristic earthquake, which is approximately 180% of the mean. This results in the Very Large event currently specified in the 2018 ICCPC being 20% lower than ASCE 7-16 specifies in capped regions. For the Large event, two-thirds of the

Risk-Targeted Maximum considered Earthquake (MCE sub R) has a return period significantly higher than 475 years for most of the country. Continued use of the 2018 ICCPC 475 year return period for the Large earthquake would be substantially unconservative at many locations relative to the seismic design provisions of the 2018 IBC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

There will be no cost impact because this change simply aligns the seismic hazard descriptions of the ICCPC with the engineering standard referenced in the IBC.

Proposal # 4586

PC4-19

PC5-19

ICCPC@: [BS] 501.3.5

Proponent: Robert Pekelnicky, representing Self (RPekelnicky@degenkolb.com)

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Code Council Performance Code

Revise as follows:

[BS] 501.3.5 Safety factors. The design of buildings and structures shall consider appropriate factors of safety to provide adequate performance from:

1. Effects of uncertainties resulting from construction activities.
2. Variation in the properties of materials and the characteristics of the site.
3. Accuracy limitations inherent in the methods used to predict the stability of the building.
4. Self-straining forces arising from differential settlements of foundations and from restrained dimensional changes due to temperature, moisture, shrinkage, creep and similar effects.
5. Uncertainties in the determination of the expected loads.

Reason: The ICCPC currently does not list uncertainties in the determination of the design load as one of the things that should be considered when determining an appropriate factor of safety. All expected loads have an uncertainty associated with them, whether it be an environmental load expressed using a return period or a live load based on the use of the space. Those uncertainties are taken in to account in the development of the design loads in the IBC and the ASCE 7-16 standard. This change makes it clear that such uncertainties be considered if one choses to do a performance-based design per the ICCPC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This code change proposal will not affect the cost of construction, as it simply aligns the requiremetns of the ICCPC with the perscriptive requirements of the IBC and its reference standards.

Proposal # 5407

PC5-19

2019 GROUP B – PROPOSED CHANGES TO THE INTERNATIONAL EXISTING BUILDING CODE

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TENTATIVE ORDER OF DISCUSSION 2019 PROPOSED CHANGES TO THE INTERNATIONAL EXISTING BUILDING CODE

The following is the tentative order in which the proposed changes to the code will be discussed at the public hearings. Proposed changes which impact the same subject have been grouped to permit consideration in consecutive changes.

Proposed change numbers that are indented are those which are being heard out of numerical order. Indentation does not necessarily indicate that one change is related to another. Proposed changes may be grouped for purposes of discussion at the hearing at the discretion of the chair. Note that some EB code change proposals may not be included on this list, as they are being heard by another committee.

EB4-19	EB39-19	EB78-19	EB106-19
EB9-19	EB40-19	EB79-19	EB107-19
EB10-19	EB6-19	EB80-19	EB108-19
EB11-19	EB7-19	EB81-19	EB109-19
EB12-19	EB41-19	EB82-19	EB110-19
EB13-19	EB42-19	EB83-19	EB111-19
EB17-19	EB46-19	EB84-19	EB112-19
EB5-19	EB47-19	EB85-19	EB113-19
EB8-19	EB48-19	EB93-19	EB114-19
EB19-19	EB118-19	EB86-19	EB115-19
EB20-19	EB134-19	EB87-19	EB116-19
EB21-19	EB49-19	EB88-19	EB117-19
EB22-19	EB50-19	EB89-19	EB119-19
EB23-19	EB51-19	EB90-19	EB120-19
EB24-19	EB52-19	EB91-19	EB121-19
EB25-19	EB59-19	EB92-19	EB122-19
EB26-19	EB60-19	EB94-19	EB123-19
EB27-19	EB61-19	EB95-19	EB124-19
EB28-19	EB62 -19	EB96-19	EB125-19
EB29-19	EB63-19 Part I	EB97-19	EB126-19
EB30-19	EB64-19	EB98-19	EB127-19
EB31-19	EB65-19	EB99-19	EB128-19
EB33-19	EB70-19	EB100-19	EB129-19
EB34-19	EB3-19	EB101-19 Part I	EB130-19
EB35-19	EB1-19	EB102-19	EB131-19
EB32-19	EB71-19	EB103-19	EB132-19
EB36-19	EB72-19	EB104-19	EB133-19
EB37-19	EB74-19	EB14-19	
EB38-19	EB77-19	EB105-19	

EB1-19

IEBC@: 202 (New)

Proponent: Felix I. Zemel, ICC Region 6 -- North East Regional Coalition, representing ICC Region 6 -- North East Regional Coalition (felix@pracademicsolutions.com); Peter Zvingilas, ICC Region 6- North East Regional Coalition, Town of Groton and Voluntown CT (pzvingilas@voluntown.gov)

2018 International Existing Building Code

Add new definition as follows:

SPACE, RECONFIGURED An alteration that results in a change to any component of the means of egress or the path of egress travel and does not meet the scope of Alteration--Level 1 in Section 602.1.

Reason: Code officials and RDPs often debate whether a proposed project is either an Alteration--Level 1 or Alteration--Level 2. From experience, this determination frequently hinges upon a determination whether the proposed work is a "reconfiguration of space," but this term is not defined in the IEBC. The MA Board of Building Regulations and Standards' Existing Building Advisory Technical Advisory Committee has been working on an interpretation of the definition of "work area" for many years, as a result. After many years of debate, they have conceptually agreed that the determination of reconfiguration of space is related to changes in either the path of egress travel or any of the egress component(s): exit access, exit, or exit discharge.

Without the addition of the last preposition of the definition, code officials may erroneously misclassify "removal and replacement or covering of existing materials, elements, equipment, or fixtures using new materials, elements, equipment, or fixtures that serve the same purpose" (scope of Alteration--Level 1 from Section 602.1) as an Alteration--Level 2 or Alteration--Level 3; thus requiring a more extensive scope of work and increasing the potential cost of construction.

Addition of this definition can potentially reduce the number of appeals of code officials' interpretations; thus improving efficiency in the permitting process.

Cost Impact: The code change proposal will decrease the cost of construction

Due to the extended guidance to code officials, addition of this definition can only decrease the cost of construction. This is because it further clarifies when an alteration project should be classified as an Alteration--Level 1 or one of the other two alteration levels.

Proposal # 4763

EB1-19

EB2-19

IEBC@: [BS] 202

Proponent: Michael Fillion, representing National Council of Structural Engineers Association (mrf.structure@verizon.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Revise as follows:

[BS] SUBSTANTIAL STRUCTURAL ALTERATION. An alteration in which the gravity load-carrying structural elements altered within a 5-year period support more than 30 percent of the total floor and roof area of the building or structure. The areas to be counted toward the 30 percent shall include mezzanines, penthouses, and in-filled courts and shafts tributary to the altered structural elements. For the purpose of this definition, a structural element shall be considered altered if its demand is increased by more than 5% or its capacity is reduced by any amount.

Reason: The National Council of Structural Engineers Existing Buildings Sub-committee has received inquiries from practicing structural engineers regarding the interpretation of this definition. In Massachusetts, a structural engineering firm requested an interpretation from the Chief of Building Inspectors and the Structural Advisory Committee to the Massachusetts State Building Code. From our feedback, practicing structural engineers have various opinions regarding the interpretation of the definition. A common question is "What is considered an alteration." The intent of the proposed added language is to make it clear what an alteration is in the context of the definition.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The intent of this code change proposal is for clarification

Proposal # 5307

EB2-19

EB3-19

IEBC@: 202

Proponent: Allison Cook, Arlington County, VA, representing VBCOA; Kenney Payne, Moseley Architects, representing AIA Virginia (kpayne@moseleyarchitects.com); Ronald Clements Jr, representing Chesterfield County (clementsro@chesterfield.gov); Bob Orr, representing VBCOA (borr@culpepercounty.gov); Charles Vernon, representing VBCOA (cvernon@arlingtonva.us); Michael Williams (mike.williams@harrisonburgva.gov); Debra McMahon (debra.mcmahon@fairfaxcounty.gov); David Collins, The American Institute of Architects, representing The American Institute of Architects (dcollins@preview-group.com); Christina Jackson, City of Norfolk, representing City of Norfolk / WICED of VA (christina.reynolds@norfolk.gov)

2018 International Existing Building Code

Revise as follows:

WORK AREA. ~~That portion or portions of a building consisting of all reconfigured spaces as indicated on the construction documents. Work area excludes other portions of the building where incidental work entailed by the intended work must be performed and portions of the building where work not initially intended by the owner is specifically required by this code.~~ intended room, space, or portion of a building or structure where a wall or walls are added, relocated, or removed. Work area excludes the following:

1. The addition or elimination of any door or window.
2. The reconfiguration or extension of any system
3. The installation of any additional equipment
4. the removal of finished flooring or ceiling materials
5. adjacent rooms or other rooms, spaces, or portions of the building or structure where incidental work entailed by the intended work must be performed
6. portions of the building or structure where work not initially intended is specifically required by this code.

Reason: The current definition of work area is too vague and creates the potential for significantly different interpretations of what constitutes a work area. In Virginia, we have experienced inconsistency between jurisdictions and adopted this definition to address that issue. The proposed change provides more details on what is and is not part of a work area. This should help both building officials and design professionals.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal is only to add clarification, it should not impact cost.

Proposal # 5218

EB3-19

EB4-19

IEBC@: CHAPTER 1, CHAPTER 2, CHAPTER 3, 301.3, 301.3.1, 301.3.3, 301.3.2, 301.4, SECTION 306 (New), 504.1, 504.1.1, 504.1.2, 504.1.3, 504.1.4, 504.2, 504.3, 504.4, 504.5, SECTION 307 (New), 702.4, 701.4, 702.5, 402.1, SECTION 308 (New), [BS] 706.1, [BS] 705.1, [BS] 705.2, [BS] 706.2, [BS] 705.3, [BS] 705.3.1, [BS] 705.3.1.1, [BS] 705.4, [BS] 705.5, [BS] 705.6, [BS] 706.3, [BS] 706.3.1, [BS] 706.3.2, CHAPTER 4, 401.1, CHAPTER 5, SECTION 501, 501.1, 501.1.1, 501.2, SECTION 502, 502.1, [BS] 502.2, [BS] 502.3, [BS] 502.4, [BS] 502.5, 502.6, 502.7, 502.8, SECTION 503, 503.1, [BS] 503.2, [BS] 503.3, [BS] 503.4, [BS] 503.5, [BS] 503.6, [BS] 503.7, [BS] 503.8, [BS] 503.9, [BS] 503.10, [BS] 503.11, [BS] 503.12, [BS] 503.13, 503.14, 503.15, 503.16, 503.16.1, 503.16.2, 503.16.3, SECTION 505, 505.1, 505.2, 505.3, 505.4, SECTION 506, 506.1, 506.1.1, 506.2, 506.3, 506.4, 506.4.1, 506.4.2, 506.4.3, 506.4.4, SECTION 507, 507.1, 507.2, [BS] 507.3, [BS] 507.4, CHAPTER 6, SECTION 601, 601.1, 601.1.1, 601.2, 501.3 (New), 602.1, 602.2, 603.1, 603.2, 604.1, 604.2, [BS] 701.3, 707.1, 501.6 (New), 605.1, 605.2, 606.1, 606.2, 607.1, 607.2, 608.1, 608.2, CHAPTER 7, SECTION 701, 701.1, 701.2, 703.1, 704.1, 502.4 (New), 702.1, 702.2, 702.3, 702.6, [FG] 702.6.1, CHAPTER 8, SECTION 503 (New), 801.1, 801.2, 801.3, 802.1, 802.2, 802.2.1, 802.2.2, 802.2.3, 802.3, 802.4, 802.4.1, 802.5, 802.5.1, 802.5.2, 802.6, 803.1, 803.1.1, 803.2, 803.2.1, 803.2.1.1, 803.2.2, 803.2.2.1, 803.2.3, 803.2.4, 803.3, 803.4, 803.4.1, 803.4.1.1, 803.4.1.2, 803.4.1.3, 803.4.1.4, 803.4.1.5, 803.4.1.6, 803.4.2, 803.4.3, 804.1, 805.2, 805.1, 805.3, 805.3.1, 805.3.1.1, TABLE 805.3.1.1(1), TABLE 805.3.1.1(2), 805.3.1.2, 805.3.1.2.1, 805.3.1.2.2, 805.3.1.2.3, 805.3.2, 805.3.3, 805.4, 805.4.1, 805.4.1.1, 805.4.1.2, 805.4.2, 805.4.2.1, 805.4.3, 805.4.3.1, 805.4.4, 805.4.4.1, 805.4.5, 805.5, 805.5.1, 805.5.2, 805.5.3, 805.5.3.1, 805.5.4, 805.6, 805.7, 805.7.1, 805.7.2, 805.8, 805.8.1, 805.8.2, 805.9, 805.9.1, 805.9.2, 805.10, 805.10.1, 805.10.1.1, 805.10.1.2, 805.10.1.3, 805.10.2, 805.11, 805.11.1, 805.11.2, [BS] 806.1, [BS] 806.2, [BS] 806.3, [BS] 806.4, 503.9 (New), 807.1, 807.2, 807.3, 807.3.1, 807.3.2, 807.3.3, 807.3.4, 807.3.5, 807.3.6, 807.3.7, 808.1, 808.2, 808.3, 809.1, CHAPTER 9, SECTION 504 (New), 901.1, 901.2, 504.3 (New), 902.1, 902.1.1, 902.1.2, 902.2, 504.4 (New), 903.1, 903.2, 903.2.1, 903.3, 504.5 (New), 904.1, 904.1.1, 904.1.2, 904.1.3, 904.1.4, 904.2, 904.2.1, 904.2.2, 905.1, 905.2, 905.3, [BS] 906.1, [BS] 906.2, [BS] 906.3, [BS] 906.4., [BS] 906.5, [BS] 906.6, [BS] 906.7, CHAPTER 10, 1001.2.1, 1011.1.1.1, 1011.1.1.2, 1011.4.1, 1011.4.4, 1011.4.5, CHAPTER 11, 1101.3, [BS] 1103.1, CHAPTER 12, 1203.10.1, 1204.1, 1204.3, 1204.14, CHAPTER 13, CHAPTER 14, CHAPTER 15, CHAPTER 16

Proponent: Allison Cook, Arlington, VA, representing VBCOA; Kenney Payne, Moseley Architects, representing AIA Virginia (kpayne@moseleyarchitects.com); Ronald Clements Jr, representing Chesterfield County (clementsro@chesterfield.gov); Charles Vernon, representing VBCOA (cvernon@arlingtonva.us); Michael Williams (mike.williams@harrisonburgva.gov); Debra McMahon (debra.mcmahon@fairfaxcounty.gov); David Collins (dcollins@preview-group.com); Christina Jackson, representing City of Norfolk / WICED of VA (christina.reynolds@norfolk.gov)

2018 International Existing Building Code

CHAPTER 1 SCOPE AND ADMINISTRATION

CHAPTER 2 DEFINITIONS

CHAPTER 3 PROVISIONS FOR ALL COMPLIANCE METHODS GENERAL PROVISIONS AND SPECIAL DETAILED REQUIREMENTS

Revise as follows:

301.3 Alteration, addition or change of occupancy. The *alteration, addition or change of occupancy* of all *existing buildings* shall comply with one of the methods listed in Section 301.3.1, 301.3.2 or 301.3.3 as selected by the applicant. Sections 301.3.1 through 301.3.3 shall not be applied in combination with each other.

Exception: Subject to the approval of the *code official, alterations* complying with the laws in existence at the time the building or the affected portion of the building was built shall be considered in compliance with the provisions of this code. New structural members added as part of the *alteration* shall comply with the International Building Code. This exception shall not apply to alterations that constitute substantial improvement in *flood hazard areas*, which shall comply with Section 503.2, 701.3 or 1301.3.3. This exception shall not apply to the structural provisions of ~~Chapter 5 or to the structural provisions of Sections 706, 806 and 906. Sections 308, 502, 503, and 504.~~

Delete without substitution:

~~**301.3.1 Prescriptive compliance method.** *Alterations, additions and changes of occupancy* complying with Chapter 5 of this code in buildings complying with the International Fire Code shall be considered in compliance with the provisions of this code.~~

Revise as follows:

~~**301.3.3**~~ **301.3.2 Performance compliance method.** *Alterations, additions and changes of occupancy* complying with Chapter ~~4~~9 of this code shall be considered in compliance with the provisions of this code.

~~**301.3.2**~~ **301.3.1 Work area compliance method.** *Alterations, additions and changes of occupancy* complying with the applicable requirements of Chapters ~~6-5~~ through ~~4~~2-8 of this code shall be considered in compliance with the provisions of this code.

301.4 Relocated buildings. Relocated buildings shall comply with the requirements of ~~Chapter 14.~~Chapter 10.

Add new text as follows:

SECTION 306 **FIRE ESCAPES**

Revise as follows:

~~504.1~~ **306.1** **Where permitted.** Fire escapes shall be permitted only as provided for in Sections ~~504.1.1~~ **306.1.1** through ~~504.1.4~~ **306.1.4**.

~~504.1.1~~ **306.1.1** **New buildings.** Fire escapes shall not constitute any part of the required means of egress in new buildings.

~~504.1.2~~ **306.1.2** **Existing fire escapes.** Existing fire escapes shall continue to be accepted as a component in the means of egress in *existing buildings* only.

~~504.1.3~~ **306.1.3** **New fire escapes.** New fire escapes for *existing buildings* shall be permitted only where exterior stairways cannot be utilized because of lot lines limiting stairway size or because of sidewalks, alleys or roads at grade level. New fire escapes shall not incorporate ladders or access by windows.

~~504.1.4~~ **306.1.4** **Limitations.** Fire escapes shall comply with this section and shall not constitute more than 50 percent of the required number of exits nor more than 50 percent of the required exit capacity.

~~504.2~~ **306.2** **Location.** Where located on the front of the building and where projecting beyond the building line, the lowest landing shall be not less than 7 feet (2134 mm) or more than 12 feet (3658 mm) above grade, and shall be equipped with a counterbalanced stairway to the street. In alleyways and thoroughfares less than 30 feet (9144 mm) wide, the clearance under the lowest landing shall be not less than 12 feet (3658 mm).

~~504.3~~ **306.3** **Construction.** The fire escape shall be designed to support a live load of 100 pounds per square foot (4788 Pa) and shall be constructed of steel or other *approved noncombustible materials*. Fire escapes constructed of wood not less than nominal 2 inches (51 mm) thick are permitted on buildings of Type V construction. Walkways and railings located over or supported by combustible roofs in buildings of Type III and IV construction are permitted to be of wood not less than nominal 2 inches (51 mm) thick.

~~504.4~~ **306.4** **Dimensions.** Stairways shall be not less than 22 inches (559 mm) wide with risers not more than, and treads not less than, 8 inches (203 mm) and landings at the foot of stairways not less than 40 inches (1016 mm) wide by 36 inches (914 mm) long, located not more than 8 inches (203 mm) below the door.

~~504.5~~ **306.5** **Opening protectives.** Doors and windows within 10 feet (3048 mm) of fire escape stairways shall be protected with ³/₄-hour opening protectives.

Exception: Opening protection shall not be required in buildings equipped throughout with an *approved* automatic sprinkler system.

Add new text as follows:

SECTION 307 **GLASS REPLACEMENT AND WINDOW OPENINGS**

Revise as follows:

~~702.4~~ **307.1** **Window opening control devices on replacement windows.** In Group R-2 or R-3 buildings containing dwelling units and one- and two-family dwellings and townhouses regulated by the International Residential Code, window opening control devices complying with ASTM F2090 shall be installed where an existing window is replaced and where all of the following apply to the replacement window:

1. The window is operable.
2. The window replacement includes replacement of the sash and the frame.
3. One of the following applies:
 - 3.1. In Group R-2 or R-3 buildings containing dwelling units, the top of the sill of the window opening is at a height less than 36 inches (915 mm) above the finished floor.
 - 3.2. In one- and two-family dwellings and townhouses regulated by the International Residential Code, the top sill of the window opening is at a height less than 24 inches (610 mm) above the finished floor.
4. The window will permit openings that will allow passage of a 4-inch-diameter (102 mm) sphere when the window is in its largest opened position.
5. The vertical distance from the top of the sill of the window opening to the finished grade or other surface below, on the exterior of the building, is greater than 72 inches (1829 mm).

The window opening control device, after operation to release the control device allowing the window to fully open, shall not reduce the minimum net clear opening area of the window unit to less than the area required by Section 1030.2 of the International Building Code.

Exceptions:

1. Operable windows where the top of the sill of the window opening is located more than 75 feet (22 860 mm) above the finished grade or other surface below, on the exterior of the room, space or building, and that are provided with window fall prevention devices that comply with ASTM F2006.
2. Operable windows with openings that are provided with window fall prevention devices that comply with ASTM F2090.

701-4 307.2 Emergency escape and rescue openings. Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys or tools. Bars, grilles, grates or similar devices placed over emergency escape and rescue openings shall comply with the minimum net clear opening size required by the code that was in effect at the time of construction. Such devices shall be releasable or removable from the inside without the use of a key, tool or force greater than that which is required for normal operation of the escape and rescue opening. Where such bars, grilles, grates or similar devices are installed, they shall not reduce the net clear opening of the emergency escape and rescue openings. Smoke alarms shall be installed in accordance with Section 907.2.10 of the International Building Code regardless of the valuation of the alteration.

702-5 307.3 Replacement window emergency escape and rescue openings. Where windows are required to provide emergency escape and rescue openings in Group R-2 and R-3 occupancies and one- and two-family dwellings and townhouses regulated by the International Residential Code, replacement windows shall be exempt from the requirements of Sections 1030.2, 1030.3 and 1030.4 of the International Building Code and Sections R310.2.1, R310.2.2 and R310.2.3 of the International Residential Code, provided that the replacement window meets the following conditions:

1. The replacement window is the manufacturer's largest standard size window that will fit within the existing frame or existing rough opening.
2. The replacement window is not part of a *change of occupancy*.

Window opening control devices complying with ASTM F2090 shall be permitted for use on windows required to provide *emergency escape and rescue openings*.

402-1 307.4 Glazing in hazardous locations. Replacement glazing in hazardous locations shall comply with the safety glazing requirements of the International Building Code or International Residential Code as applicable.

Exception: Glass block walls, louvered windows and jalousies repaired with like materials.

Add new text as follows:

SECTION 308 **REROOFING AND ROOF REPAIR**

Delete without substitution:

~~**[BS] 706.1 General.** Where *alteration* work includes replacement of equipment that is supported by the building or where a reroofing permit is required, the provisions of this section shall apply.~~

Revise as follows:

[BS] 705-1 308.1 General. Materials and methods of application used for recovering or replacing an existing roof covering shall comply with the requirements of Chapter 15 of the International Building Code.

Exceptions:

1. *Roof replacement* or roof recover of existing low-slope roof coverings shall not be required to meet the minimum design slope requirement of one-quarter unit vertical in 12 units horizontal (2-percent slope) in Section 1507 of the International Building Code for roofs that provide positive roof drainage.
2. Recovering or replacing an existing roof covering shall not be required to meet the requirement for secondary (emergency overflow) drains or scuppers in Section 1502 of the International Building Code for roofs that provide for positive roof drainage. For the purposes of this exception, existing secondary drainage or scupper systems required in accordance with this code shall not be removed unless they are replaced by secondary drains or scuppers designed and installed in accordance with Section 1502 of the International Building Code.

[BS] 705-2 308.2 Structural and construction loads. Structural roof components shall be capable of supporting the roof-covering system and the material and equipment loads that will be encountered during installation of the system.

[BS] 706-2 308.3 Addition or replacement of roofing or replacement of equipment. Any existing gravity load-carrying structural element for which an *alteration* causes an increase in design dead, live or snow load, including snow drift effects, of more than 5 percent shall be replaced or

altered as needed to carry the gravity loads required by the International Building Code for new structures.

Exceptions:

1. Buildings of Group R occupancy with not more than five dwelling or sleeping units used solely for residential purposes where the altered building complies with the conventional light-frame construction methods of the International Building Code or the provisions of the International Residential Code.
2. Buildings in which the increased dead load is due entirely to the addition of a second layer of roof covering weighing 3 pounds per square foot (0.1437 kN/m²) or less over an existing single layer of roof covering.

[BS] 705.3-308.4 Roof replacement. *Roof replacement* shall include the removal of all existing layers of roof coverings down to the roof deck.

Exception: Where the existing roof assembly includes an ice barrier membrane that is adhered to the roof deck, the existing ice barrier membrane shall be permitted to remain in place and covered with an additional layer of ice barrier membrane in accordance with Section 1507 of the International Building Code.

[BS] 705.3-1-308.4.1 Roof recover. The installation of a new roof covering over an existing roof covering shall be permitted where any of the following conditions occur:

1. The new roof covering is installed in accordance with the roof covering manufacturer's *approved* instructions.
2. Complete and separate roofing systems, such as standing-seam metal roof panel systems, that are designed to transmit the roof loads directly to the building's structural system and that do not rely on existing roofs and roof coverings for support, are installed.
3. Metal panel, metal shingle and concrete and clay tile roof coverings are installed over existing wood shake roofs in accordance with Section ~~705.4-~~ 308.5.
4. A new protective *roof coating* is applied over an existing protective *roof coating*, a metal roof panel, metal roof shingles, mineral-surfaced roll roofing, a built-up roof, modified bitumen roofing, thermoset and thermoplastic single-ply roofing or a spray polyurethane foam roofing system.

[BS] 705.3-1-1-308.4.1.1 Exceptions. A roof recover shall not be permitted where any of the following conditions occur:

1. The existing roof or roof covering is water soaked or has deteriorated to the point that the existing roof or roof covering is not adequate as a base for additional roofing.
2. The existing roof covering is slate, clay, cement or asbestos-cement tile.
3. The existing roof has two or more applications of any type of roof covering.

[BS] 705.4-308.5 Roof recovering. Where the application of a new roof covering over wood shingle or shake roofs creates a combustible concealed space, the entire existing surface shall be covered with gypsum board, mineral fiber, glass fiber or other *approved* materials securely fastened in place.

[BS] 705.5-308.6 Reinstallation of materials. Existing slate, clay or cement tile shall be permitted for reinstallation, except that damaged, cracked or broken slate or tile shall not be reinstalled. Existing vent flashing, metal edgings, drain outlets, collars and metal counterflashings shall not be reinstalled where rusted, damaged or deteriorated. Aggregate surfacing materials shall not be reinstalled.

[BS] 705.6-308.7 Flashings. Flashings shall be reconstructed in accordance with *approved* manufacturer's installation instructions. Metal flashing to which bituminous materials are to be adhered shall be primed prior to installation.

[BS] 706.3-308.8 Additional requirements for reroof permits. The requirements of this section shall apply to *alteration* work requiring reroof permits.

[BS] 706.3-1-308.8.1 Bracing for unreinforced masonry bearing wall parapets. Where a permit is issued for reroofing for more than 25 percent of the roof area of a building assigned to Seismic Design Category D, E or F that has parapets constructed of unreinforced masonry, the work shall include installation of parapet bracing unless an evaluation demonstrates compliance of such items. Reduced seismic forces shall be permitted.

[BS] 706.3-2-308.8.2 Roof diaphragms resisting wind loads in high-wind regions. Where roofing materials are removed from more than 50 percent of the roof diaphragm or section of a building located where the ultimate design wind speed, *Vult*, determined in accordance with Figure 1609.3(1) of the International Building Code, is greater than 115 mph (51 m/s) or in a special wind region, as defined in Section 1609 of the International Building Code, roof diaphragms, connections of the roof diaphragm to roof framing members, and roof-to-wall connections shall be evaluated for the wind loads specified in the International Building Code, including wind uplift. If the diaphragms and connections in their current condition are not capable of resisting 75 percent of those wind loads, they shall be replaced or strengthened in accordance with the loads specified in the International Building Code.

CHAPTER 4 REPAIRS

Revise as follows:

401.1 Scope. *Repairs* shall comply with the requirements of this chapter. *Repairs to historic buildings* need only comply with Chapter 42-8.

Delete without substitution:

CHAPTER 5 PRESCRIPTIVE COMPLIANCE METHOD

SECTION 501- GENERAL

501.1 Scope. The provisions of this chapter shall control the *alteration, addition and change of occupancy of existing buildings and structures*, including *historic buildings and structures* as referenced in Section 301.3.2.

Exception: Existing bleachers, grandstands and folding and telescopic seating shall comply with IGC 300.

501.1.1 Compliance with other methods. *Alterations, additions and changes of occupancy to existing buildings and structures* shall comply with the provisions of this chapter or with one of the methods provided in Section 301.3.

501.2 Fire-resistance ratings. Where *approved by the code official*, in buildings where an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2 of the International Building Code has been added, and the building is now sprinklered throughout, the required fire-resistance ratings of building elements and materials shall be permitted to meet the requirements of the current building code. The building is required to meet the other applicable requirements of the International Building Code.

Plans, investigation and evaluation reports, and other data shall be submitted indicating which building elements and materials the applicant is requesting the *code official* to review and approve for determination of applying the current building code fire-resistance ratings. Any special construction features, including fire-resistance-rated assemblies and smoke-resistive assemblies, conditions of occupancy, means of egress conditions, fire code deficiencies, *approved modifications or approved alternative materials*, design and methods of construction, and equipment applying to the building that impact required fire-resistance ratings shall be identified in the evaluation reports submitted.

SECTION 502- ADDITIONS

502.1 General. *Additions* to any building or structure shall comply with the requirements of the International Building Code for new construction. *Alterations to the existing building or structure* shall be made to ensure that the *existing building or structure* together with the *addition* are not less complying with the provisions of the International Building Code than the *existing building or structure* was prior to the *addition*. An *existing building* together with its *additions* shall comply with the height and area provisions of Chapter 5 of the International Building Code.

[BS] 502.2 Disproportionate earthquake damage. A building assigned to Seismic Design Category D, E or F that has sustained *disproportionate earthquake damage* shall be subject to the requirements for buildings with substantial structural damage to vertical elements of the lateral force-resisting system.

[BS] 502.3 Flood hazard areas. For buildings and structures in *flood hazard areas* established in Section 1612.3 of the International Building Code, or Section R322 of the International Residential Code, as applicable, any *addition* that constitutes *substantial improvement* of the *existing structure* shall comply with the flood design requirements for new construction, and all aspects of the *existing structure* shall be brought into compliance with the requirements for new construction for flood design.

For buildings and structures in *flood hazard areas* established in Section 1612.3 of the International Building Code, or Section R322 of the International Residential Code, as applicable, any *additions* that do not constitute *substantial improvement* of the *existing structure* are not required to comply with the flood design requirements for new construction.

[BS] 502.4 Existing structural elements carrying gravity load. Any existing gravity load-carrying structural element for which an *addition* and its related *alterations* cause an increase in design dead, live or snow load, including snow drift effects, of more than 5 percent shall be replaced or altered as needed to carry the gravity loads required by the International Building Code for new structures. Any existing gravity load-carrying structural element whose vertical load-carrying capacity is decreased as part of the *addition* and its related *alterations* shall be considered to be an altered element subject to the requirements of Section 503.3. Any existing element that will form part of the lateral load path for any part of the *addition* shall be considered to be an existing lateral load-carrying structural element subject to the requirements of Section 502.5.

Exception: Buildings of Group R occupancy with not more than five dwelling or sleeping units used solely for residential purposes where the *existing building* and the *addition* together comply with the conventional light frame construction methods of the International Building Code or the provisions of the International Residential Code.

[BS] 502.5 Existing structural elements carrying lateral load. Where the *addition* is structurally independent of the *existing structure*, existing lateral load-carrying structural elements shall be permitted to remain unaltered. Where the *addition* is not structurally independent of the *existing structure*, the *existing structure* and its *addition* acting together as a single structure shall be shown to meet the requirements of Sections 1609 and 1613 of the International Building Code using full seismic forces.

Exceptions:

1. Any existing lateral load-carrying structural element whose demand-capacity ratio with the *addition* considered is not more than 10 percent greater than its demand-capacity ratio with the *addition* ignored shall be permitted to remain unaltered. For purposes of calculating demand-capacity ratios, the demand shall consider applicable load combinations with design lateral loads or forces in accordance with Sections 1609 and 1613 of the International Building Code. For purposes of this exception, comparisons of demand-capacity ratios and calculation of design lateral loads, forces and capacities shall account for the cumulative effects of *additions* and *alterations* since original construction.
2. Buildings of Group R occupancy with not more than five dwelling or sleeping units used solely for residential purposes where the *existing building* and the addition together comply with the conventional light-frame construction methods of the International Building Code or the provisions of the International Residential Code.

502.6 Smoke alarms in existing portions of a building. Where an *addition* is made to a building or structure of a Group R or I-1 occupancy, the *existing building* shall be provided with smoke alarms in accordance with Section 1103.8 of the International Fire Code.

502.7 Carbon monoxide alarms in existing portions of a building. Where an *addition* is made to a building or structure of Group I-1, I-2, I-4 or R occupancy, the existing building shall be provided with carbon monoxide alarms in accordance with Section 1103.9 of the International Fire Code or Section R315 of the International Residential Code, as applicable.

Exceptions:

1. Work involving the exterior surfaces of buildings, such as the replacement of roofing or siding, the addition or replacement of windows or doors, or the addition of porches or decks.
2. Installation, alteration or *repairs* of plumbing or mechanical systems, other than fuel-burning appliances.

502.8 Additions to Group E facilities. For *additions* to Group E occupancies, storm shelters shall be provided in accordance with Section 1106.1.

SECTION 503 ALTERATIONS

503.1 General. Except as provided by Section 302.4, 302.5 or this section, *alterations* to any building or structure shall comply with the requirements of the International Building Code for new construction. *Alterations* shall be such that the *existing building* or structure is not less complying with the provisions of the International Building Code than the *existing building* or structure was prior to the *alteration*.

Exceptions:

1. An existing stairway shall not be required to comply with the requirements of Section 1011 of the International Building Code where the existing space and construction does not allow a reduction in pitch or slope.
2. Handrails otherwise required to comply with Section 1011.11 of the International Building Code shall not be required to comply with the requirements of Section 1014.6 of the International Building Code regarding full extension of the handrails where such extensions would be hazardous because of plan configuration.
3. Where provided in below-grade transportation stations, existing and new escalators shall have a clear width of less than 32 inches (815 mm).

[BS] 503.2 Flood hazard areas. For buildings and structures in *flood hazard areas* established in Section 1612.3 of the International Building Code, or Section R322 of the International Residential Code, as applicable, any *alteration* that constitutes *substantial improvement* of the *existing structure* shall comply with the flood design requirements for new construction, and all aspects of the *existing structure* shall be brought into compliance with the requirements for new construction for flood design.

For buildings and structures in *flood hazard areas* established in Section 1612.3 of the International Building Code, or Section R322 of the International Residential Code, as applicable, any *alterations* that do not constitute *substantial improvement* of the *existing structure* are not required to comply with the flood design requirements for new construction.

[BS] 503.3 Existing structural elements carrying gravity load. Any existing gravity load-carrying structural element for which an *alteration* causes an increase in design dead, live or snow load, including snow drift effects, of more than 5 percent shall be replaced or altered as needed to carry the gravity loads required by the International Building Code for new structures. Any existing gravity load-carrying structural element whose gravity load-carrying capacity is decreased as part of the *alteration* shall be shown to have the capacity to resist the applicable design dead, live and snow loads including snow drift effects required by the International Building Code for new structures.

Exceptions:

1. Buildings of Group R occupancy with not more than five dwelling or sleeping units used solely for residential purposes where the altered building complies with the conventional light-frame construction methods of the International Building Code or the provisions of the International Residential Code.
2. Buildings in which the increased dead load is due entirely to the addition of a second layer of roof covering weighing 3 pounds per square foot (0.1437 kN/m²) or less over an existing single layer of roof covering.

[BS] 503.4 Existing structural elements carrying lateral load. Except as permitted by Section 503.13, where the *alteration* increases design lateral loads, results in a prohibited structural irregularity as defined in ASCE 7, or decreases the capacity of any existing lateral load-carrying structural element, the structure of the altered building or structure shall meet the requirements of Sections 1609 and 1613 of the International Building Code. Reduced seismic forces shall be permitted.

Exception: Any existing lateral load-carrying structural element whose demand-capacity ratio with the *alteration* considered is not more than 10 percent greater than its demand-capacity ratio with the *alteration* ignored shall be permitted to remain unaltered. For purposes of calculating demand-capacity ratios, the demand shall consider applicable load combinations with design lateral loads or forces in accordance with Sections 1609 and 1613 of the International Building Code. Reduced seismic forces shall be permitted. For purposes of this exception, comparisons of demand-capacity ratios and calculation of design lateral loads, forces and capacities shall account for the cumulative effects of *additions* and *alterations* since original construction.

[BS] 503.5 Seismic Design Category F. Where the *work area* exceeds 50 percent of the building area, and where the building is assigned to Seismic Design Category F, the structure of the altered building shall meet the requirements of Sections 1609 and 1613 of the International Building Code. Reduced seismic forces shall be permitted.

[BS] 503.6 Bracing for unreinforced masonry parapets on reroofing. Where the intended *alteration* requires a permit for reroofing and involves removal of roofing materials from more than 25 percent of the roof area of a building assigned to Seismic Design Category D, E or F that has parapets constructed of unreinforced masonry, the work shall include installation of parapet bracing to resist out-of-plane seismic forces, unless an evaluation demonstrates compliance of such items. Reduced seismic forces shall be permitted.

[BS] 503.7 Anchorage for concrete and reinforced masonry walls. Where the *work area* exceeds 50 percent of the building area, the building is assigned to Seismic Design Category C, D, E or F and the building's structural system includes concrete or reinforced masonry walls with a flexible roof diaphragm, the *alteration* work shall include installation of wall anchors at the roof line, unless an evaluation demonstrates compliance of existing wall anchorage. Use of reduced seismic forces shall be permitted.

[BS] 503.8 Anchorage for unreinforced masonry walls in major alterations. Where the *work area* exceeds 50 percent of the building area, the building is assigned to Seismic Design Category C, D, E or F and the building's structural system includes unreinforced masonry bearing walls, the *alteration* work shall include installation of wall anchors at the floor and roof lines, unless an evaluation demonstrates compliance of existing wall anchorage. Reduced seismic forces shall be permitted.

[BS] 503.9 Bracing for unreinforced masonry parapets in major alterations. Where the *work area* exceeds 50 percent of the building area, and where the building is assigned to Seismic Design Category C, D, E or F, parapets constructed of unreinforced masonry shall have bracing installed as needed to resist out-of-plane seismic forces, unless an evaluation demonstrates compliance of such items. Reduced seismic forces shall be permitted.

[BS] 503.10 Anchorage of unreinforced masonry partitions in major alterations. Where the *work area* exceeds 50 percent of the building area, and where the building is assigned to Seismic Design Category C, D, E or F, unreinforced masonry partitions and nonstructural walls within the *work area* and adjacent to egress paths from the *work area* shall be anchored, removed or altered to resist out-of-plane seismic forces, unless an evaluation demonstrates compliance of such items. Use of reduced seismic forces shall be permitted.

[BS] 503.11 Substantial structural alteration. Where the *work area* exceeds 50 percent of the building area and where work involves a *substantial structural alteration*, the lateral load-resisting system of the altered building shall satisfy the requirements of Sections 1609 and 1613 of the International Building Code. Reduced seismic forces shall be permitted.

Exceptions:

1. Buildings of Group R occupancy with not more than five dwelling or sleeping units used solely for residential purposes that are altered based on the conventional light frame construction methods of the International Building Code or in compliance with the provisions of the International Residential Code.
2. Where the intended *alteration* involves only the lowest story of a building, only the lateral load-resisting components in and below that story need comply with this section.

[BS] 503.12 Roof diaphragms resisting wind loads in high-wind regions. Where the intended *alteration* requires a permit for reroofing and involves removal of roofing materials from more than 50 percent of the roof diaphragm of a building or section of a building located where the ultimate design wind speed is greater than 115 mph (51 m/s) in accordance with Figure 1609.3(1) of the International Building Code or in a special wind region as defined in Section 1609 of the International Building Code, roof diaphragms, connections of the roof diaphragm to roof framing members, and roof-to-wall connections shall be evaluated for the wind loads specified in Section 1609 of the International Building Code, including wind uplift. If the diaphragms and connections in their current condition are not capable of resisting 75 percent of those wind loads, they shall be replaced or strengthened in accordance with the loads specified in Section 1609 of the International Building Code.

[BS] 503.13 Voluntary lateral force-resisting system alterations. Structural *alterations* that are intended exclusively to improve the lateral force-resisting system and are not required by other sections of this code shall not be required to meet the requirements of Section 1609 or Section 1613 of the International Building Code, provided that all of the following apply:

- 1- The capacity of existing structural systems to resist forces is not reduced.
- 2- New structural elements are detailed and connected to existing or new structural elements as required by the International Building Code for new construction.
- 3- New or relocated nonstructural elements are detailed and connected to existing or new structural elements as required by the International Building Code for new construction.
- 4- The *alterations* do not create a structural irregularity as defined in ASCE 7 or make an existing structural irregularity more severe.

503.14 Smoke alarms. Individual sleeping units and individual dwelling units in Group R and I-1 occupancies shall be provided with smoke alarms in accordance with Section 1103.8 of the International Fire Code.

503.15 Carbon monoxide alarms. Carbon monoxide alarms shall be provided to protect sleeping units and dwelling units in Group I-1, I-2, I-4 and R occupancies in accordance with Section 1103.9 of the International Fire Code.

Exceptions:

- 1- Work involving the exterior surfaces of buildings, such as the replacement of roofing or siding, the addition or replacement of windows or doors, or the addition of porches or decks.
- 2- Installation, alteration or *repairs* of plumbing or mechanical systems, other than fuel-burning appliances.

503.16 Refuge areas. Where *alterations* affect the configuration of an area utilized as a refuge area, the capacity of the refuge area shall not be reduced below that required in Sections 503.16.1 through 503.16.3.

503.16.1 Smoke compartments. In Group I-2 and I-3 occupancies, the required capacity of the refuge areas for smoke compartments in accordance with Sections 407.5.1 and 408.6.2 of the International Building Code shall be maintained.

503.16.2 Ambulatory care. In ambulatory care facilities required to be separated by Section 422.2 of the International Building Code, the required capacity of the refuge areas for smoke compartments in accordance with Section 422.3.2 of the International Building Code shall be maintained.

503.16.3 Horizontal exits. The required capacity of the refuge area for horizontal exits in accordance with Section 1026.4 of the International Building Code shall be maintained.

SECTION 505- WINDOWS AND EMERGENCY ESCAPE OPENINGS

505.1 Replacement glass. The installation or replacement of glass shall be as required for new installations.

505.2 Replacement window opening control devices. In Group R-2 or R-3 buildings containing dwelling units, and one- and two-family dwellings and townhouses regulated by the International Residential Code, window opening control devices complying with ASTM F2090 shall be installed where an existing window is replaced and where all of the following apply to the replacement window:

- 1- The window is operable.
- 2- The window replacement includes replacement of the sash and the frame.
- 3- One of the following applies:
 - 3.1- In Group R-2 or R-3 buildings containing dwelling units, the top of the sill of the window opening is at a height less than 36 inches (915 mm) above the finished floor.
 - 3.2- In one- and two-family dwellings and townhouses regulated by the International Residential Code, the top of the sill of the window opening is at a height less than 24 inches (610 mm) above the finished floor.
- 4- The window will permit openings that will allow passage of a 4-inch-diameter (102 mm) sphere when the window is in its largest opened position.
- 5- The vertical distance from the top of the sill of the window opening to the finished grade or other surface below, on the exterior of the building, is greater than 72 inches (1829 mm).

The window opening control device, after operation to release the control device allowing the window to fully open, shall not reduce the minimum net clear opening area of the window unit to less than the area required by Section 1030.2 of the International Building Code.

Exceptions:

- 1- Operable windows where the top of the sill of the window opening is located more than 75 feet (22 860 mm) above the finished grade or other surface below, on the exterior of the room, space or building, and that are provided with window fall prevention devices that comply with ASTM F2006.
- 2- Operable windows with openings that are provided with window fall prevention devices that comply with ASTM F2090.

505.3 Replacement window emergency escape and rescue openings. Where windows are required to provide *emergency escape and rescue*

~~openings in Group R-2 and R-3 occupancies and one- and two-family dwellings and townhouses regulated by the International Residential Code; replacement windows shall be exempt from the requirements of Sections 1030.2, 1030.3 and 1030.4 of the International Building Code and Sections R310.2.1, R310.2.2 and R310.2.3 of the International Residential Code, provided that the replacement window meets the following conditions:~~

- ~~1. The replacement window is the manufacturer's largest standard size window that will fit within the existing frame or existing rough opening. The replacement window shall be permitted to be of the same operating style as the existing window or a style that provides for an equal or greater window opening area than the existing window.~~
- ~~2. The replacement of the window is not part of a *change of occupancy*.~~

~~Window opening control devices complying with ASTM F2090 shall be permitted for use on windows required to provide emergency escape and rescue openings.~~

~~**505.4 Emergency escape and rescue openings.** Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys or tools. Bars, grilles, grates or similar devices are permitted to be placed over emergency escape and rescue openings provided that the minimum net clear opening size complies with the code that was in effect at the time of construction and such devices shall be releasable or removable from the inside without the use of a key, tool or force greater than that which is required for normal operation of the escape and rescue opening. Where such bars, grilles, grates or similar devices are installed, they shall not reduce the net clear opening of the emergency escape and rescue openings. Smoke alarms shall be installed in accordance with Section 907.2.10 of the International Building Code regardless of the valuation of the *alteration*.~~

SECTION 506 CHANGE OF OCCUPANCY

~~**506.1 Compliance.** A *change of occupancy* shall not be made in any building unless that building is made to comply with the requirements of the International Building Code for the use or occupancy. Changes of occupancy in a building or portion thereof shall be such that the *existing building* is not less complying with the provisions of this code than the *existing building* or structure was prior to the change. Subject to the approval of the building official, changes of occupancy shall be permitted without complying with all of the requirements of this code for the new occupancy, provided that the new occupancy is less hazardous, based on life and fire risk, than the existing occupancy.~~

~~Exception: The building need not be made to comply with Chapter 16 of the International Building Code unless required by Section 506.4.~~

~~**506.1.1 Change in the character of use.** A change of occupancy with no *change of occupancy* classification shall not be made to any structure that will subject the structure to any special provisions of the applicable *International Codes*, without approval of the *code official*. Compliance shall be only as necessary to meet the specific provisions and is not intended to require the entire building be brought into compliance.~~

~~**506.2 Certificate of occupancy.** A certificate of occupancy shall be issued where it has been determined that the requirements for the new occupancy classification have been met.~~

~~**506.3 Stairways.** An existing stairway shall not be required to comply with the requirements of Section 1011 of the International Building Code where the existing space and construction does not allow a reduction in pitch or slope.~~

~~**506.4 Structural.** Any building undergoing a *change of occupancy* shall satisfy the requirements of this section.~~

~~**506.4.1 Live loads.** Structural elements carrying tributary live loads from an area with a *change of occupancy* shall satisfy the requirements of Section 1607 of the International Building Code. Design live loads for areas of new occupancy shall be based on Section 1607 of the International Building Code. Design live loads for other areas shall be permitted to use previously *approved* design live loads.~~

~~**Exception:** Structural elements whose demand-capacity ratio considering the *change of occupancy* is not more than 5 percent greater than the demand-capacity ratio based on previously *approved* live loads need not comply with this section.~~

~~**506.4.2 Snow and wind loads.** Where a change of occupancy results in a structure being assigned to a higher *risk category*, the structure shall satisfy the requirements of Sections 1608 and 1609 of the International Building Code for the new *risk category*.~~

~~**Exception:** Where the area of the new occupancy is less than 10 percent of the building area, compliance with this section is not required. The cumulative effect of occupancy changes over time shall be considered.~~

~~**506.4.3 Seismic loads (seismic force-resisting system).** Where a *change of occupancy* results in a building being assigned to a higher *risk category*, the building shall satisfy the requirements of Section 1613 of the International Building Code for the new *risk category* using full seismic forces.~~

Exceptions:

- ~~1. Where the area of the new occupancy is less than 10 percent of the building area and the new occupancy is not assigned to *Risk Category IV*, compliance with this section is not required. The cumulative effect of occupancy changes over time shall be considered.~~

2. Where a change of use results in a building being reclassified from *Risk Category I* or *II* to *Risk Category III* and the seismic coefficient, *SDS*, is less than 0.33, compliance with this section is not required.
3. Unreinforced masonry bearing wall buildings assigned to *Risk Category III* and to Seismic Design Category *A* or *B*, shall be permitted to use Appendix Chapter *A1* of this code.

506.4.4 Access to Risk Category IV. Any structure that provides operational access to an adjacent structure assigned to *Risk Category IV* as the result of a *change of occupancy* shall itself satisfy the requirements of Sections 1608, 1609 and 1613 of the International Building Code. For compliance with Section 1613, International Building Code level seismic forces shall be used. Where operational access to the *Risk Category IV* structure is less than 10 feet (3048 mm) from either an interior lot line or from another structure, access protection from potential falling debris shall be provided.

SECTION 507 HISTORIC BUILDINGS

507.1 Historic buildings. The provisions of this code that require improvements relative to a building's existing condition or, in the case of *repairs*, that require improvements relative to a building's predamage condition, shall not be mandatory for *historic buildings* unless specifically required by this section.

507.2 Life safety hazards. The provisions of this code shall apply to *historic buildings* judged by the building official to constitute a distinct life safety hazard.

[BS] 507.3 Flood hazard areas. Within flood *hazard areas* established in accordance with Section 1612.3 of the International Building Code, or Section R322 of the International Residential Code, as applicable, where the work proposed constitutes *substantial improvement*, the building shall be brought into compliance with Section 1612 of the International Building Code, or Section R322 of the International Residential Code, as applicable.

Exception: *Historic buildings* meeting any of the following criteria need not be brought into compliance:

1. Listed or preliminarily determined to be eligible for listing in the National Register of Historic Places.
2. Determined by the Secretary of the U.S. Department of Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined to qualify as an historic district.
3. Designated as historic under a state or local historic preservation program that is *approved* by the Department of Interior.

[BS] 507.4 Structural. Historic buildings shall comply with the applicable structural provisions in this chapter.

Exceptions:

1. The *code official* shall be authorized to accept existing floors and existing live loads and to approve operational controls that limit the live load on any floor.
2. Repair of *substantial structural damage* is not required to comply with Sections 405.2.3, and 405.2.4. *Substantial structural damage* shall be repaired in accordance with Section 405.2.1.

CHAPTER 6_5 CLASSIFICATION OF WORK ALTERATIONS

Revise as follows:

SECTION 601_501 GENERAL

601-1 501.1 Scope: General. The provisions of this chapter shall be used in conjunction with Chapters 7 through 12 and shall apply to the *alteration, addition and change of occupancy of existing structures*, including historic and moved structures, as referenced in Section 301.3.2. The work performed on an *existing building* shall be classified in accordance with this chapter. Except as provided by Chapter 8 or this chapter, alterations to any building or structure shall comply with the requirements of the international Building Code for new construction. Alterations shall be such that the existing building or structure is no less conforming to the provisions of the international Building Code than the existing building or structure was prior to the alteration.

Exceptions:

1. An existing stairway shall not be required to comply with the requirements of Section 1011 of the International Building Code where the existing space and construction does not allow a reduction in pitch or slope.
2. Handrails otherwise required to comply with Section 1011.11 of the International Building Code shall not be required to comply with the requirements of Section 1014.6 of the International Building Code regarding full extension of the handrails where such extensions would be hazardous because of plan configuration.
3. Where provided in below-grade transportation stations, existing and new escalators shall have a clear width of less than 32

- inches (815 mm).
4. Where the current level of safety or sanitation is proposed to be reduced, the portion altered shall conform to the requirements of the International Building Code.

Delete without substitution:

~~601.1.1 Compliance with other alternatives.~~ *Alterations, additions and changes of occupancy to existing structures shall comply with the provisions of Chapters 7 through 12 or with one of the alternatives provided in Section 301.3.*

Revise as follows:

~~601.2~~ 501.2 Work area. The *work area*, as defined in Chapter 2, shall be identified on the construction documents.

Add new text as follows:

501.3 Levels of Alteration *Alterations to any existing building or structure shall be classified as the following:*

Revise as follows:

~~602.1~~ 501.3.1 Scope: Level 1. Level 1 alterations include the removal and replacement or the covering of existing materials, elements, equipment, or fixtures using new materials, elements, equipment, or fixtures that serve the same purpose.

~~602.2~~ 501.3.1.1 Application. Level 1 *alterations* shall comply with the provisions of ~~Chapter 7.~~ Section 502.

~~603.1~~ 501.3.2 Scope: Level 2. Level 2 *alterations* include the reconfiguration of space, the addition or elimination of any door or window, the reconfiguration or extension of any system, or the installation of any additional equipment.

~~603.2~~ 501.3.2.1 Application. Level 2 *alterations* shall comply with the provisions of ~~Chapter 7.~~ Section 502 for Level 1 *alterations* as well as the provisions of ~~Chapter 8.~~ Section 503.

~~604.1~~ 501.3.3 Scope: Level 3. Level 3 *alterations* apply where the *work area* exceeds 50 percent of the *building area*.

~~604.2~~ 501.3.3.1 Application. Level 3 *alterations* shall comply with the provisions of ~~Chapters 7 and 8.~~ Section 502 and 503 for Level 1 and 2 *alterations*, respectively, as well as the provisions of ~~Chapter 9.~~ Section 504.

~~[BS] 701.3~~ 501.4 Flood hazard areas. In *flood hazard areas*, *alterations* that constitute *substantial improvement* shall require that the building comply with Section 1612 of the International Building Code, or Section R322 of the International Residential Code, as applicable.

~~707.1~~ 501.5 Minimum requirements: Energy Conservation Level 1, 2, and 3 *alterations to existing buildings* or structures do not require the entire building or structure to comply with the energy requirements of the International Energy Conservation Code or International Residential Code. The *alterations* shall conform to the energy requirements of the International Energy Conservation Code or International Residential Code as they relate to new construction only.

Add new text as follows:

501.6 Accessibility Accessibility shall be provided in accordance with the applicable provisions of Section 305.

Revise as follows:

~~605.1~~ 501.7 Scope: Change of occupancy. *Change of occupancy* provisions apply where the activity is classified as a *change of occupancy* as defined in Chapter 2.

~~605.2~~ 501.7.1 Application. *Changes of occupancy* shall comply with the provisions of Chapter ~~10.~~ 6.

~~606.1~~ 501.8 Scope: Additions. Provisions for *additions* shall apply where work is classified as an *addition* as defined in Chapter 2.

~~606.2~~ 501.8.1 Application. *Additions to existing buildings* shall comply with the provisions of Chapter ~~11.~~ 7.

~~607.1~~ 501.9 Scope: Historic Buildings. *Historic building* provisions shall apply to buildings classified as historic as defined in Chapter 2.

~~607.2~~ 501.9.1 Application. Except as specifically provided for in Chapter ~~12.~~ 8, *historic buildings* shall comply with applicable provisions of this code for the type of work being performed.

~~608.1~~ 501.10 Scope: Relocated building. Relocated building provisions shall apply to relocated or moved buildings.

~~608.2~~ 501.10.1 Application. Relocated buildings shall comply with the provisions of ~~Chapter 14.~~ Chapter 10.

Delete without substitution:

~~CHAPTER 7 ALTERATIONS—LEVEL 1~~

Revise as follows:

SECTION 701.502 GENERAL ALTERATION—LEVEL 1

~~701.1 502.1~~ **Scope.** Level 1 *alterations* as described in Section ~~602-501.3.1~~ shall comply with the requirements of this chapter. Level 1 *alterations* to *historic buildings* shall comply with this chapter, except as modified in Chapter ~~42-8~~.

Delete without substitution:

~~701.2 Conformance.~~ An *existing building* or portion thereof shall not be altered such that the building becomes less safe than its existing condition.

~~Exception:~~ Where the current level of safety or sanitation is proposed to be reduced, the portion altered shall conform to the requirements of the International Building Code.

Revise as follows:

~~703.1 502.2~~ **General: Fire Protection.** *Alterations* shall be done in a manner that maintains the level of fire protection provided.

~~704.1 502.3~~ **General: Means of Egress.** *Alterations* shall be done in a manner that maintains the level of protection provided for the means of egress.

Add new text as follows:

502.4 Building elements and materials. Building elements and materials shall comply with the applicable provisions of Section 502.4.1 through 502.4.5.

Revise as follows:

~~702.1 502.4.1~~ **Interior finishes.** Newly installed interior wall and ceiling finishes shall comply with Chapter 8 of the International Building Code.

~~702.2 502.4.2~~ **Interior floor finish.** New interior floor finish, including new carpeting used as an interior floor finish material, shall comply with Section 804 of the International Building Code.

~~702.3 502.4.3~~ **Interior trim.** Newly installed interior trim materials shall comply with Section 806 of the International Building Code.

~~702.6 502.4.4~~ **Materials and methods.** New work shall comply with the materials and methods requirements in the International Building Code, International Energy Conservation Code, International Mechanical Code, and International Plumbing Code, as applicable, that specify material standards, detail of installation and connection, joints, penetrations, and continuity of any element, component, or system in the building.

[FG] ~~702.6.1 502.4.5~~ **International Fuel Gas Code.** The following sections of the International Fuel Gas Code shall constitute the fuel gas materials and methods requirements for Level 1 *alterations*.

1. Chapter 3, entitled "General Regulations," except Sections 303.7 and 306.
2. Chapter 4, entitled "Gas Piping Installations," except Sections 401.8 and 402.3.
 - 2.1. Sections 401.8 and 402.3 shall apply where the work being performed increases the load on the system such that the existing pipe does not meet the size required by code. Existing systems that are modified shall not require resizing as long as the load on the system is not increased and the system length is not increased even if the altered system does not meet code minimums.
3. Chapter 5, entitled "Chimneys and Vents."
4. Chapter 6, entitled "Specific Appliances."

Delete without substitution:

~~CHAPTER 8 ALTERATIONS—LEVEL 2~~

Add new text as follows:

SECTION 503 ALTERATIONS-LEVEL 2

Revise as follows:

~~801.1 503.1~~ **Scope.** Level 2 *alterations* as described in Section ~~603-501.3~~ shall comply with the requirements of this chapter.

Exception: Buildings in which the reconfiguration is exclusively the result of compliance with the accessibility requirements of Section 305.7 shall be permitted to comply with ~~Chapter 7, Section 602.~~

~~801-2~~ **503.2 Alteration Level 1 compliance.** In addition to the requirements of this chapter, all work shall comply with the requirements of ~~Chapter 7, Section 502.~~

~~801-3~~ **503.3 Compliance.** New construction elements, components, systems, and spaces shall comply with the requirements of the International Building Code.

Exceptions:

1. Where windows are added they are not required to comply with the light and ventilation requirements of the International Building Code.
2. Newly installed electrical equipment shall comply with the requirements of Section 807.
3. The length of dead-end corridors in newly constructed spaces shall only be required to comply with the provisions of Section 805.6.
4. The minimum ceiling height of the newly created habitable and occupiable spaces and corridors shall be 7 feet (2134 mm).
5. Where provided in below-grade transportation stations, existing and new escalators shall be permitted to have a clear width of less than 32 inches (815 mm).
6. New structural members and connections shall be permitted to comply with alternative design criteria in accordance with Section 302.

~~802-1~~ **503.4 Scope: Building elements and materials.** The requirements of this section are limited to *work areas* in which Level 2 *alterations* are being performed and shall apply beyond the work area where specified.

~~802-2~~ **503.4.1 Vertical openings.** Existing vertical openings shall comply with the provisions of Sections ~~802-2-1~~ 503.4.1.1, ~~802-2-2~~ 503.4.1.2, and ~~802-2-3~~ 503.4.1.3.

~~802-2-1~~ **503.4.1.1 Existing vertical openings.** Existing interior vertical openings connecting two or more floors shall be enclosed with *approved* assemblies having a fire-resistance rating of not less than 1 hour with *approved* opening protectives.

Exceptions:

1. Where vertical opening enclosure is not required by the International Building Code or the International Fire Code.
2. Interior vertical openings other than stairways may be blocked at the floor and ceiling of the *work area* by installation of not less than 2 inches (51 mm) of solid wood or equivalent construction.
3. The enclosure shall not be required where:
 - 3.1. Connecting the main floor and mezzanines; or
 - 3.2. All of the following conditions are met:
 - 3.2.1. The communicating area has a low-hazard occupancy or has a moderate-hazard occupancy that is protected throughout by an automatic sprinkler system.
 - 3.2.2. The lowest or next-to-the-lowest level is a street floor.
 - 3.2.3. The entire area is open and unobstructed in a manner such that it is reasonable to assume that a fire in any part of the interconnected spaces will be readily obvious to all of the occupants.
 - 3.2.4. Exit capacity is sufficient to provide egress simultaneously for all occupants of all levels by considering all areas to be a single floor area for the determination of required exit capacity.
 - 3.2.5. Each floor level, considered separately, has not less than one-half of its individual required exit capacity provided by an exit or exits leading directly out of that level without having to traverse another communicating floor level or be exposed to the smoke or fire spreading from another communicating floor level.
4. In Group A occupancies, a minimum 30-minute enclosure shall be provided to protect all vertical openings not exceeding three stories.
5. In Group B occupancies, a minimum 30-minute enclosure shall be provided to protect all vertical openings not exceeding three stories. This enclosure, or the enclosure specified in Section ~~802-2-1~~ 503.4.1.1, shall not be required in the following locations:
 - 5.1. Buildings not exceeding 3,000 square feet (279 m²) per floor.
 - 5.2. Buildings protected throughout by an *approved* automatic fire sprinkler system.
6. In Group E occupancies, the enclosure shall not be required for vertical openings not exceeding three stories where the building is protected throughout by an *approved* automatic fire sprinkler system.
7. In Group F occupancies, the enclosure shall not be required in the following locations:
 - 7.1. Vertical openings not exceeding three stories.
 - 7.2. Special-purpose occupancies where necessary for manufacturing operations and direct access is provided to not fewer than one protected stairway.
 - 7.3. Buildings protected throughout by an *approved* automatic sprinkler system.
8. In Group H occupancies, the enclosure shall not be required for vertical openings not exceeding three stories where necessary

- for manufacturing operations and every floor level has direct access to not fewer than two remote enclosed stairways or other *approved* exits.
9. In Group M occupancies, a minimum 30-minute enclosure shall be provided to protect all vertical openings not exceeding three stories. This enclosure, or the enclosure specified in Section ~~802.2.1~~ 503.4.1.1, shall not be required in the following locations:
 - 9.1. Openings connecting only two floor levels.
 - 9.2. Occupancies protected throughout by an *approved* automatic sprinkler system.
 10. In Group R-1 occupancies, the enclosure shall not be required for vertical openings not exceeding three stories in the following locations:
 - 10.1. Buildings protected throughout by an *approved* automatic sprinkler system.
 - 10.2. Buildings with less than 25 dwelling units or sleeping units where every sleeping room above the second floor is provided with direct access to a fire escape or other *approved* second exit by means of an *approved* exterior door or window having a sill height of not greater than 44 inches (1118 mm) and where both of the following conditions are met:
 - 10.2.1. Any exit access corridor exceeding 8 feet (2438 mm) in length that serves two means of egress, one of which is an unprotected vertical opening, shall have not fewer than one of the means of egress separated from the vertical opening by a 1-hour fire barrier.
 - 10.2.2. The building is protected throughout by an automatic fire alarm system, installed and supervised in accordance with the International Building Code.
 11. In Group R-2 occupancies, a minimum 30-minute enclosure shall be provided to protect all vertical openings not exceeding three stories. This enclosure, or the enclosure specified in Section ~~802.2.1~~ 503.4.1.1, shall not be required in the following locations:
 - 11.1. Vertical openings not exceeding two stories with not more than four dwelling units per floor.
 - 11.2. Buildings protected throughout by an *approved* automatic sprinkler system.
 - 11.3. Buildings with not more than four dwelling units per floor where every sleeping room above the second floor is provided with direct access to a fire escape or other *approved* second exit by means of an *approved* exterior door or window having a sill height of not greater than 44 inches (1118 mm) and the building is protected throughout by an automatic fire alarm system complying with Section 803.4.
 12. One- and two-family dwellings.
 13. Group S occupancies where connecting not more than two floor levels or where connecting not more than three floor levels and the structure is equipped throughout with an *approved* automatic sprinkler system.
 14. Group S occupancies where vertical opening protection is not required for open parking garages and ramps.

~~802.2.2~~ 503.4.1.2 Supplemental shaft and floor opening enclosure requirements. Where the *work area* on any floor exceeds 50 percent of that floor area, the enclosure requirements of Section ~~802.2~~ 503.4.1 shall apply to vertical openings other than stairways throughout the floor.

Exception: Vertical openings located in tenant spaces that are entirely outside the *work area*.

~~802.2.3~~ 503.4.1.3 Supplemental stairway enclosure requirements. Where the *work area* on any floor exceeds 50 percent of that floor area, stairways that are part of the means of egress serving the *work area* shall, at a minimum, be enclosed with smoke-tight construction on the highest *work area* floor and all floors below.

Exception: Where stairway enclosure is not required by the International Building Code or the International Fire Code.

~~802.3~~ 503.4.2 Smoke compartments. In Group I-2 occupancies where the *work area* is on a story used for sleeping rooms for more than 30 patients, the story shall be divided into not less than two compartments by smoke barrier walls in accordance with Section 407.5 of the International Building Code as required for new construction.

~~802.4~~ 503.4.3 Interior finish. The interior finish of walls and ceilings in exits and corridors in any *work area* shall comply with the requirements of the International Building Code.

Exception: Existing interior finish materials that do not comply with the interior finish requirements of the International Building Code shall be permitted to be treated with an *approved* fire-retardant coating in accordance with the manufacturer's instructions to achieve the required rating.

~~802.4.1~~ 503.4.3.1 Supplemental interior finish requirements. Where the *work area* on any floor exceeds 50 percent of the floor area, Section ~~802.4~~ 503.4.3 shall apply to the interior finish in exits and corridors serving the *work area* throughout the floor.

Exception: Interior finish within tenant spaces that are entirely outside the *work area*.

~~802.5~~ 503.4.4 Guards. The requirements of Sections ~~802.5.1~~ 503.4.4.1 and ~~802.5.2~~ 503.4.4.2 shall apply in all *work areas*.

~~802.5.1~~ 503.4.4.1 Minimum requirement. Every portion of a floor, such as a balcony or a loading dock, that is more than 30 inches (762 mm) above the floor or grade below and is not provided with guards, or those in which the existing guards are judged to be in danger of collapsing, shall be provided with guards.

~~802.5.2~~ 503.4.4.2 Design. Where there are no guards or where existing guards must be replaced, the guards shall be designed and installed in accordance with the International Building Code.

~~803-6~~ 503.4.5 Fire-resistance ratings. Where *approved* by the *code official*, buildings where an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2 of the International Building Code has been added, and the building is now sprinklered throughout, the required fire-resistance ratings of building elements and materials shall be permitted to meet the requirements of the current building code. The building is required to meet the other applicable requirements of the International Building Code.

Plans, investigation and evaluation reports, and other data shall be submitted indicating which building elements and materials the applicant is requesting the *code official* to review and approve for determination of applying the current building code fire-resistance ratings. Any special construction features, including fire-resistance-rated assemblies and smoke-resistive assemblies, conditions of occupancy, means-of-egress conditions, fire code deficiencies, *approved* modifications or *approved* alternative materials, design and methods of construction, and equipment applying to the building that impact required fire-resistance ratings shall be identified in the evaluation reports submitted.

~~803-1~~ 503.5 Scope: Fire Protection. The requirements of this section shall be limited to *work areas* in which Level 2 *alterations* are being performed, and where specified they shall apply throughout the floor on which the *work areas* are located or otherwise beyond the *work area*.

~~803-1-1~~ 503.5.1 Corridor ratings. Where an *approved* automatic sprinkler system is installed throughout the story, the required fire-resistance rating for any corridor located on the story shall be permitted to be reduced in accordance with the International Building Code. In order to be considered for a corridor rating reduction, such system shall provide coverage for the stairway landings serving the floor and the intermediate landings immediately below.

~~803-2~~ 503.5.2 Automatic sprinkler systems. Automatic sprinkler systems shall be provided in accordance with the requirements of Sections ~~803-2-1~~ 503.5.2.1 through ~~803-2-4~~ 503.5.2.4. Installation requirements shall be in accordance with the International Building Code.

~~803-2-1~~ 503.5.2.1 High-rise buildings. In high-rise buildings, *work areas* that have exits or corridors shared by more than one tenant or that have exits or corridors serving an occupant load greater than 30 shall be provided with automatic sprinkler protection in the entire *work area* where the *work area* is located on a floor that has a sufficient sprinkler water supply system from an existing standpipe or a sprinkler riser serving that floor.

~~803-2-1-1~~ 503.5.2.1.1 Supplemental automatic sprinkler system requirements. Where the *work area* on any floor exceeds 50 percent of that floor area, Section ~~803-2-1~~ 503.5.2.1 shall apply to the entire floor on which the *work area* is located.

Exception: Occupied tenant spaces that are entirely outside the *work area*.

~~803-2-2~~ 503.5.2.2 Groups A, B, E, F-1, H, I, M, R-1, R-2, R-4, S-1 and S-2. In buildings with occupancies in Groups A, B, E, F-1, H, I, M, R-1, R-2, R-4, S-1 and S-2, *work areas* that have exits or corridors shared by more than one tenant or that have exits or corridors serving an occupant load greater than 30 shall be provided with automatic sprinkler protection where both of the following conditions occur:

1. The *work area* is required to be provided with automatic sprinkler protection in accordance with the International Building Code as applicable to new construction.
2. The *work area* exceeds 50 percent of the floor area.

Exception: If the building does not have sufficient municipal water supply for design of a fire sprinkler system available to the floor without installation of a new fire pump, *work areas* shall be protected by an automatic smoke detection system throughout all occupiable spaces other than sleeping units or individual dwelling units that activates the occupant notification system in accordance with Sections 907.4, 907.5 and 907.6 of the International Building Code.

~~803-2-2-1~~ 503.5.2.2.1 Mixed uses. In *work areas* containing mixed uses, one or more of which requires automatic sprinkler protection in accordance with Section ~~803-2-2~~ 503.5.2.2, such protection shall not be required throughout the *work area* provided that the uses requiring such protection are separated from those not requiring protection by fire-resistance-rated construction having a minimum 2-hour rating for Group H and a minimum 1-hour rating for all other occupancy groups.

~~803-2-3~~ 503.5.2.3 Windowless stories. Work located in a windowless story, as determined in accordance with the International Building Code, shall be sprinklered where the *work area* is required to be sprinklered under the provisions of the International Building Code for newly constructed buildings and the building has a sufficient municipal water supply without installation of a new fire pump.

~~803-2-4~~ 503.5.2.4 Supervision. Fire sprinkler systems required by this section shall be supervised by one of the following methods:

1. *Approved* central station system in accordance with NFPA 72.
2. *Approved* proprietary system in accordance with NFPA 72.
3. *Approved* remote station system of the jurisdiction in accordance with NFPA 72.
4. Where *approved* by the *code official*, *approved* local alarm service that will cause the sounding of an alarm in accordance with NFPA 72.

Exception: Supervision is not required for the following:

1. Underground gate valve with roadway boxes.
2. Halogenated extinguishing systems.
3. Carbon dioxide extinguishing systems.

4. Dry- and wet-chemical extinguishing systems.
5. Automatic sprinkler systems installed in accordance with NFPA 13R where a common supply main is used to supply both domestic and automatic sprinkler systems and a separate shutoff valve for the automatic sprinkler system is not provided.

~~803.3~~ 503.5.3 Standpipes. Where the *work area* includes exits or corridors shared by more than one tenant and is located more than 50 feet (15 240 mm) above or below the lowest level of fire department access, a standpipe system shall be provided. Standpipes shall have an *approved* fire department connection with hose connections at each floor level above or below the lowest level of fire department access. Standpipe systems shall be installed in accordance with the International Building Code.

Exceptions:

1. A pump shall not be required provided that the standpipes are capable of accepting delivery by fire department apparatus of not less than 250 gallons per minute (gpm) at 65 pounds per square inch (psi) (946 L/m at 448KPa) to the topmost floor in buildings equipped throughout with an automatic sprinkler system or not less than 500 gpm at 65 psi (1892 L/m at 448KPa) to the topmost floor in all other buildings. Where the standpipe terminates below the topmost floor, the standpipe shall be designed to meet (gpm/psi) (L/m/KPa) requirements of this exception for possible future extension of the standpipe.
2. The interconnection of multiple standpipe risers shall not be required.

~~803.4~~ 503.5.4 Fire alarm and detection. An *approved* fire alarm system shall be installed in accordance with Sections ~~803.4.1~~ 503.5.4.1 through ~~803.4.3~~ 503.5.4.3. Where automatic sprinkler protection is provided in accordance with Section ~~803.2~~ 503.5.2 and is connected to the building fire alarm system, automatic heat detection shall not be required.

An *approved* automatic fire detection system shall be installed in accordance with the provisions of this code and NFPA 72. Devices, combinations of devices, appliances, and equipment shall be *approved*. The automatic fire detectors shall be smoke detectors, except that an *approved* alternative type of detector shall be installed in spaces such as boiler rooms, where products of combustion are present during normal operation in sufficient quantity to actuate a smoke detector.

~~803.4.1~~ 503.5.4.1 Occupancy requirements. A fire alarm system shall be installed in accordance with Sections ~~803.4.1.1~~ 503.5.4.1.1 through ~~803.4.1.6~~ 503.5.4.1.6. Existing alarm-notification appliances shall be automatically activated throughout the building. Where the building is not equipped with a fire alarm system, alarm-notification appliances within the *work area* shall be provided and automatically activated.

Exceptions:

1. Occupancies with an existing, previously *approved* fire alarm system.
2. Where selective notification is permitted, alarm-notification appliances shall be automatically activated in the areas selected.

~~803.4.1.1~~ 503.5.4.1.1 Group E. A fire alarm system shall be installed in *work areas* of Group E occupancies as required by the International Fire Code for existing Group E occupancies.

~~803.4.1.2~~ 503.5.4.1.2 Group I-1. A fire alarm system shall be installed in *work areas* of Group I-1 residential care/assisted living facilities as required by the International Fire Code for existing Group I-1 occupancies.

~~803.4.1.3~~ 503.5.4.1.3 Group I-2. A fire alarm system shall be installed throughout Group I-2 occupancies as required by the International Fire Code.

~~803.4.1.4~~ 503.5.4.1.4 Group I-3. A fire alarm system shall be installed in *work areas* of Group I-3 occupancies as required by the International Fire Code.

~~803.4.1.5~~ 503.5.4.1.5 Group R-1. A fire alarm system shall be installed in Group R-1 occupancies as required by the International Fire Code for existing Group R-1 occupancies.

~~803.4.1.6~~ 503.5.4.1.6 Group R-2. A fire alarm system shall be installed in *work areas* of Group R-2 apartment buildings as required by the International Fire Code for existing Group R-2 occupancies.

~~803.4.2~~ 503.5.4.2 Supplemental fire alarm system requirements. Where the *work area* on any floor exceeds 50 percent of that floor area, Section ~~803.4.1~~ 503.5.4.1 shall apply throughout the floor.

Exception: Alarm-initiating and notification appliances shall not be required to be installed in tenant spaces outside of the *work area*.

~~803.4.3~~ 503.5.4.3 Smoke alarms. Individual sleeping units and individual dwelling units in any *work area* in Group R and I-1 occupancies shall be provided with smoke alarms in accordance with the International Fire Code.

Exception: Interconnection of smoke alarms outside of the *work area* shall not be required.

~~804.1~~ 503.6 Carbon monoxide alarms. Any *work area* in Group I-1, I-2, I-4 and R occupancies shall be equipped with carbon monoxide alarms in accordance with Section 1103.9 of the International Fire Code.

Exceptions:

1. Work involving the exterior surfaces of buildings, such as the replacement of roofing or siding, the addition or replacement of windows or doors, or the addition of porches or decks.
2. Installation, alteration or *repairs* of plumbing or mechanical systems, other than fuel-burning appliances.

~~805.2~~ 503.7 ~~General.~~ Means of egress. The means of egress shall comply with the requirements of ~~this section.~~ Section 503.7.

Exceptions:

1. Where the *work area* and the means of egress serving it complies with NFPA 101.
2. Means of egress complying with the requirements of the building code under which the building was constructed shall be considered to be compliant means of egress if, in the opinion of the *code official*, they do not constitute a distinct hazard to life.

~~805.1~~ 503.7.1 ~~Scope.~~ General. The requirements of this section shall be limited to *work areas* that include exits or corridors shared by more than one tenant within the *work area* in which Level 2 *alterations* are being performed, and where specified they shall apply throughout the floor on which the *work areas* are located or otherwise beyond the *work area*.

~~805.3~~ 503.7.2 **Number of exits.** The number of exits shall be in accordance with Sections ~~805.3.1~~ 503.7.2.1 through ~~805.3.3~~ 503.7.2.3.

~~805.3.1~~ 503.7.2.1 **Minimum number.** Every story utilized for human occupancy on which there is a *work area* that includes exits or corridors shared by more than one tenant within the *work area* shall be provided with the minimum number of exits based on the occupancy and the occupant load in accordance with the International Building Code. In addition, the exits shall comply with Sections ~~805.3.1.1~~ 503.7.2.1.1 and ~~805.3.1.2~~ 503.7.2.1.2.

~~805.3.1.1~~ 503.7.2.1.1 **Single-exit buildings.** A single exit or access to a single exit shall be permitted from spaces, any story or any occupied roof where one of the following conditions exists:

1. The occupant load, number of dwelling units and exit access travel distance do not exceed the values in Table ~~805.3.1.1~~ 503.7.2.1.1(1) or ~~805.3.1.1~~ 503.7.2.1.1(2).
2. In Group R-1 or R-2, nonsprinklered buildings, individual single-story or multiple-story dwelling or sleeping units shall be permitted to have a single exit or access to a single exit from the dwelling or sleeping unit provided one of the following criteria are met:
 - 2.1. The occupant load is not greater than 10 and the exit access travel distance within the unit does not exceed 75 feet (22 860 mm).
 - 2.2. The building is not more than three stories in height; all third-story space is part of dwelling with an exit access doorway on the second story; and the portion of the exit access travel distance from the door to any habitable room within any such unit to the unit entrance doors does not exceed 50 feet (15 240 mm).
3. In buildings of Group R-2 occupancy of any number of stories with not more than four dwelling units per floor served by an interior exit stairway; with a smokeproof enclosure in accordance with Sections 909.20 and 1023.11 of the International Building Code or an exterior stairway as an exit; and where the portion of the exit access travel distance from the dwelling unit entrance door to the exit is not greater than 20 feet (6096 mm).

**TABLE ~~805.3.1.1~~ 503.7.2.1.1(1)
STORIES WITH ONE EXIT OR ACCESS TO ONE EXIT FOR R-2 OCCUPANCIES**

STORY	OCCUPANCY	MAXIMUM NUMBER OF DWELLING UNITS	MAXIMUM EXIT ACCESS TRAVEL DISTANCE (feet)
Basement, first or second story above grade plane	R-2 ^a	4 dwelling units	50
Third story above grade plane and higher	NP	NA	NA

For SI: 1 foot = 304.8 mm.

NP = Not Permitted.

NA = Not Applicable.

- a. Group R-2, nonsprinklered and provided with emergency escape and rescue openings in accordance with Section 1030 of the International Building Code.

**TABLE ~~805.3.1.1~~ 503.7.2.1.1(2)
STORIES WITH ONE EXIT OR ACCESS TO ONE EXIT FOR OTHER OCCUPANCIES**

STORY	OCCUPANCY	MAXIMUM OCCUPANT LOAD PER STORY	MAXIMUM EXIT ACCESS TRAVEL DISTANCE (feet)
First story above or below grade plane	B, F-2, S-2 ^a	35	75
Second story above grade plane	B, F-2, S-2 ^a	35	75
Third story above grade plane and higher	NP	NA	NA

For SI: 1 foot = 304.8 mm.

NP = Not Permitted.

NA = Not Applicable.

- a. The length of exit access travel distance in a Group S-2 open parking garage shall be not more than 100 feet.

Delete without substitution:

805.3.1.2 Fire escapes required. For other than Group I-2, where more than one exit is required, an existing or newly constructed fire escape complying with Section 805.3.1.2.1 shall be accepted as providing one of the required means of egress.

805.3.1.2.1 Fire escape access and details. Fire escapes shall comply with all of the following requirements:

- 1- Occupants shall have unobstructed access to the fire escape without having to pass through a room subject to locking.
- 2- Access to a new fire escape shall be through a door, except that windows shall be permitted to provide access from single dwelling units or sleeping units in Group R-1, R-2 and I-1 occupancies or to provide access from spaces having a maximum occupant load of 10 in other occupancy classifications.
 - 2.1- The window shall have a minimum net clear opening of 5.7 square feet (0.53 m²) or 5 square feet (0.46 m²) where located at grade.
 - 2.2- The minimum net clear opening height shall be 24 inches (610 mm) and net clear opening width shall be 20 inches (508 mm).
 - 2.3- The bottom of the clear opening shall not be greater than 44 inches (1118 mm) above the floor.
 - 2.4- The operation of the window shall comply with the operational constraints of the International Building Code.
- 3- Newly constructed fire escapes shall be permitted only where exterior stairways cannot be utilized because of lot lines limiting the stairway size or because of the sidewalks, alleys, or roads at grade level.
- 4- Openings within 10 feet (3048 mm) of fire escape stairways shall be protected by fire assemblies having minimum ³/₄ hour fire-resistance ratings.

Exception: Opening protection shall not be required in buildings equipped throughout with an *approved* automatic sprinkler system.

- 5- In all buildings of Group E occupancy, up to and including the 12th grade, buildings of Group I occupancy, rooming houses and childcare centers, ladders of any type are prohibited on fire escapes used as a required means of egress.

805.3.1.2.2 Construction. The fire escape shall be designed to support a live load of 100 pounds per square foot (4788 Pa) and shall be constructed of steel or other *approved noncombustible materials*. Fire escapes constructed of wood not less than nominal 2 inches (51 mm) thick are permitted on buildings of Type V construction. Walkways and railings located over or supported by combustible roofs in buildings of Types III and IV construction are permitted to be of wood not less than nominal 2 inches (51 mm) thick.

805.3.1.2.3 Dimensions. Stairways shall be not less than 22 inches (559 mm) wide with risers not more than, and treads not less than, 8 inches (203 mm). Landings at the foot of stairways shall be not less than 40 inches (1016 mm) wide by 36 inches (914 mm) long and located not more than 8 inches (203 mm) below the door.

Revise as follows:

805.3.2 503.7.2.2 Mezzanines. Mezzanines in the *work area* and with an occupant load of more than 50 or in which the travel distance to an exit exceeds 75 feet (22 860 mm) shall have access to not fewer than two independent means of egress.

Exception: Two independent means of egress are not required where the travel distance to an exit does not exceed 100 feet (30 480 mm) and the building is protected throughout with an automatic sprinkler system.

805.3.3 503.7.2.3 Main entrance—Group A. Buildings of Group A with an occupant load of 300 or more shall be provided with a main entrance capable of serving as the main exit with an egress capacity of not less than one-half of the total occupant load. The remaining exits shall be capable

of providing one-half of the total required exit capacity.

Exception: Where a main exit is not well defined or where multiple main exits are provided, exits shall be permitted to be distributed around the perimeter of the building provided that the total width of egress is not less than 100 percent of the required width.

~~805.4.1~~ **503.7.3 Egress doorways.** Egress doorways in any *work area* shall comply with Sections ~~805.4.1-503.7.3.1~~ through ~~805.4.5-503.7.3.5~~.

~~805.4.1~~ **503.7.3.1 Two egress doorways required.** Work areas shall be provided with two egress doorways in accordance with the requirements of Sections ~~805.4.1.1-503.7.3.1.1~~ and ~~805.4.1.2-503.7.3.1.2~~.

~~805.4.1.1~~ **503.7.3.1.1 Occupant load and travel distance.** In any *work area*, all rooms and spaces having an occupant load greater than 50 or in which the travel distance to an exit exceeds 75 feet (22 860 mm) shall have not fewer than two egress doorways.

Exceptions:

1. Storage rooms having a maximum occupant load of 10.
2. Where the *work area* is served by a single exit in accordance with Section ~~805.3.1.1-503.7.2.1.1~~.

~~805.4.1.2~~ **503.7.3.1.2 Group I-2.** In buildings of Group I-2 occupancy, any patient sleeping room or suite of patient rooms greater than 1,000 square feet (93 m²) within the *work area* shall have not fewer than two egress doorways.

~~805.4.2~~ **503.7.3.2 Door swing.** In the *work area* and in the egress path from any *work area* to the exit discharge, all egress doors serving an occupant load greater than 50 shall swing in the direction of exit travel.

~~805.4.2.1~~ **503.7.3.2.1 Supplemental requirements for door swing.** Where the *work area* exceeds 50 percent of the floor area, door swing shall comply with Section ~~805.4.2-503.7.3~~ throughout the floor.

Exception: Means of egress within or serving only a tenant space that is entirely outside the *work area*.

~~805.4.3~~ **503.7.3.3 Door closing.** In any *work area*, all doors opening onto an exit passageway at grade or an exit stairway shall be self-closing or automatic-closing by listed closing devices.

Exceptions:

1. Where exit enclosure is not required by the International Building Code.
2. Means of egress within or serving only a tenant space that is entirely outside the *work area*.

~~805.4.3.1~~ **503.7.3.3.1 Supplemental requirements for door closing.** Where the *work area* exceeds 50 percent of the floor area, doors shall comply with Section ~~805.4.3-503.7.3.3~~ throughout the exit stairway from the *work area* to, and including, the level of exit discharge.

~~805.4.4~~ **503.7.3.4 Panic hardware.** In any *work area*, and in the egress path from any *work area* to the exit discharge, in buildings or portions thereof of Group A assembly occupancies with an occupant load greater than 100, all required exit doors equipped with latching devices shall be equipped with *approved* panic hardware.

~~805.4.4.1~~ **503.7.3.4.1 Supplemental requirements for panic hardware.** Where the *work area* exceeds 50 percent of the floor area, panic hardware shall comply with Section ~~805.4.4-503.7.4~~ throughout the floor.

Exception: Means of egress within a tenant space that is entirely outside the *work area*.

~~805.4.5~~ **503.7.3.5 Emergency power source in Group I-3.** Power-operated sliding doors or power-operated locks for swinging doors shall be operable by a manual release mechanism at the door. Emergency power shall be provided for the doors and locks in accordance with Section 2702 of the International Building Code.

Exceptions:

1. Emergency power is not required in facilities with 10 or fewer locks complying with the exception to Section 408.4.1 of the International Building Code.
2. Emergency power is not required where remote mechanical operating releases are provided.

~~805.5~~ **503.7.4 Openings in corridor walls.** Openings in corridor walls in any *work area* shall comply with Sections ~~805.5.1-503.7.4.1~~ through ~~805.5.4-503.7.4.4~~.

Exception: Openings in corridors where such corridors are not required to be rated in accordance with the International Building Code.

~~805.5.1~~ **503.7.4.1 Corridor doors.** Corridor doors in the *work area* shall not be constructed of hollow core wood and shall not contain louvers. Dwelling unit or sleeping unit corridor doors in *work areas* in buildings of Groups R-1, R-2, and I-1 shall be not less than 1³/₈-inch (35 mm) solid core

wood or *approved* equivalent and shall not have any glass panels, other than *approved* wired glass or other *approved* glazing material in metal frames. Dwelling unit or sleeping unit corridor doors in *work areas* in buildings of Groups R-1, R-2, and I-1 shall be equipped with *approved* door closers. Replacement doors shall be 1³/₄-inch (44 mm) solid bonded wood core or *approved* equivalent, unless the existing frame will accommodate only a 1³/₈-inch (35 mm) door.

Exceptions:

1. Corridor doors within a dwelling unit or sleeping unit.
2. Existing doors meeting the requirements of *Guidelines on Fire Ratings of Archaic Materials and Assemblies* (IEBC Resource A) for a rating of 15 minutes or more shall be accepted as meeting the provisions of this requirement.
3. Existing doors in buildings protected throughout with an *approved* automatic sprinkler system shall be required only to resist smoke, be reasonably tight fitting, and shall not contain louvers.
4. In group homes with not more than 15 occupants and that are protected with an *approved* automatic detection system, closing devices are not required.
5. Door assemblies having a fire protection rating of not less than 20 minutes.

~~805.5.2~~ 503.7.4.2 Transoms. In all buildings of Group I-1, I-2, R-1 and R-2 occupancies, all transoms in corridor walls in *work areas* shall be either glazed with 1/4-inch (6.4 mm) wired glass set in metal frames or other glazing assemblies having a fire protection rating as required for the door and permanently secured in the closed position or sealed with materials consistent with the corridor construction.

~~805.5.3~~ 503.7.4.3 Other corridor openings. In any *work area*, any other sash, grille, or opening in a corridor and any window in a corridor not opening to the outside air shall be sealed with materials consistent with the corridor construction.

~~805.5.3.1~~ 503.7.4.3.1 Supplemental requirements for other corridor opening. Where the *work area* exceeds 50 percent of the floor area, Section ~~805.5.3~~ 503.7.4.3 shall be applicable to all corridor windows, grills, sashes, and other openings on the floor.

Exception: Means of egress within or serving only a tenant space that is entirely outside the *work area*.

~~805.5.4~~ 503.7.4.4 Supplemental requirements for corridor openings. Where the *work area* on any floor exceeds 50 percent of the floor area, the requirements of Sections ~~805.5.4~~ 503.7.4.1 through ~~805.5.3~~ 503.7.4.3 shall apply throughout the floor.

~~805.6~~ 503.7.5 Dead-end corridors. Dead-end corridors in any *work area* shall not exceed 35 feet (10 670 mm).

Exceptions:

1. Where dead-end corridors of greater length are permitted by the International Building Code.
2. In other than Group A and H occupancies, the maximum length of an existing dead-end corridor shall be 50 feet (15 240 mm) in buildings equipped throughout with an automatic fire alarm system installed in accordance with the International Building Code.
3. In other than Group A and H occupancies, the maximum length of an existing dead-end corridor shall be 70 feet (21 356 mm) in buildings equipped throughout with an automatic sprinkler system installed in accordance with the International Building Code.
4. In other than Group A and H occupancies, the maximum length of an existing, newly constructed, or extended dead-end corridor shall not exceed 50 feet (15 240 mm) on floors equipped with an automatic sprinkler system installed in accordance with the International Building Code.

~~805.7~~ 503.7.6 Means-of-egress lighting. Means-of-egress lighting shall be in accordance with this section, as applicable.

~~805.7.1~~ 503.7.6.1 Artificial lighting required. Means of egress in all work areas shall be provided with artificial lighting in accordance with the requirements of the International Building Code.

~~805.7.2~~ 503.7.6.2 Supplemental requirements for means-of-egress lighting. Where the *work area* on any floor exceeds 50 percent of that floor area, means of egress throughout the floor shall comply with Section ~~805.7.1~~ 503.7.6.1.

Exception: Means of egress within or serving only a tenant space that is entirely outside the *work area*.

~~805.8~~ 503.7.7 Exit signs. Exit signs shall be in accordance with this section, as applicable.

~~805.8.1~~ 503.7.7.1 Work areas. Means of egress in all *work areas* shall be provided with exit signs in accordance with the requirements of the International Building Code.

~~805.8.2~~ 503.7.7.2 Supplemental requirements for exit signs. Where the *work area* on any floor exceeds 50 percent of that floor area, means of egress throughout the floor shall comply with Section ~~805.8.1~~ 503.7.7.1.

Exception: Means of egress within a tenant space that is entirely outside the *work area*.

~~805.9~~ 503.7.8 Handrails. The requirements of Sections ~~805.9.1~~ 503.7.8.1 and ~~805.9.2~~ 503.7.8.2 shall apply to handrails from the *work area* floor to, and including, the level of exit discharge.

~~805.9.1~~ **503.7.8.1 Minimum requirement.** Every required exit stairway that is part of the means of egress for any *work area* and that has three or more risers and is not provided with not fewer than one handrail, or in which the existing handrails are judged to be in danger of collapsing, shall be provided with handrails for the full length of the stairway on not fewer than one side. Exit stairways with a required egress width of more than 66 inches (1676 mm) shall have handrails on both sides.

~~805.9.2~~ **503.7.8.2 Design.** Handrails required in accordance with Section ~~805.9.1~~ 503.7.8.1 shall be designed and installed in accordance with the provisions of the International Building Code.

~~805.10~~ **503.7.9 Refuge areas.** Where *alterations* affect the configuration of an area utilized as a refuge area, the capacity of the refuge area shall not be reduced below that required in Sections ~~805.10.1~~ 503.7.9.1 and ~~805.10.2~~ 503.7.9.2.

~~805.10.1~~ **503.7.9.1 Capacity.** The required capacity of refuge areas shall be in accordance with Sections ~~805.10.1.1~~ 503.7.9.1.1 through ~~805.10.1.3~~ 503.7.9.1.3.

~~805.10.1.1~~ **503.7.9.1.1 Group I-2.** In Group I-2 occupancies, the required capacity of the refuge areas for smoke compartments in accordance with Section 407.5.1 of the International Building Code shall be maintained.

~~805.10.1.2~~ **503.7.9.1.2 Group I-3.** In Group I-3 occupancies, the required capacity of the refuge areas for smoke compartments in accordance with Section 408.6.2 of the International Building Code shall be maintained.

~~805.10.1.3~~ **503.7.9.1.3 Ambulatory care.** In ambulatory care facilities required to be separated by Section 422.2 of the International Building Code, the required capacity of the refuge areas for smoke compartments in accordance with Section 422.3.2 of the International Building Code shall be maintained.

~~805.10.2~~ **503.7.9.2 Horizontal exits.** The required capacity of the refuge area for horizontal exits in accordance with Section 1026.4 of the International Building Code shall be maintained.

~~805.11~~ **503.7.10 Guards.** The requirements of Sections ~~805.11.1~~ 503.7.10.1 and ~~805.11.2~~ 503.7.10.2 shall apply to guards from the *work area* floor to, and including, the level of exit discharge but shall be confined to the egress path of any *work area*.

~~805.11.1~~ **503.7.10.1 Minimum requirement.** Every open portion of a stairway, landing, or balcony that is more than 30 inches (762 mm) above the floor or grade below and is not provided with guards, or those portions in which existing guards are judged to be in danger of collapsing, shall be provided with guards.

~~805.11.2~~ **503.7.10.2 Design.** Guards required in accordance with Section ~~805.11.1~~ 503.7.10.1 shall be designed and installed in accordance with the International Building Code.

[BS] ~~806.1~~ **503.8 General: Structural.** Structural elements and systems within buildings undergoing Level 2 *alterations* shall comply with ~~this section~~ sections 503.8.1 through 503.8.3.

[BS] ~~806.2~~ **503.8.1 Existing structural elements carrying gravity loads.** Any existing gravity load-carrying structural element for which an *alteration* causes an increase in design dead, live or snow load, including snow drift effects, of more than 5 percent shall be replaced or altered as needed to carry the gravity loads required by the International Building Code for new structures. Any existing gravity load-carrying structural element whose gravity load-carrying capacity is decreased as part of the *alteration* shall be shown to have the capacity to resist the applicable design dead, live and snow loads, including snow drift effects, required by the International Building Code for new structures.

Exceptions:

1. Buildings of Group R occupancy with not more than five dwelling or sleeping units used solely for residential purposes where the altered building complies with the conventional light-frame construction methods of the International Building Code or the provisions of the International Residential Code.
2. Buildings in which the increased dead load is attributable to the addition of a second layer of roof covering weighing 3 pounds per square foot (0.1437 kN/m²) or less over an existing single layer of roof covering.

[BS] ~~806.3~~ **503.8.2 Existing structural elements resisting lateral loads.** Except as permitted by Section ~~806.4~~ 503.8.3, where the *alteration* increases design lateral loads, or where the alteration results in prohibited structural irregularity as defined in ASCE 7, or where the *alteration* decreases the capacity of any existing lateral load-carrying structural element, the structure of the altered building or structure shall meet the requirements of Sections 1609 and 1613 of the International Building Code. Reduced seismic forces shall be permitted.

Exception: Any existing lateral load-carrying structural element whose demand-capacity ratio with the *alteration* considered is not more than 10 percent greater than its demand-capacity ratio with the *alteration* ignored shall be permitted to remain unaltered. For purposes of calculating demand-capacity ratios, the demand shall consider applicable load combinations with design lateral loads or forces in accordance with Sections 1609 and 1613 of the International Building Code. Reduced seismic forces shall be permitted. For purposes of this exception, comparisons of demand-capacity ratios and calculation of design lateral loads, forces and capacities shall account for the cumulative effects of *additions* and *alterations* since original construction.

[BS] 806.4 503.8.3 Voluntary lateral force-resisting system alterations. Structural *alterations* that are intended exclusively to improve the lateral force-resisting system and are not required by other sections of this code shall not be required to meet the requirements of Section 1609 or Section 1613 of the International Building Code, provided that the following conditions are met:

1. The capacity of existing structural systems to resist forces is not reduced.
2. New structural elements are detailed and connected to existing or new structural elements as required by the International Building Code for new construction.
3. New or relocated nonstructural elements are detailed and connected to existing or new structural elements as required by the International Building Code for new construction.
4. The *alterations* do not create a structural irregularity as defined in ASCE 7 or make an existing structural irregularity more severe.

Add new text as follows:

503.9 Electrical Electrical elements and systems within a *building* undergoing *Level 2 alterations* shall comply with Section 503.9.1 through 503.9.3.

Revise as follows:

~~807.3-1~~ **503.9.1 New installations.** Newly installed electrical equipment and wiring relating to work done in any *work area* shall comply with all applicable requirements of NFPA 70 except as provided for in Section ~~807.3-~~ 503.9.3.

~~807.2~~ **503.9.2 Existing installations.** Existing wiring in all *work areas* in Group A-1, A-2, A-5, H and I occupancies shall be upgraded to meet the materials and methods requirements of ~~Chapter 7-~~ Section 502.

~~807.3~~ **503.9.3 Residential occupancies.** In Group R-2, R-3 and R-4 occupancies and buildings regulated by the International Residential Code, the requirements of Sections ~~807.3-1~~ 503.9.3.1 through ~~807.3-7~~ 503.9.3.7 shall be applicable only to *work areas* located within a dwelling unit.

~~807.3-1~~ **503.9.3.1 Enclosed areas.** Enclosed areas, other than closets, kitchens, basements, garages, hallways, laundry areas, utility areas, storage areas and bathrooms shall have not fewer than two duplex receptacle outlets or one duplex receptacle outlet and one ceiling or wall-type lighting outlet.

~~807.3-2~~ **503.9.3.2 Kitchens.** Kitchen areas shall have not fewer than two duplex receptacle outlets.

~~807.3-3~~ **503.9.3.3 Laundry areas.** Laundry areas shall have not fewer than one duplex receptacle outlet located near the laundry equipment and installed on an independent circuit.

~~807.3-4~~ **503.9.3.4 Ground fault circuit interruption.** Newly installed receptacle outlets shall be provided with ground fault circuit interruption as required by NFPA 70.

~~807.3-5~~ **503.9.3.5 Minimum lighting outlets.** Not fewer than one lighting outlet shall be provided in every bathroom, hallway, stairway, attached garage, and detached garage with electric power, and to illuminate outdoor entrances and exits.

~~807.3-6~~ **503.9.3.6 Utility rooms and basements.** Not fewer than one lighting outlet shall be provided in utility rooms and basements where such spaces are used for storage or contain equipment requiring service.

~~807.3-7~~ **503.9.3.7 Clearance for equipment.** Clearance for electrical service equipment shall be provided in accordance with the NFPA 70.

~~808-1~~ **503.10 Reconfigured or converted spaces- Mechanical.** Reconfigured spaces intended for occupancy and spaces converted to habitable or occupiable space in any *work area* shall be provided with natural or mechanical ventilation in accordance with the International Mechanical Code.

Exception: Existing mechanical ventilation systems shall comply with the requirements of Section ~~808-2-~~ 503.10.1.

~~808-2~~ **503.10.1 Altered existing systems.** In mechanically ventilated spaces, existing mechanical ventilation systems that are altered, reconfigured, or extended shall provide not less than 5 cubic feet per minute (cfm) (0.0024 m³/s) per person of outdoor air and not less than 15 cfm (0.0071 m³/s) of ventilation air per person; or not less than the amount of ventilation air determined by the Indoor Air Quality Procedure of ASHRAE 62.1.

~~808-3~~ **503.10.2 Local exhaust.** Newly introduced devices, equipment, or operations that produce airborne particulate matter, odors, fumes, vapor, combustion products, gaseous contaminants, pathogenic and allergenic organisms, and microbial contaminants in such quantities as to affect adversely or impair health or cause discomfort to occupants shall be provided with local exhaust.

~~809-1~~ **503.10.2 Minimum fixtures- Plumbing.** Where the occupant load of the story is increased by more than 20 percent, plumbing fixtures for the story shall be provided in quantities specified in the International Plumbing Code based on the increased occupant load.

Delete without substitution:

~~CHAPTER 9 ALTERATIONS—LEVEL 3~~

Add new text as follows:

SECTION 504 **ALTERATION-LEVEL 3**

Revise as follows:

~~901-1~~ **504.1 Scope.** Level 3 *alterations* as described in Section ~~604-501.3~~ shall comply with the requirements of this chapter.

~~901-2~~ **504.2 Alteration Level 1 and 2 Compliance.** In *addition* to the provisions of this chapter, work shall comply with all of the requirements of ~~Chapters 7 Sections 502 and 8-503.~~ The requirements of Sections ~~802-503.4, 803-503.5, and 804-503.6~~ shall apply within all *work areas* whether or not they include exits and corridors shared by more than one tenant and regardless of the occupant load.

Exception: Buildings in which the reconfiguration of space affecting exits or shared egress access is exclusively the result of compliance with the accessibility requirements of Section 305.7 shall not be required to comply with this chapter.

Add new text as follows:

504.3 Special Use and Occupancy The following special uses and occupancies shall comply with the requirements of Sections 604.3.1 and 604.3.2.

Revise as follows:

~~902-1~~ **504.3.1 High-rise buildings.** Any building having occupied floors more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access shall comply with the requirements of Sections ~~902-1-1-504.3.1.1 and 902-1-2-504.3.1.2.~~

~~902-1-1~~ **504.3.1.1 Recirculating air or exhaust systems.** Where a floor is served by a recirculating air or exhaust system with a capacity greater than 15,000 cubic feet per minute (701 m³/s), that system shall be equipped with *approved* smoke and heat detection devices installed in accordance with the International Mechanical Code.

~~902-1-2~~ **504.3.1.2 Elevators.** Where there is an elevator or elevators for public use, not fewer than one elevator serving the *work area* shall comply with this section. Existing elevators with a travel distance of 25 feet (7620 mm) or more above or below the main floor or other level of a building and intended to serve the needs of emergency personnel for fire-fighting or rescue purposes shall be provided with emergency operation in accordance with ASME A17.3. New elevators shall be provided with Phase I emergency recall operation and Phase II emergency in-car operation in accordance with ASME A17.1/CSAB44.1.

~~902-2~~ **504.3.2 Boiler and furnace equipment rooms.** Boiler and furnace equipment rooms adjacent to or within Group I-1, I-2, I-4, R-1, R-2 and R-4 occupancies shall be enclosed by 1-hour fire-resistance-rated construction.

Exceptions:

1. Steam boiler equipment operating at pressures of 15 pounds per square inch gauge (psig) (103.4 kPa) or less is not required to be enclosed.
2. Hot water boilers operating at pressures of 170 psig (1171 kPa) or less are not required to be enclosed.
3. Furnace and boiler equipment with 400,000 British thermal units (Btu) (4.22×10⁸ J) per hour input rating or less is not required to be enclosed.
4. Furnace rooms protected with an automatic sprinkler system are not required to be enclosed.

Add new text as follows:

504.4 Building elements and materials. Building elements and materials shall comply with the requirements of Section 503.4 except as specifically required in Sections 504.4.1 through 504.4.3.

Revise as follows:

~~903-1~~ **504.4.1 Existing shafts and vertical openings.** Existing stairways that are part of the means of egress shall be enclosed in accordance with Section ~~802-2-1-503.4.1.1~~ from the highest *work area* floor to, and including, the level of exit discharge and all floors below.

~~903-2~~ **504.4.2 Fire partitions in Group R-3.** Fire separation in Group R-3 occupancies shall be in accordance with Section ~~903-2-1-504.4.2.1.~~

~~903-2-1~~ **504.4.2.1 Separation required.** Where the *work area* is in any attached dwelling unit in Group R-3 or any multiple single-family dwelling (townhouse), walls separating the dwelling units that are not continuous from the foundation to the underside of the roof sheathing shall be constructed to provide a continuous fire separation using construction materials consistent with the existing wall or complying with the requirements for new structures. Work shall be performed on the side of the dwelling unit wall that is part of the *work area*.

Exception: Where *alterations* or *repairs* do not result in the removal of wall or ceiling finishes exposing the structure, walls are not required to be

continuous through concealed floor spaces.

~~903-3~~ **504.4.3 Interior finish.** Interior finish in exits serving the *work area* shall comply with Section ~~802-4~~ 503.4.3 between the highest floor on which there is a *work area* to the floor of exit discharge.

Add new text as follows:

504.5 Fire Protection. Fire protection shall comply with the requirements of Section 503.5 except as specifically required in Sections 504.5.1 through 504.5.3

Revise as follows:

~~904-1~~ **504.5.1 Automatic sprinkler systems.** An automatic sprinkler system shall be provided in a *work area* where required by Section ~~802-2~~ 503.4.1 or this section.

~~904-1-1~~ **504.5.1.1 High-rise buildings.** An automatic sprinkler system shall be provided in *work areas* where the high-rise building has a sufficient municipal water supply for the design and installation of an automatic sprinkler system at the site.

~~904-1-2~~ **504.5.1.2 Rubbish and linen chutes.** Rubbish and linen chutes located in the *work area* shall be provided with automatic sprinkler system protection or an *approved* automatic fire-extinguishing system where protection of the rubbish and linen chute would be required under the provisions of the International Building Code for new construction.

~~904-1-3~~ **504.5.1.3 Upholstered furniture or mattresses.** *Work areas* shall be provided with an automatic sprinkler system in accordance with the International Building Code where any of the following conditions exist:

1. A Group F-1 occupancy used for the manufacture of upholstered furniture or mattresses exceeds 2,500 square feet (232 m²).
2. A Group M occupancy used for the display and sale of upholstered furniture or mattresses exceeds 5,000 square feet (464 m²).
3. A Group S-1 occupancy used for the storage of upholstered furniture or mattresses exceeds 2,500 square feet (232 m²).

~~904-1-4~~ **504.5.1.4 Other required automatic sprinkler systems.** In buildings and areas listed in Table 903.2.11.6 of the International Building Code, *work areas* that have exits or corridors shared by more than one tenant or that have exits or corridors serving an occupant load greater than 30 shall be provided with an automatic sprinkler system under the following conditions:

1. The *work area* is required to be provided with an automatic sprinkler system in accordance with the International Building Code applicable to new construction.
2. The building site has sufficient municipal water supply for design and installation of an automatic sprinkler system.

~~904-2~~ **504.5.2 Fire alarm and detection systems.** Fire alarm and detection shall be provided in accordance with Section 907 of the International Building Code as required for new construction.

~~904-2-1~~ **504.5.2.1 Manual fire alarm systems.** Where required by the International Building Code, a manual fire alarm system shall be provided throughout the *work area*. Alarm notification appliances shall be provided on such floors and shall be automatically activated as required by the International Building Code.

Exceptions:

1. Alarm-initiating and notification appliances shall not be required to be installed in tenant spaces outside of the *work area*.
2. Visual alarm notification appliances are not required, except where an existing alarm system is upgraded or replaced or where a new fire alarm system is installed.

~~904-2-2~~ **504.5.2.2 Automatic fire detection.** Where required by the International Building Code for new buildings, automatic fire detection systems shall be provided throughout the *work area*.

~~905-1~~ **504.6 General Means of Egress.** The means of egress shall comply with the requirements of Section ~~805~~ 503.7 except as specifically required in Sections ~~905-2~~ 504.6.1 and ~~905-3~~ 504.6.2.

~~905-2~~ **504.6.1 Means-of-egress lighting.** Means of egress from the highest *work area* floor to the floor of exit discharge shall be provided with artificial lighting within the exit enclosure in accordance with the requirements of the International Building Code.

~~905-3~~ **504.6.2 Exit signs.** Means of egress from the highest *work area* floor to the floor of exit discharge shall be provided with exit signs in accordance with the requirements of the International Building Code.

[BS] ~~906-1~~ **504.7 General.** Where buildings are undergoing Level 3 *alterations*, the provisions of this section shall apply.

[BS] ~~906-2~~ **504.7.1 Existing structural elements resisting lateral loads.** Where work involves a *substantial structural alteration*, the lateral load-resisting system of the altered building shall be shown to satisfy the requirements of Sections 1609 and 1613 of the International Building Code.

Reduced seismic forces shall be permitted.

Exceptions:

1. Buildings of Group R occupancy with not more than five dwelling or sleeping units used solely for residential purposes that are altered based on the conventional light-frame construction methods of the International Building Code or in compliance with the provisions of the International Residential Code.
2. Where the intended alteration involves only the lowest story of a building, only the lateral load resisting components in and below that story need comply with this section.

[BS] 906-3 504.7.2 Seismic Design Category F. Where the building is assigned to Seismic Design Category F, the structure of the altered building shall meet the requirements of Sections 1609 and 1613 of the International Building Code. Reduced seismic forces shall be permitted.

[BS] 906-4 504.7.3 Anchorage for concrete and masonry buildings. For any building assigned to Seismic Design Category D, E or F with a structural system that includes concrete or reinforced masonry walls with a flexible roof diaphragm, the alteration work shall include installation of wall anchors at the roof line of all subject buildings and at the floor lines of unreinforced masonry buildings unless an evaluation demonstrates compliance of existing wall anchorage. Reduced seismic forces shall be permitted.

[BS] 906-5 504.7.4 Anchorage for unreinforced masonry walls. For any building assigned to Seismic Design Category C, D, E or F with a structural system that includes unreinforced masonry bearing walls, the alteration work shall include installation of wall anchors at the roof line, unless an evaluation demonstrates compliance of existing wall anchorage. Reduced seismic forces shall be permitted.

[BS] 906-6 504.7.5 Bracing for unreinforced masonry parapets. Parapets constructed of unreinforced masonry in buildings assigned to Seismic Design Category C, D, E or F shall have bracing installed as needed to resist the reduced International Building Code -level seismic forces in accordance with Section 303.3, unless an evaluation demonstrates compliance of such items. Use of reduced seismic forces shall be permitted.

[BS] 906-7 504.7.6 Anchorage of unreinforced masonry partitions. Where the building is assigned to Seismic Design Category C, D, E or F, unreinforced masonry partitions and nonstructural walls within the *work area* and adjacent to egress paths from the *work area* shall be anchored, removed, or altered to resist out-of-plane seismic forces, unless an evaluation demonstrates compliance of such items. Use of reduced seismic forces shall be permitted.

CHAPTER ~~10~~ 6 CHANGE OF OCCUPANCY

Revise as follows:

~~1001-2-1~~ **601.2.1 Change of use.** Any work undertaken in connection with a change in use that does not involve a change of occupancy classification or a change to another group within an occupancy classification shall conform to the applicable requirements for the work as classified in ~~Chapter 5~~ Section 501 and to the requirements of Sections ~~1002-602~~ through ~~1010-610~~.

Exception: As modified in Section ~~1204-804~~ for *historic buildings* .

~~1011-1-1-1~~ **611.1.1.1 Change of occupancy classification without separation.** Where a portion of an *existing building* is changed to a new occupancy classification or where there is a *change of occupancy* within a space where there is a different fire protection system threshold requirement in Chapter 9 of the International Building Code, and that portion is not separated from the remainder of the building with fire barriers having a fire-resistance rating as required in the International Building Code for the separate occupancy, the entire building shall comply with all of the requirements of ~~Chapter 9~~ Section 504 of this code applied throughout the building for the most restrictive occupancy classification in the building and with the requirements of this chapter.

~~1011-1-1-2~~ **611.1.1.2 Change of occupancy classification with separation.** Where a portion of an *existing building* is changed to a new occupancy classification or where there is a *change of occupancy* within a space where there is a different fire protection system threshold requirement in Chapter 9 of the International Building Code, and that portion is separated from the remainder of the building with fire barriers having a fire-resistance rating as required in the International Building Code for the separate occupancy, that portion shall comply with all of the requirements of ~~Chapter 9~~ Section 504 of this code for the new occupancy classification and with the requirements of this chapter.

~~1011-4-1~~ **611.4.1 Means of egress for change to a higher-hazard category.** Where a change of occupancy classification is made to a higher-hazard category (lower number) as shown in Table ~~1011-4~~ 611.4, the means of egress shall comply with the requirements of Chapter 10 of the International Building Code.

Exceptions:

1. Stairways shall be enclosed in compliance with the applicable provisions of Section ~~903-1~~ 504.4.1.
2. Existing stairways including handrails and guards complying with the requirements of ~~Chapter 9~~ Section 504.9 shall be permitted for continued use subject to approval of the *code official*.
3. Any stairway replacing an existing stairway within a space where the pitch or slope cannot be reduced because of existing construction shall not be required to comply with the maximum riser height and minimum tread depth requirements.

4. Existing corridor walls constructed on both sides of wood lath and plaster in good condition or 1/2 inch-thick (12.7 mm) gypsum wallboard shall be permitted. Such walls shall either terminate at the underside of a ceiling of equivalent construction or extend to the underside of the floor or roof next above.
5. Existing corridor doorways, transoms and other corridor openings shall comply with the ~~requirements~~ requirements in Sections ~~805.5.1-503.7.4.1, 805.5.2-503.7.4.2 and 805.5.3-503.7.4.3.~~
6. Existing dead-end corridors shall comply with the requirements in Section ~~805.6-503.7.5.~~
7. An existing operable window with clear opening area not less than 4 square feet (0.38 m²) and minimum opening height and width of 22 inches (559 mm) and 20 inches (508 mm), respectively, shall be accepted as an emergency escape and rescue opening.

~~1011.4.4~~ **611.4.4 Handrails.** Existing stairways shall comply with the handrail requirements of Section ~~805.9-503.7.8~~ in the area of the *change of occupancy* classification.

~~1011.4.5~~ **611.4.5 Guards.** Existing guards shall comply with the requirements in Section ~~805.11-503.7.10~~ in the area of the *change of occupancy* classification.

CHAPTER ~~11~~ 7 ADDITIONS

Revise as follows:

~~1101.3~~ **701.3 Other work.** Any *repair* or *alteration* work within an *existing building* to which an *addition* is being made shall comply with the applicable requirements for the work as classified in Chapter ~~6-5.~~

[BS] ~~1103.1~~ **703.1 Additional gravity loads.** Any existing gravity load-carrying structural element for which an *addition* and its related *alterations* cause an increase in design dead, live or snow load, including snow drift effects, of more than 5 percent shall be replaced or altered as needed to carry the gravity loads required by the International Building Code for new structures. Any existing gravity load-carrying structural element whose gravity load-carrying capacity is decreased as part of the *addition* and its related *alterations* shall be considered to be an altered element subject to the requirements of Section ~~806.2-503.8.1.~~ Any existing element that will form part of the lateral load path for any part of the *addition* shall be considered to be an existing lateral load-carrying structural element subject to the requirements of Section ~~1103.3-703.3.~~

Exception: Buildings of Group R occupancy with not more than five dwelling units or sleeping units used solely for residential purposes where the *existing building* and the *addition* together comply with the conventional lightframe construction methods of the International Building Code or the provisions of the International Residential Code.

CHAPTER ~~12~~ 8 HISTORIC BUILDINGS

Revise as follows:

~~1203.10.1~~ **803.10.1 Height.** Existing guards shall comply with the requirements of Section ~~704-502.3.~~

~~1204.1~~ **804.1 General.** *Historic buildings* undergoing a *change of occupancy* shall comply with the applicable provisions of Chapter ~~10-6,~~ except as specifically permitted in this chapter. Where Chapter ~~10-6~~ requires compliance with specific requirements of ~~Chapter 7, Chapter 8 or Chapter 9~~ Section 501, Section 502, Section 503 or Section 504 and where those requirements are subject to the exceptions in Section ~~1202-802,~~ the same exceptions shall apply to this section.

~~1204.3~~ **804.3 Location on property.** Historic structures undergoing a change of use to a higher-hazard category in accordance with Section ~~1011.6-611.6~~ may use alternative methods to comply with the fire-resistance and exterior opening protective requirements. Such alternatives shall comply with Section ~~1201.2-801.2.~~

~~1204.14~~ **804.14 Natural light.** Where it is determined by the *code official* that compliance with the natural light requirements of Section ~~1010.1-610.1~~ will lead to loss of historic character or historic materials in the building, the existing level of natural lighting shall be considered to be acceptable.

CHAPTER ~~13~~ 9 PERFORMANCE COMPLIANCE METHODS

CHAPTER ~~14~~ 10 RELOCATED OR MOVED BUILDINGS

CHAPTER ~~15~~ 11 CONSTRUCTION SAFEGUARDS

CHAPTER ~~16~~ 12 REFERENCED STANDARDS

Reason: This proposal reformats the majority of the code to basically eliminate the need for the three (3) main compliance methods (Prescriptive, Work Area, and Performance) by eliminating the prescriptive method and restructuring the Work Area Method. In so doing, we are able to reduce the number of chapters from 16 to 12. Why does there need to be three different ways to do: Repairs, Alterations, Change of Occupancy, and Additions?

In addition, the reformat moves Fire Escapes, Glass Replacement and Window Replacement, and Reroofing and Repairs into Chapter 3. Why should we debate over whether a roof replacement is a repair or an alteration? Why do we need to duplicate the same text in multiple chapters?

Worse – in some sections the text is repeated across different chapters, but not **exactly** the same text (even though the intent was to be the same).

With the above in mind, the reformatting goes like this:

Chapter 1 SCOPE AND ADMINISTRATION: Remains the same

Chapter 2 DEFINITIONS: Remains the same

Chapter 3 GENERAL PROVISIONS AND SPECIAL DETAILED REQUIREMENTS: Currently "PROVISIONS FOR ALL COMPLIANCE METHODS", proposal to rename this chapter to "GENERAL PROVISIONS AND SPECIAL DETAILED REQUIREMENTS"

This is like Chapter 4 in the IBC where there may be "special" construction that may need additional requirements to those elsewhere in the code. This is serving the same purpose as the original Chapter 3 of the IBC where conditions that apply to ALL compliance methods would appear here. Fire escapes, glass replacement and window openings, and reroofing and roof repair have been relocated here. Seismic force and Accessibility were already located in this Chapter.

Chapter 4 REPAIRS: Remain the same

Chapter 5 PRESCRIPTIVE METHOD. Deleted title and contents

New Chapter 5 ALTERATIONS revised from current title "**CLASSIFICATION OF WORK** "

All things "alterations" have been located here. The chapter is made from the work area compliance methods (IEBC Chapters 6, 7, 8, and 9) and portions of Chapter 5.

Chapter 6 CHANGE OF OCCUPANCY: Currently "PRESCRIPTIVE COMPLIANCE METHODS", proposal to rename this chapter and relocate all content of Chapter 10 CHANGE OF OCCUPANCY to Chapter 6 due to the reformat of Chapters 6, 7, 8, and 9 into a new Chapter 5

Chapter 7 ADDITIONS: Currently "ALTERATIONS-LEVEL 1", proposal to rename this chapter and relocate all content of Chapter 11 ADDITIONS to Chapter 7 due to the reformat of Chapters 6, 7, 8, and 9 into a new Chapter 5.

Chapter 8 HISTORIC BUILDINGS: Currently "ALTERATIONS-LEVEL 2", proposal to rename this chapter and relocate all content of Chapter 12 HISTORIC BUILDINGS to Chapter 8 due to the reformat of Chapters 6, 7, 8, and 9 into a new Chapter 5

Chapter 9 PERFORMANCE COMPLIANCE METHODS: Currently "ALTERATIONS-LEVEL 3", proposal to rename this chapter and relocate all content of Chapter 13 PERFORMANCE COMPLIANCE METHODS to Chapter 9 due to the reformat of Chapters 6, 7, 8, and 9 into a new Chapter 5

Chapter 10 RELOCATED OR MOVED BUILDINGS: Currently "CHANGE OF OCCUPANCY", proposal to rename this chapter and relocate all content of Chapter 14 RELOCATED OR MOVED BUILDINGS to Chapter 10 due to the reformat of Chapters 6, 7, 8, and 9 into a new Chapter 5

Chapter 11 CONSTRUCTION SAFEGUARDS: Currently "ADDITIONS", proposal to rename this chapter and relocate all content of Chapter 15 CONSTRUCTION SAFEGUARDS to Chapter 11 due to the reformat of Chapters 6, 7, 8, and 9 into a new Chapter 5

Chapter 12 REFERENCED STANDARDS: Currently "HISTORIC BUILDINGS", proposal to rename this chapter and relocate all content of Chapter 16 REFERENCED STANDARDS to Chapter 12 due to the reformat of Chapters 6, 7, 8, and 9 into a new Chapter 5

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This change is to reformat the code to be easier to use. It should not increase or decrease the cost of construction.

Staff Analysis: Please note for clarity the intended layout of Chapters is as follows:

Chapter 1 SCOPE AND ADMINISTRATION:

Chapter 2 DEFINITIONS:

Chapter 3 GENERAL PROVISIONS AND SPECIAL DETAILED REQUIREMENTS ~~PROVISIONS FOR ALL COMPLIANCE METHODS~~

Chapter 4 REPAIRS

~~Chapter 5 ALTERATIONS~~

~~CHAPTER 6 CLASSIFICATION OF WORK ALTERATIONS (Contains current Chapters 6, 7, 8 and 9)~~

~~CHAPTER 7 ALTERATIONS LEVEL 1~~

~~CHAPTER 8 ALTERATIONS LEVEL 2~~

~~CHAPTER 9 ALTERATION LEVEL 3~~

Chapter ~~10~~ 6 CHANGE OF OCCUPANCY

Chapter ~~11~~ 7 ADDITIONS

Chapter ~~12~~ 8 HISTORIC BUILDINGS

Chapter ~~13~~ 9 PERFORMANCE COMPLIANCE METHODS

Chapter ~~14~~ 10 RELOCATED OR MOVED BUILDINGS

Chapter ~~15~~ 11 CONSTRUCTION SAFEGUARDS

Chapter ~~16~~ 12 REFERENCED STANDARDS

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EB5-19

IEBC@: SECTION 305, 305.1, 305.2, 305.3, 305.4, 305.4.1, 305.4.2, 305.5, 305.6, 305.7, 305.8, 305.8.1, 305.8.2, 305.8.3, 305.8.4, 305.8.5, TABLE 305.8.5, 305.8.6, 305.8.7, 305.8.8, 305.8.9, 305.8.10, 305.8.11, 305.8.12, 305.8.13, 305.8.14, 305.8.15, 305.9, 305.9.1, 305.9.2, 305.9.3, 305.9.4, SECTION 405 (New), 405.1 (New), SECTION 705 (New), 705.1 (New), 705.2 (New), 705.3 (New), 705.3.1 (New), 705.3.2 (New), 705.3.3 (New), 705.3.4 (New), TABLE 705.3.4 (New), 705.3.5 (New), 705.3.6 (New), 705.3.7 (New), 705.3.8 (New), 705.3.9 (New), 705.3.10 (New), 705.3.11 (New), 705.3.12 (New), 705.3.13 (New), 705.3.14 (New), 705.3.15 (New), 705.4 (New), SECTION 806 (New), 806.1 (New), 806.2 (New), SECTION 906 (New), 906.1 (New), 906.2 (New), SECTION 1006 (New), 1006.1 (New), SECTION 1105 (New), 1105.1 (New), 1105.2 (New), 1105.3 (New), 1105.4 (New), SECTION 1204 (New), 1204.1 (New), 1301.2.6 (New)

Proponent: Eirene Knott, representing Metropolitan Kansas City Chapter of the ICC (Eirene.Knott@brrarch.com)

2018 International Existing Building Code

Revise as follows:

SECTION ~~305~~ 508 ACCESSIBILITY FOR EXISTING BUILDINGS

~~305-1~~ **508.1 Scope.** The provisions of Sections ~~305-1~~ 508.1 through ~~305-9~~ 508.9 apply to maintenance, *change of occupancy*, *additions* and *alterations* to existing buildings, including those identified as *historic buildings*.

~~305-2~~ **508.2 Maintenance of facilities.** A *facility* that is constructed or altered to be *accessible* shall be maintained *accessible* during occupancy.

~~305-3~~ **508.3 Extent of application.** An *alteration* of an existing *facility* shall not impose a requirement for greater accessibility than that which would be required for new construction. *Alterations* shall not reduce or have the effect of reducing accessibility of a *facility* or portion of a *facility*.

~~305-4~~ **508.4 Change of occupancy.** Existing buildings that undergo a change of group or occupancy shall comply with this section.

Exception: Type B dwelling or sleeping units required by Section 1107 of the International Building Code are not required to be provided in existing buildings and facilities undergoing a *change of occupancy* in conjunction with *alterations* where the *work area* is 50 percent or less of the aggregate area of the building.

~~305-4-1~~ **508.4.1 Partial change of occupancy.** Where a portion of the building is changed to a new occupancy classification, any *alterations* shall comply with Sections ~~305-6~~ 508.6, ~~305-7~~ 508.7 and ~~305-8-~~ 508.8.

~~305-4-2~~ **508.4.2 Complete change of occupancy.** Where an entire building undergoes a *change of occupancy*, it shall comply with Section ~~305-4-1~~ 508.4.1 and shall have all of the following accessible features:

1. Not fewer than one accessible building entrance.
2. Not fewer than one accessible route from an accessible building entrance to *primary function* areas.
3. Signage complying with Section 1111 of the International Building Code.
4. Accessible parking, where parking is being provided.
5. Not fewer than one accessible passenger loading zone, where loading zones are provided.
6. Not fewer than one accessible route connecting accessible parking and accessible passenger loading zones to an accessible entrance.

Where it is *technically infeasible* to comply with the new construction standards for any of these requirements for a change of group or occupancy, Items 1 through 6 shall conform to the requirements to the maximum extent technically feasible.

Exception: The accessible features listed in Items 1 through 6 are not required for an accessible route to Type B units.

~~305-5~~ **508.5 Additions.** Provisions for new construction shall apply to *additions*. An *addition* that affects the accessibility to, or contains an area of, a *primary function* shall comply with the requirements in Section ~~305-7-~~ 508.7.

~~305-6~~ **508.6 Alterations.** A *facility* that is altered shall comply with the applicable provisions in Chapter 11 of the International Building Code, unless *technically infeasible*. Where compliance with this section is *technically infeasible*, the *alteration* shall provide access to the maximum extent technically feasible.

Exceptions:

1. The altered element or space is not required to be on an accessible route, unless required by Section ~~305-7-~~ 508.7.
2. Accessible means of egress required by Chapter 10 of the International Building Code are not required to be provided in existing facilities.
3. The *alteration* to Type A individually owned dwelling units within a Group R-2 occupancy shall be permitted to meet the provision

- for a Type B dwelling unit.
4. Type B dwelling or sleeping units required by Section 1107 of the International Building Code are not required to be provided in *existing buildings* and facilities undergoing *alterations* where the *work area* is 50 percent or less of the aggregate area of the building.

305.7 508.7 Alterations affecting an area containing a primary function. Where an *alteration* affects the accessibility to, or contains an area of *primary function*, the route to the *primary function* area shall be *accessible*. The accessible route to the *primary function* area shall include toilet facilities and drinking fountains serving the area of *primary function*.

Exceptions:

1. The costs of providing the *accessible* route are not required to exceed 20 percent of the costs of the *alterations* affecting the area of *primary function*.
2. This provision does not apply to *alterations* limited solely to windows, hardware, operating controls, electrical outlets and signs.
3. This provision does not apply to *alterations* limited solely to mechanical systems, electrical systems, installation or *alteration* of fire protection systems and abatement of hazardous materials.
4. This provision does not apply to *alterations* undertaken for the primary purpose of increasing the accessibility of a *facility*.
5. This provision does not apply to altered areas limited to Type B dwelling and sleeping units.

305.8 508.8 Scoping for alterations. The provisions of Sections ~~305.8.1-508.8.1~~ through ~~305.8.15-508.8.15~~ shall apply to *alterations* to *existing buildings* and *facilities*.

305.8.1 508.8.1 Entrances. Where an *alteration* includes alterations to an entrance that is not accessible, and the *facility* has an *accessible* entrance, the altered entrance is not required to be *accessible* unless required by ~~Section 305.7-Section 508.7~~. Signs complying with Section 1111 of the International Building Code shall be provided.

305.8.2 508.8.2 Elevators. Altered elements of existing elevators shall comply with ASME A17.1 and ICC A117.1. Such elements shall also be altered in elevators programmed to respond to the same hall call control as the altered elevator.

305.8.3 508.8.3 Platform lifts. Platform (wheelchair) lifts complying with ICC A117.1 and installed in accordance with ASME A18.1 shall be permitted as a component of an accessible route.

305.8.4 508.8.4 Stairways and escalators in existing buildings. Where an escalator or stairway is added where none existed previously and major structural modifications are necessary for installation, an accessible route shall be provided between the levels served by the escalator or stairways in accordance with Section 1104.4 of the International Building Code.

305.8.5 508.8.5 Ramps. Where slopes steeper than allowed by Section 1012.2 of the International Building Code are necessitated by space limitations, the slope of ramps in or providing access to existing facilities shall comply with ~~Table 305.8.5-805.8.5~~.

**TABLE 305.8.5 508.8.5
RAMPS**

SLOPE	MAXIMUM RISE
Steeper than 1:10 but not steeper than 1:8	3 inches
Steeper than 1:12 but not steeper than 1:10	6 inches

For SI: 1 inch = 25.4 mm.

305.8.6 508.8.6 Accessible dwelling or sleeping units. Where Group I-1, I-2, I-3, R-1, R-2 or R-4 dwelling or sleeping units are being altered or added, the requirements of Section 1107 of the International Building Code for Accessible units apply only to the quantity of spaces being altered or added.

305.8.7 508.8.7 Type A dwelling or sleeping units. Where more than 20 Group R-2 dwelling or sleeping units are being altered or added, the requirements of Section 1107 of the International Building Code for Type A units apply only to the quantity of the spaces being altered or added.

305.8.8 508.8.8 Type B dwelling or sleeping units. Where four or more Group I-1, I-2, R-1, R-2, R-3 or R-4 dwelling or sleeping units are being added, the requirements of Section 1107 of the International Building Code for Type B units apply only to the quantity of the spaces being added. Where Group I-1, I-2, R-1, R-2, R-3 or R-4 dwelling or sleeping units are being altered and where the *work area* is greater than 50 percent of the aggregate area of the building, the requirements of Section 1107 of the International Building Code for Type B units apply only to the quantity of the spaces being altered.

305.8.9 508.8.9 Jury boxes and witness stands. In *alterations*, accessible wheelchair spaces are not required to be located within the defined area of raised jury boxes or witness stands and shall be permitted to be located outside these spaces where the ramp or lift access restricts or

projects into the required means of egress.

~~305.8.10~~ **508.8.10 Toilet rooms.** Where it is *technically infeasible* to alter existing toilet and bathing rooms to be *accessible*, an *accessible* family or assisted-use toilet or bathing room constructed in accordance with Section 1109.2.1 of the International Building Code is permitted. The family or assisted-use toilet or bathing room shall be located on the same floor and in the same area as the existing toilet or bathing rooms. At the inaccessible toilet and bathing rooms, directional signs indicating the location of the nearest family or assisted-use toilet room or bathing room shall be provided. These directional signs shall include the International Symbol of Accessibility and sign characters shall meet the visual character requirements in accordance with ICC A117.1.

~~305.8.11~~ **508.8.11 Additional toilet and bathing facilities.** In assembly and mercantile occupancies, where additional toilet fixtures are added, not fewer than one accessible family or assisted-use toilet room shall be provided where required by Section 1109.2.1 of the International Building Code. In recreational facilities, where additional bathing rooms are being added, not fewer than one family or assisted-use bathing room shall be provided where required by Section 1109.2.1 of the International Building Code.

~~305.8.12~~ **508.8.12 Dressing, fitting and locker rooms.** Where it is *technically infeasible* to provide accessible dressing, fitting or locker rooms at the same location as similar types of rooms, one accessible room on the same level shall be provided. Where separate-sex facilities are provided, accessible rooms for each sex shall be provided. Separate-sex facilities are not required where only unisex rooms are provided.

~~305.8.13~~ **508.8.13 Fuel dispensers.** Operable parts of replacement fuel dispensers shall be permitted to be 54 inches (1370 mm) maximum, measuring from the surface of the vehicular way where fuel dispensers are installed on existing curbs.

~~305.8.14~~ **508.8.14 Thresholds.** The maximum height of thresholds at doorways shall be $\frac{3}{4}$ inch (19.1 mm). Such thresholds shall have beveled edges on each side.

~~305.8.15~~ **508.8.15 Amusement rides.** Where the structural or operational characteristics of an amusement ride are altered to the extent that the amusement ride's performance differs from that specified by the manufacturer or the original design, the amusement ride shall comply with requirements for new construction in Section 1110.4.8 of the International Building Code.

~~305.9~~ **508.9 Historic buildings.** These provisions shall apply to *facilities* designated as historic structures that undergo *alterations* or a *change of occupancy*, unless *technically infeasible*. Where compliance with the requirements for accessible routes, entrances or toilet rooms would threaten or destroy the historic significance of the *facility*, as determined by the authority having jurisdiction, the alternative requirements of Sections ~~305.9.1~~ 508.9.1 through ~~305.9.4~~ 508.9.4 for that element shall be permitted.

Exception: Type B dwelling or sleeping units required by Section 1107 of the International Building Code are not required to be provided in historic buildings.

~~305.9.1~~ **508.9.1 Site arrival points.** Not fewer than one accessible route from a site arrival point to an accessible entrance shall be provided.

~~305.9.2~~ **508.9.2 Multiple-level buildings and facilities.** An accessible route from an accessible entrance to public spaces on the level of the accessible entrance shall be provided.

~~305.9.3~~ **508.9.3 Entrances.** Not fewer than one main entrance shall be accessible.

Exception: If a public entrance cannot be made accessible, an accessible entrance that is unlocked while the building is occupied shall be provided; or, a locked accessible entrance with a notification system or remote monitoring shall be provided.

Signs complying with Section 1111 of the International Building Code shall be provided at the public entrance and the accessible entrance.

~~305.9.4~~ **508.9.4 Toilet and bathing facilities.** Where toilet rooms are provided, not fewer than one accessible family or assisted-use toilet room complying with Section 1109.2.1 of the International Building Code shall be provided.

Add new text as follows:

SECTION 405 **Accessibility**

405.1 General. Repairs shall be done in a manner that maintains the level of accessibility provided.

SECTION 705 **Accessibility**

705.1 General. Where compliance with this section is technically infeasible, the alteration shall provide access to the maximum extent that is technically feasible. A facility that is constructed or altered to be accessible shall be maintained accessible during construction.

Exceptions:

1. The altered element or space is not required to be on an accessible route unless required by Section 705.2.
2. Accessible means of egress required by Chapter 10 of the International Building Code are not required to be provided in existing facilities.
3. Type B dwelling or sleeping units required by Section 1107 of the International Building Code are not required to be provided in existing facilities undergoing less than a Level 3 alteration.
4. The alteration to Type A individually owned dwelling units within a Group R-2 occupancy shall meet the provisions for Type B dwelling units.

705.2 Extent of application. An alteration of an existing element, space or area of a facility shall not impose a requirement for greater accessibility than that which would be required for new construction. Alterations shall not reduce or have the effect of reducing accessibility of a facility or portion of a facility.

705.3 Scoping. A facility that is altered shall comply with the applicable provisions of Sections 705.3.1 through 705.3.15, and Chapter 11 of the International Building Code unless it is technically infeasible.

705.3.1 Entrances. Where an alteration includes alterations to an entrance that is not accessible, and the facility has an accessible entrance, the altered entrance is not required to be accessible unless required by Section 705.4. Signs complying with Section 1111 of the International Building Code shall be provided.

705.3.2 Elevators. Altered elements of existing elevators shall comply with ASME A17.1 and ICC A117.1. Such elements shall also be altered in elevators programmed to respond to the same hall call control as the altered elevator.

705.3.3 Platform lifts. Platform (wheelchair) lifts complying with ICC A117.1 and installed in accordance with ASME A18.1 shall be permitted as a component of an accessible route.

705.3.4 Ramps. Where slopes steeper than allowed by Section 1012.2 of the International Building Code are necessitated by space limitations, the slope of ramps in or providing access to existing facilities shall comply with Table 705.3.4.

**TABLE 705.3.4
RAMPS**

SLOPE	MAXIMUM RISE
Steeper than 1:10 but not steeper than 1:8	3 inches
Steeper than 1:12 but not steeper than 1:10	6 inches

For SI: inch = 25.4 mm

705.3.5 Dining areas An accessible route shall be provided throughout the dining area.

Exception: An accessible route to raised or sunken areas or to outdoor seating areas is not required provided the same services and decor are provided in an accessible space.

705.3.6 Accessible dwelling and sleeping units. Where Group I-1, I-2, I-3, R-1, R-2 or R-4 dwelling or sleeping units are being altered or added, the requirements of Section 1107 of the International Building Code for Accessible units apply only to the quantity of spaces being altered or added.

705.3.7 Type A dwelling or sleeping units. Where more than 20 Group R-2 dwelling or sleeping units are being altered or added, the requirements of Section 1107 of the International Building Code for Type A units apply only to the quantity of the spaces being altered or added.

705.3.8 Type B dwelling or sleeping units. Where four or more Group I-1, I-2, R-1, R-2, R-3 or R-4 dwelling or sleeping units are being added, the requirements of Section 1107 of the International Building Code for Type B units apply only to the quantity of the spaces being added. Where Group I-1, I-2, R-1, R-2, R-3 or R-4 dwelling or sleeping units are being altered and where the work area is greater than 50 percent of the aggregate area of the building, the requirements of Section 1107 of the International Building Code for Type B units apply only to the quantity of the spaces being altered.

705.3.9 Jury boxes and witness stands. In alterations, accessible wheelchair spaces are not required to be located within the defined area of raised jury boxes or witness stands and shall be permitted to be located outside these spaces where the ramp or lift access restricts or projects into the required means of egress.

705.3.10 Toilet rooms. Where it is technically infeasible to alter existing toilet and bathing rooms to be accessible, an accessible family or assisted-use toilet or bathing room constructed in accordance with Section 1109.2.1 of the International Building Code is permitted. The family or assisted-use toilet or bathing room shall be located on the same floor and in the same area as the existing toilet or bathing rooms. At the inaccessible toilet and bathing rooms, directional signs indicating the location of the nearest family or assisted-use toilet room or bathing room shall be provided. These directional signs shall include the International Symbol of Accessibility and sign characters shall meet the visual character requirements in accordance with ICC A117.1.

705.3.11 Additional toilet and bathing facilities. In assembly and mercantile occupancies, where additional toilet fixtures are added, not fewer than one accessible family or assisted-use toilet room shall be provided where required by Section 1109.2.1 of the International Building Code. In recreational facilities, where additional bathing rooms are being added, not fewer than one family or assisted-use bathing room shall be provided where required by Section 1109.2.1 of the International Building Code.

705.3.12 Dressing, fitting and locker rooms. Where it is technically infeasible to provide accessible dressing, fitting or locker rooms at the same location as similar types of rooms, one accessible room on the same level shall be provided. Where separate-sex facilities are provided, accessible rooms for each sex shall be provided. Separate-sex facilities are not required where only unisex rooms are provided.

705.3.13 Fuel dispensers. Operable parts of replacement fuel dispensers shall be permitted to be 54 inches (1370 mm) maximum, measuring from the surface of the vehicular way where fuel dispensers are installed on existing curbs.

705.3.14 Thresholds The maximum height of thresholds at doorways shall be 3/4 inch (19.1 mm). Such thresholds shall have beveled edges on each side.

705.3.15 Amusement rides. Where the structural or operational characteristics of an amusement ride are altered to the extent that the amusement ride's performance differs from that specified by the manufacturer or the original design, the amusement ride shall comply with requirements for new construction in Section 1110.4.8 of the International Building Code.

705.4 Alterations affecting an area containing a primary function. Where an alteration affects the accessibility to, or contains an area of primary function, the route to the primary function area shall be accessible. The accessible route to the primary function area shall include toilet facilities and drinking fountains serving the area of primary function.

Exceptions:

1. The costs of providing the accessible route are not required to exceed 20 percent of the costs of the alterations affecting the area of primary function.
2. This provision does not apply to alterations limited solely to windows, hardware, operating controls, electrical outlets and signs.
3. This provision does not apply to alterations limited solely to mechanical systems, electrical systems, installation or alteration of fire protection systems and abatement of hazardous materials.
4. This provision does not apply to alterations undertaken for the primary purpose of increasing the accessibility of a facility.
5. This provision does not apply to altered areas limited to Type B dwelling and sleeping units.

SECTION 806
Accessibility

806.1 General. A building, facility, or element that is altered shall comply with this section and Section 705.

806.2 Stairways and escalators in existing buildings. In alterations where an escalator or stairway is added where none existed previously, an accessible route shall be provided in accordance with Sections 1104.4 and 1104.5 of the International Building Code.

SECTION 906
Accessibility

906.1 General. A building, facility, or element that is altered shall comply with this section and Sections 705 and 806.

906.2 Type B dwelling or sleeping units. Where four or more Group I-1, I-2, R-1, R-2, R-3 or R-4 dwelling or sleeping units are being altered, the requirements of Section 1107 of the International Building Code for Type B units and Chapter 9 of the International Building Code for visible alarms apply only to the quantity of the spaces being altered.

Exception: Group I-1, I-2, R-2, R-3 and R-4 dwelling or sleeping units where the first certificate of occupancy was issued before March 15, 1991 are not required to provide Type B dwelling or sleeping units.

SECTION 1006
Accessibility

1006.1 General. Accessibility in portions of buildings undergoing a change of occupancy classification shall comply with Section 1011.

SECTION 1105
Accessibility

1105.1 Minimum requirements. Accessibility provisions for new construction shall apply to additions. An addition that affects the accessibility to, or contains an area of primary function, shall comply with the requirements of Sections 705, 806 and 906 as applicable.

1105.2 Accessible dwelling units and sleeping units. Where Group I-1, I-2, I-3, R-1, R-2 or R-4 dwelling or sleeping units are being added, the

requirements of Section 1107 of the International Building Code for accessible units apply only to the quantity of spaces being added.

1105.3 Type A dwelling or sleeping units. Where more than 20 Group R-2 dwelling or sleeping units are being added, the requirements of Section 1107 of the International Building Code for Type A units and Chapter 9 of the International Building Code for visible alarms apply only to the quantity of the spaces being added.

1105.4 Type B dwelling or sleeping units. Where four or more Group I-1, I-2, R-1, R-2, R-3 or R-4 dwelling or sleeping units are being added, the requirements of Section 1107 of the International Building Code for Type B units and Chapter 9 of the International Building Code for visible alarms apply only to the quantity of spaces being added.

SECTION 1204 **Accessibility**

1204.1 Accessibility requirements The provisions of Sections 705, 806 and 906, as applicable, shall apply to facilities designated as historic structures that undergo alterations or a change of occupancy, unless technically infeasible. Where compliance with the requirements for accessible routes, entrances or toilet rooms would threaten or destroy the historic significance of the facility, as determined by the authority having jurisdiction, the alternative requirements of Sections 1204.1.1 through 1204.4.4 for that element shall be permitted.

Exception: Type B dwelling or sleeping units required by Section 1107 of the International Building Code are not required to be provided in historical buildings.

Revise as follows:

305.9.1 1204.1.1 Site arrival points. Not fewer than one accessible route from a site arrival point to an accessible entrance shall be provided.

305.9.2 1204.1.2 Multiple-level buildings and facilities. An accessible route from an accessible entrance to public spaces on the level of the accessible entrance shall be provided.

305.9.3 1204.1.3 Entrances. Not fewer than one main entrance shall be accessible.

Exception: If a public entrance cannot be made accessible, an accessible entrance that is unlocked while the building is occupied shall be provided; or, a locked accessible entrance with a notification system or remote monitoring shall be provided.

Signs complying with Section 1111 of the International Building Code shall be provided at the public entrance and the accessible entrance.

305.9.4 1204.1.4 Toilet and bathing facilities. Where toilet rooms are provided, not fewer than one accessible family or assisted-use toilet room complying with Section 1109.2.1 of the International Building Code shall be provided.

Add new text as follows:

1301.2.6 Accessibility requirements. Accessibility shall be provided in accordance with Section 410 or 605.

Reason: The IEBC was set up many code cycles ago to offer three distinct options for compliance of existing buildings. By lumping all of the accessibility requirements into one chapter, there is no distinction for accessibility under any of the compliance methods. Previous editions of the IEBC offered code requirements for accessibility under each distinct compliance method. Those requirements should remain with each distinct compliance method as each method is designed to stand on its own merits.

This proposal is relocating the contents of Section 305 to the various chapters, depending on the compliance method. For the prescriptive method, the language in 305 has been moved to a new Section 508. For the work area compliance method, the language in 305 has been moved to Section 705. In addition to the language in Section 705, language has been added to cover the other work area options including repairs, Level 2 alterations, Level 3 alterations, change of occupancy, additions and historic buildings. For the performance compliance method, a section has been added to direct the user to comply with either the prescriptive method or the language for repairs.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is just reformatting current language so there is no impact to the construction cost.

Proposal # 5080

EB5-19

EB6-19

IEBC@: 4, SECTION 401, 401.1, 401.2, [BS] 401.3, SECTION 402, 402.1, SECTION 403, 403.1, SECTION 404, 404.1, SECTION 405, [BS] 405.1, [BS] 405.2, [BS] 405.2.1, [BS] 405.2.1.1, [BS] 405.2.2, [BS] 405.2.3, [BS] 405.2.3.1, [BS] 405.2.3.2, [BS] 405.2.3.3, [BS] 405.2.4, [BS] 405.2.4.1, [BS] 405.2.5, SECTION 406, 406.1, 406.1.1, 406.1.2, 406.1.3, 406.1.4, 406.1.5, SECTION 407, 407.1, 407.2, SECTION 408, 408.1, 408.2

Proponent: Eirene Knott, representing Metropolitan Kansas City Chapter of the ICC (Eirene.Knott@brrarch.com)

2018 International Existing Building Code

Revise as follows:

4 306 REPAIRS

Delete without substitution:

~~SECTION 401- GENERAL~~

Revise as follows:

~~401-1 306.1~~ **Scope.** *Repairs* shall comply with the requirements of this chapter. Section 306. *Repairs to historic buildings* need only comply with Chapter 12.

~~401-2 306.2~~ **Compliance.** The work shall not make the building less complying than it was before the *repair* was undertaken.

[BS] ~~401-3 306.3~~ **Flood hazard areas.** In flood hazard areas, *repairs* that constitute *substantial improvement* shall require that the building comply with Section 1612 of the International Building Code, or Section R322 of the International Residential Code, as applicable.

Delete without substitution:

~~SECTION 402- BUILDING ELEMENTS AND MATERIALS~~

Revise as follows:

~~402-1 306.4~~ **Glazing in hazardous locations.** Replacement glazing in hazardous locations shall comply with the safety glazing requirements of the International Building Code or International Residential Code as applicable.

Exception: Glass block walls, louvered windows and jalousies repaired with like materials.

Delete without substitution:

~~SECTION 403- FIRE PROTECTION~~

Revise as follows:

~~403-1 306.5~~ **General: Fire Protection.** *Repairs* shall be done in a manner that maintains the level of fire protection provided.

Delete without substitution:

~~SECTION 404- MEANS OF EGRESS~~

Revise as follows:

~~404-1 306.6~~ **General: Means of Egress.** *Repairs* shall be done in a manner that maintains the level of protection provided for the means of egress.

Delete without substitution:

~~SECTION 405- STRUCTURAL~~

Revise as follows:

[BS] ~~405-1 306.7~~ **General: Structural.** Structural *repairs* shall be in compliance with this section and Section ~~401-2-306.2~~

[BS] ~~405.2.306.7.1~~ **Repairs to damaged buildings.** *Repairs* to damaged buildings shall comply with this section.

[BS] ~~405.2.1~~ ~~306.7.1.1~~ **Repairs for less than substantial structural damage.** Unless otherwise required by this section, for damage less than *substantial structural damage*, the damaged elements shall be permitted to be restored to their predamage condition.

[BS] ~~405.2.1.1~~ ~~306.7.1.1.1~~ **Snow damage.** Structural components whose damage was caused by or related to snow load effects shall be repaired, replaced or altered to satisfy the requirements of Section 1608 of the International Building Code.

[BS] ~~405.2.2~~ ~~306.7.1.2~~ **Disproportionate earthquake damage.** A building assigned to Seismic Design Category D, E or F that has sustained *disproportionate earthquake damage* shall be subject to the requirements for buildings with substantial structural damage to vertical elements of the lateral force-resisting system.

[BS] ~~405.2.3~~ ~~306.7.1.3~~ **Substantial structural damage to vertical elements of the lateral force-resisting system.** A building that has sustained *substantial structural damage* to the vertical elements of its lateral force-resisting system shall be evaluated in accordance with Section ~~405.2.3.1~~ ~~306.7.1.3.1~~, and either repaired in accordance with Section ~~405.2.3.2~~ ~~306.7.1.3.2~~ or repaired and retrofitted in accordance with Section ~~405.2.3.3~~ ~~306.7.1.3.3~~, depending on the results of the evaluation.

Exceptions:

1. Buildings assigned to Seismic Design Category A, B or C whose *substantial structural damage* was not caused by earthquake need not be evaluated or retrofitted for load combinations that include earthquake effects.
2. One- and two-family dwellings need not be evaluated or retrofitted for load combinations that include earthquake effects.

[BS] ~~405.2.3.1~~ ~~306.7.1.3.1~~ **Evaluation.** The building shall be evaluated by a registered design professional, and the evaluation findings shall be submitted to the *code official*. The evaluation shall establish whether the damaged building, if repaired to its predamage state, would comply with the provisions of the International Building Code for load combinations that include wind or earthquake effects, except that the seismic forces shall be the reduced seismic forces.

[BS] ~~405.2.3.2~~ ~~306.7.1.3.2~~ **Extent of repair for compliant buildings.** If the evaluation establishes that the building in its predamage condition complies with the provisions of Section ~~405.2.3.1~~ ~~306.7.1.3.1~~, then the damaged elements shall be permitted to be restored to their predamage condition.

[BS] ~~405.2.3.3~~ ~~306.7.1.3.3~~ **Extent of repair for noncompliant buildings.** If the evaluation does not establish that the building in its predamage condition complies with the provisions of Section ~~405.2.3.1~~ ~~306.7.1.3.1~~, then the building shall be retrofitted to comply with the provisions of this section. The wind loads for the *repair* and *retrofit* shall be those required by the building code in effect at the time of original construction, unless the damage was caused by wind, in which case the wind loads shall be in accordance with the International Building Code. The seismic loads for this *retrofit* design shall be those required by the building code in effect at the time of original construction, but not less than the reduced seismic forces.

[BS] ~~405.2.4~~ ~~306.7.1.4~~ **Substantial structural damage to gravity load-carrying components.** Gravity load-carrying components that have sustained *substantial structural damage* shall be rehabilitated to comply with the applicable provisions for dead and live loads in the International Building Code. Snow loads shall be considered if the *substantial structural damage* was caused by or related to snow load effects. Undamaged gravity load-carrying components that receive dead, live or snow loads from rehabilitated components shall also be rehabilitated if required to comply with the design loads of the *rehabilitation* design.

[BS] ~~405.2.4.1~~ ~~306.7.1.4.1~~ **Lateral force-resisting elements.** Regardless of the level of damage to vertical elements of the lateral force-resisting system, if *substantial structural damage* to gravity load-carrying components was caused primarily by wind or seismic effects, then the building shall be evaluated in accordance with Section ~~405.2.3.1~~ ~~306.7.1.3.1~~ and, if noncompliant, retrofitted in accordance with Section ~~405.2.3.3~~ ~~306.7.1.3.3~~.

Exceptions:

1. Buildings assigned to Seismic Design Category A, B, or C whose substantial structural damage was not caused by earthquake need not be evaluated or retrofitted for load combinations that include earthquake effects.
2. One- and two-family dwellings need not be evaluated or retrofitted for load combinations that include earthquake effects.

[BS] ~~405.2.5~~ ~~306.7.1.5~~ **Flood hazard areas.** In *flood hazard areas*, buildings that have sustained *substantial damage* shall be brought into compliance with Section 1612 of the International Building Code, or Section R322 of the International Residential Code, as applicable.

Delete without substitution:

**SECTION 406-
ELECTRICAL**

Revise as follows:

~~406.1~~ ~~306.8~~ **Material: Electrical.** Existing electrical wiring and equipment undergoing *repair* shall be allowed to be repaired or replaced with like

material.

~~406-1-1~~ **306.8.1 Receptacles.** Replacement of electrical receptacles shall comply with the applicable requirements of Section 406.4(D) of NFPA 70.

~~406-1-2~~ **306.8.2 Plug fuses.** Plug fuses of the Edison-base type shall be used for replacements only where there is no evidence of over fusing or tampering per applicable requirements of Section 240.51(B) of NFPA 70.

~~406-1-3~~ **306.8.3 Nongrounding-type receptacles.** For replacement of nongrounding-type receptacles with grounding-type receptacles and for branch circuits that do not have an equipment grounding conductor in the branch circuitry, the grounding conductor of a grounding-type receptacle outlet shall be permitted to be grounded to any accessible point on the grounding electrode system or to any accessible point on the grounding electrode conductor in accordance with Section 250.130(C) of NFPA 70.

~~406-1-4~~ **306.8.4 Group 1-2 receptacles.** Receptacles in patient bed locations of Group 1-2 that are not "hospital grade" shall be replaced with "hospital grade" receptacles, as required by NFPA 99 and Article 517 of NFPA 70.

~~406-1-5~~ **306.8.5 Grounding of appliances.** Frames of electric ranges, wall-mounted ovens, counter-mounted cooking units, clothes dryers and outlet or junction boxes that are part of the existing branch circuit for these appliances shall be permitted to be grounded to the grounded circuit conductor in accordance with Section 250.140 of NFPA 70.

Delete without substitution:

~~SECTION 407~~ ~~MECHANICAL~~

Revise as follows:

~~407-1~~ **306.9 General: Mechanical.** Existing mechanical systems undergoing *repair* shall not make the building less complying than it was before the damaged occurred.

~~407-2~~ **306.9.1 Mechanical draft systems for manually fired appliances and fireplaces.** A mechanical draft system shall be permitted to be used with manually fired appliances and fireplaces where such a system complies with all of the following requirements:

1. The mechanical draft device shall be listed and installed in accordance with the manufacturer's installation instructions.
2. A device shall be installed that produces visible and audible warning upon failure of the mechanical draft device or loss of electrical power at any time that the mechanical draft device is turned on. This device shall be equipped with a battery backup if it receives power from the building wiring.
3. A smoke detector shall be installed in the room with the appliance or fireplace. This device shall be equipped with a battery backup if it receives power from the building wiring.

Delete without substitution:

~~SECTION 408~~ ~~PLUMBING~~

Revise as follows:

~~408-1~~ **306.10 Materials: Plumbing.** Plumbing materials and supplies shall not be used for *repairs* that are prohibited in the International Plumbing Code .

~~408-2~~ **306.10.1 Water closet replacement.** The maximum water consumption flow rates and quantities for all replaced water closets shall be 1.6 gallons (6 L) per flushing cycle.

Exception: Blowout-design water closets [3.5 gallons (13 L) per flushing cycle].

Reason: The purpose of this code change is to pull the provisions for repairs from Chapter 4 and put them in Chapter 3 which covers general provisions as repairs can occur using any of the compliance methods with the requirements being the same for each method.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
There is no cost impact as this is just moving current language to another location within the body of the code.

Proposal # 3972

EB6-19

EB7-19

IEBC®: CHAPTER 5, SECTION 501, 501.1, 501.1.1, SECTION 502, SECTION 503, SECTION 404 (New), 404.1 (New), 404.2 (New), 404.2.1 (New), 404.2.1.1 (New), 404.2.2 (New), 404.2.3 (New), 404.2.3.1 (New), 404.2.3.2 (New), 404.2.3.3 (New), 404.2.4 (New), 404.2.4.1 (New), 404.2.5 (New), SECTION 504, SECTION 505, SECTION 506, SECTION 507, CHAPTER 6, SECTION 601, SECTION 502 (New), 502.1 (New), 502.2 (New), 502.3 (New), SECTION 602, SECTION 603, SECTION 604, SECTION 605, SECTION 606, SECTION 607, SECTION 608, CHAPTER 4, SECTION 401, 401.1, 401.2, [BS] 401.3, SECTION 402, 402.1, SECTION 403, 403.1, SECTION 404, 404.1, SECTION 405, [BS] 405.1, [BS] 405.2, [BS] 405.2.1, [BS] 405.2.1.1, [BS] 405.2.2, [BS] 405.2.3, [BS] 405.2.3.1, [BS] 405.2.3.2, [BS] 405.2.3.3, [BS] 405.2.4, [BS] 405.2.4.1, [BS] 405.2.5, SECTION 406, 406.1, 406.1.1, 406.1.2, 406.1.3, 406.1.4, 406.1.5, SECTION 407, 407.1, 407.2, SECTION 408, 408.1, 408.2, 1301.2.4

Proponent: Eirene Knott, representing Metropolitan Kansas City Chapter of the ICC (Eirene.Knott@brrarch.com)

2018 International Existing Building Code

CHAPTER ~~5~~ 4 PRESCRIPTIVE COMPLIANCE METHOD

SECTION ~~501~~ 401 GENERAL

Revise as follows:

~~501.1~~ 401.1 **Scope.** The provisions of this chapter shall control the *alteration, repair, addition and change of occupancy of existing buildings and structures, including historic buildings and structures as referenced in Section 301.3.2.*

Exception: Existing bleachers, grandstands and folding and telescopic seating shall comply with ICC 300.

~~501.1.1~~ 401.1.1 **Compliance with other methods.** *Alterations, repairs, additions and changes of occupancy to existing buildings and structures shall comply with the provisions of this chapter or with one of the methods provided in Section 301.3.*

SECTION ~~502~~ 402 ADDITIONS

SECTION ~~503~~ 403 ALTERATIONS

Add new text as follows:

SECTION 404 REPAIRS

404.1 General. Buildings and structures, and parts thereof, shall be repaired in compliance with Section 404.

404.2 Repairs to damaged buildings. Repairs to damaged buildings shall comply with this section.

404.2.1 Repairs for less than substantial structural damage. Unless otherwise required by this section, for damage less than substantial structural damage, the damaged elements shall be permitted to be restored to their predamaged condition.

404.2.1.1 Snow damage. Structural components whose damage was caused by or related to snow load effects shall be repaired, replaced or altered to satisfy the requirements of Section 1608 of the International Building Code.

404.2.2 Disproportionate earthquake damage. A building assigned to Seismic Design Category D, E or F that has sustained disproportionate earthquake damage shall be subject to the requirements for buildings with substantial structural damage to vertical elements of the lateral force-resisting system.

404.2.3 Substantial structural damage to vertical elements of the lateral force-resisting system. A building that has sustained substantial structural damage to the vertical elements of its lateral force resisting system shall be evaluated in accordance with Section 404.2.3.1, and either repaired in accordance with Section 404.2.3.2 or repaired and retrofitted in accordance with Section 404.2.3.3, depending on the results of the evaluation.

Exceptions:

- Buildings assigned to Seismic Design Category A, B or C whose substantial structural damage was not caused by earthquake need not be evaluated or retrofitted for load combinations that include earthquake effects.
- One- and two-family dwellings need not be evaluated or retrofitted for load combinations that include earthquake effects.

404.2.3.1 Evaluation. The building shall be evaluated by a registered design professional, and the evaluation findings shall be submitted to the code official. The evaluation shall establish whether the damaged building, if repaired to its predamage state, would comply with the provisions of the International Building Code for load combinations that include wind or earthquake effects, except that the seismic forces shall be the reduced seismic forces.

404.2.3.2 Extent of repair for compliant buildings. If the evaluation establishes that the building in its predamage condition complies with the provisions of Section 404.2.3.1, then the damaged elements shall be permitted to be restored to their predamage condition.

404.2.3.3 Extent of repair for noncompliant buildings. If the evaluation does not establish that the building in its predamage condition complies with the provisions of Section 404.2.3.1, then the building shall be retrofitted to comply with the provisions of this section. The wind loads for the repair and retrofit shall be those required by the building code in effect at the time of original construction, unless the damage was caused by wind, in which case the wind loads shall be in accordance with the International Building Code. The seismic loads for this retrofit design shall be those required by the building code in effect at the time of original construction, but not less than the reduced seismic forces.

404.2.4 Substantial structural damage to gravity load-carrying components. Gravity load-carrying components that have sustained substantial structural damage shall be rehabilitated to comply with the applicable provisions for dead and live loads in the International Building Code. Snow loads shall be considered if the substantial structural damages was caused by or related to snow load effects. Undamaged gravity load-carrying components that receive dead, live or snow loads from rehabilitated components shall also be rehabilitated if required to comply with the design loads of the rehabilitation design.

404.2.4.1 Lateral force-resisting elements. Regardless of the level of damage to vertical elements of the lateral force-resisting system, if substantial structural damage to gravity load-carrying components was caused primarily by wind or seismic effects, then the building shall be evaluated in accordance with Section 404.2.3.1 and, if noncompliant, retrofitted in accordance with Section 404.2.3.3.

Exceptions:

1. Buildings assigned to Seismic Design Category A, B or C whose substantial structural damage was not caused by earthquake need not be evaluated or retrofitted for load combinations that include earthquake effects.
2. One-and two-family dwellings need not be evaluated or retrofitted for load combinations that include earthquake effects.

404.2.5 Flood hazard areas. In flood hazard areas, buildings that have sustained substantial damage shall be brought into compliance with Section 1612 of the International Building Code, or Section R322 of the International Residential Code, as applicable.

**SECTION 504 405
FIRE ESCAPES**

**SECTION 505 406
WINDOWS AND EMERGENCY ESCAPE OPENINGS**

**SECTION 506 407
CHANGE OF OCCUPANCY**

**SECTION 507 408
HISTORIC BUILDINGS**

CHAPTER 6 5 CLASSIFICATION OF WORK

**SECTION 601 501
GENERAL**

Add new text as follows:

**SECTION 502
REPAIRS**

502.1 Scope. Repairs, as defined in Chapter 2, include the patching or restoration or replacement of damaged materials, elements, equipment or fixtures for the purpose of maintaining such components in good or sound condition with respect to existing loads or performance requirements.

502.2 Application. Repairs shall comply with the provisions of Chapter 6.

502.3 Related Work. Work on nondamaged components that is necessary for the required repair of damaged components shall be considered part of the repair and shall not be subject to the provisions of Chapter 7, 8, 9, 10 or 11.

SECTION ~~602~~ 503
ALTERATION—LEVEL 1

SECTION ~~603~~ 504
ALTERATION—LEVEL 2

SECTION ~~604~~ 505
ALTERATION—LEVEL 3

SECTION ~~605~~ 506
CHANGE OF OCCUPANCY

SECTION ~~606~~ 507
ADDITIONS

SECTION ~~607~~ 508
HISTORIC BUILDINGS

SECTION ~~608~~ 509
RELOCATED BUILDINGS

CHAPTER 4 6 REPAIRS

SECTION ~~401~~ 601
GENERAL

Revise as follows:

~~401-1~~ 601.1 **Scope.** *Repairs as described in Section 502* shall comply with the requirements of this chapter. *Repairs to historic buildings* need only comply with Chapter 12.

~~401-2~~ 601.2 **Compliance.** The work shall not make the building less complying than it was before the *repair* was undertaken.

[BS] ~~401-3~~ 601.3 **Flood hazard areas.** In flood hazard areas, *repairs* that constitute *substantial improvement* shall require that the building comply with Section 1612 of the International Building Code, or Section R322 of the International Residential Code, as applicable.

SECTION ~~402~~ 602
BUILDING ELEMENTS AND MATERIALS

~~402-1~~ 602.1 **Glazing in hazardous locations.** Replacement glazing in hazardous locations shall comply with the safety glazing requirements of the International Building Code or International Residential Code as applicable.

Exception: Glass block walls, louvered windows and jalousies repaired with like materials.

SECTION ~~403~~ 603
FIRE PROTECTION

~~403-1~~ 603.1 **General.** *Repairs* shall be done in a manner that maintains the level of fire protection provided.

SECTION ~~404~~ 604
MEANS OF EGRESS

~~404-1~~ 604.1 **General.** *Repairs* shall be done in a manner that maintains the level of protection provided for the means of egress.

SECTION ~~405~~ 605
STRUCTURAL

[BS] ~~405-1~~ 605.1 **General.** Structural *repairs* shall be in compliance with this section and Section ~~401-2~~ 601.2.

[BS] ~~405-2~~ 605.2 **Repairs to damaged buildings.** *Repairs* to damaged buildings shall comply with this section.

[BS] ~~405-2-1~~ 605.2.1 **Repairs for less than substantial structural damage.** Unless otherwise required by this section, for damage less than *substantial structural damage*, the damaged elements shall be permitted to be restored to their predamage condition.

[BS] ~~405.2.1.1~~ 605.2.1.1 Snow damage. Structural components whose damage was caused by or related to snow load effects shall be repaired, replaced or altered to satisfy the requirements of Section 1608 of the International Building Code.

[BS] ~~405.2.2~~ 605.2.2 Disproportionate earthquake damage. A building assigned to Seismic Design Category D, E or F that has sustained *disproportionate earthquake damage* shall be subject to the requirements for buildings with substantial structural damage to vertical elements of the lateral force-resisting system.

[BS] ~~405.2.3~~ 605.2.3 Substantial structural damage to vertical elements of the lateral force-resisting system. A building that has sustained *substantial structural damage* to the vertical elements of its lateral force-resisting system shall be evaluated in accordance with Section ~~405.2.3.1~~ **605.2.3.1**, and either repaired in accordance with Section ~~405.2.3.2~~ **605.2.3.2** or repaired and retrofitted in accordance with Section ~~405.2.3.3~~ **605.2.3.3**, depending on the results of the evaluation.

Exceptions:

1. Buildings assigned to Seismic Design Category A, B or C whose *substantial structural damage* was not caused by earthquake need not be evaluated or retrofitted for load combinations that include earthquake effects.
2. One- and two-family dwellings need not be evaluated or retrofitted for load combinations that include earthquake effects.

[BS] ~~405.2.3.1~~ 605.2.3.1 Evaluation. The building shall be evaluated by a registered design professional, and the evaluation findings shall be submitted to the *code official*. The evaluation shall establish whether the damaged building, if repaired to its predamage state, would comply with the provisions of the International Building Code for load combinations that include wind or earthquake effects, except that the seismic forces shall be the reduced seismic forces.

[BS] ~~405.2.3.2~~ 605.2.3.2 Extent of repair for compliant buildings. If the evaluation establishes that the building in its predamage condition complies with the provisions of Section ~~405.2.3.1~~ **605.2.3.1**, then the damaged elements shall be permitted to be restored to their predamage condition.

[BS] ~~405.2.3.3~~ 605.2.3.3 Extent of repair for noncompliant buildings. If the evaluation does not establish that the building in its predamage condition complies with the provisions of Section ~~405.2.3.1~~ **605.2.3.1**, then the building shall be retrofitted to comply with the provisions of this section. The wind loads for the *repair* and *retrofit* shall be those required by the building code in effect at the time of original construction, unless the damage was caused by wind, in which case the wind loads shall be in accordance with the International Building Code. The seismic loads for this *retrofit* design shall be those required by the building code in effect at the time of original construction, but not less than the reduced seismic forces.

[BS] ~~405.2.4~~ 605.2.4 Substantial structural damage to gravity load-carrying components. Gravity load-carrying components that have sustained *substantial structural damage* shall be rehabilitated to comply with the applicable provisions for dead and live loads in the International Building Code. Snow loads shall be considered if the *substantial structural damage* was caused by or related to snow load effects. Undamaged gravity load-carrying components that receive dead, live or snow loads from rehabilitated components shall also be rehabilitated if required to comply with the design loads of the *rehabilitation* design.

[BS] ~~405.2.4.1~~ 605.2.4.1 Lateral force-resisting elements. Regardless of the level of damage to vertical elements of the lateral force-resisting system, if *substantial structural damage* to gravity load-carrying components was caused primarily by wind or seismic effects, then the building shall be evaluated in accordance with Section ~~405.2.3.1~~ **605.2.3.1** and, if noncompliant, retrofitted in accordance with Section ~~405.2.3.3~~ **605.2.3.3**.

Exceptions:

1. Buildings assigned to Seismic Design Category A, B, or C whose substantial structural damage was not caused by earthquake need not be evaluated or retrofitted for load combinations that include earthquake effects.
2. One- and two-family dwellings need not be evaluated or retrofitted for load combinations that include earthquake effects.

[BS] ~~405.2.5~~ 605.2.5 Flood hazard areas. In *flood hazard* areas, buildings that have sustained *substantial damage* shall be brought into compliance with Section 1612 of the International Building Code, or Section R322 of the International Residential Code, as applicable.

SECTION 406 606 ELECTRICAL

~~406.1~~ 606.1 Material. Existing electrical wiring and equipment undergoing *repair* shall be allowed to be repaired or replaced with like material.

~~406.1.1~~ 606.1.1 Receptacles. Replacement of electrical receptacles shall comply with the applicable requirements of Section 406.4(D) of NFPA 70.

~~406.1.2~~ 606.1.2 Plug fuses. Plug fuses of the Edison-base type shall be used for replacements only where there is no evidence of over fusing or tampering per applicable requirements of Section 240.51(B) of NFPA 70.

~~406.1.3~~ 606.1.3 Nongrounding-type receptacles. For replacement of nongrounding-type receptacles with grounding-type receptacles and for branch circuits that do not have an equipment grounding conductor in the branch circuitry, the grounding conductor of a grounding-type receptacle outlet shall be permitted to be grounded to any accessible point on the grounding electrode system or to any accessible point on the grounding

electrode conductor in accordance with Section 250.130(C) of NFPA 70.

~~406-1.4~~ **606.1.4 Group I-2 receptacles.** Receptacles in patient bed locations of Group I-2 that are not “hospital grade” shall be replaced with “hospital grade” receptacles, as required by NFPA 99 and Article 517 of NFPA 70.

~~406-1.5~~ **606.1.5 Grounding of appliances.** Frames of electric ranges, wall-mounted ovens, counter-mounted cooking units, clothes dryers and outlet or junction boxes that are part of the existing branch circuit for these appliances shall be permitted to be grounded to the grounded circuit conductor in accordance with Section 250.140 of NFPA 70.

SECTION 407.607 MECHANICAL

~~407-1~~ **607.1 General.** Existing mechanical systems undergoing *repair* shall not make the building less complying than it was before the damaged occurred.

~~407-2~~ **607.2 Mechanical draft systems for manually fired appliances and fireplaces.** A mechanical draft system shall be permitted to be used with manually fired appliances and fireplaces where such a system complies with all of the following requirements:

1. The mechanical draft device shall be listed and installed in accordance with the manufacturer’s installation instructions.
2. A device shall be installed that produces visible and audible warning upon failure of the mechanical draft device or loss of electrical power at any time that the mechanical draft device is turned on. This device shall be equipped with a battery backup if it receives power from the building wiring.
3. A smoke detector shall be installed in the room with the appliance or fireplace. This device shall be equipped with a battery backup if it receives power from the building wiring.

SECTION 408.608 PLUMBING

~~408-1~~ **608.1 Materials.** Plumbing materials and supplies shall not be used for *repairs* that are prohibited in the International Plumbing Code .

~~408-2~~ **608.2 Water closet replacement.** The maximum water consumption flow rates and quantities for all replaced water closets shall be 1.6 gallons (6 L) per flushing cycle.

Exception: Blowout-design water closets [3.5 gallons (13 L) per flushing cycle].

~~1301.2.4~~ **Alterations. Alterations and repairs.** An *existing building* or portion thereof shall not be altered or repaired in such a manner that results in the building being less safe or sanitary than such building is currently. Exception: Where the current level of safety or sanitation is proposed to be reduced, the portion altered or repaired shall conform to the requirements of the International Building Code.

Reason: The IEBC was set up many code cycles ago to offer three distinct options for compliance of existing buildings. By lumping all of the repair requirements into one chapter, there is no distinction for repairs under any of the compliance methods. Previous editions of the IEBC offered code requirements for repairs under each distinct compliance method. Those requirements should remain with each distinct compliance method as each method is designed to stand on its own merits.

This proposed code change is moving the language from Chapter 4, Repairs, to become its own Chapter under the Work Area Compliance Method as well as providing language in the Prescriptive Method and the Compliance Method. The intention is that this relocation puts the repair language in the appropriate compliance method, depending on which method is utilized by the designer.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. There is no cost impact with this code change as it is only relocating language.

Proposal # 4024

EB7-19

EB8-19

301.5, 305.2 (New), 305.8.2, 305.8.3

Proponent: Dawn Anderson, representing self (gonedawning@yahoo.com); Gene Boecker, representing Code Consultants, Inc. (geneb@codeconsultants.com); Dan Buuck, representing National Association of Home Builders (dbuuck@nahb.org); David Collins, representing the American Institute of Architects (dcollins@preview-group.com); Marsha Mazz, representing United Spinal Association (m.mazz@verizon.net).

2018 International Existing Building Code

SECTION 301 ADMINISTRATION

Delete without substitution:

~~**301.5 Compliance with accessibility.** Accessibility requirements for *existing buildings* shall comply with the 2009 edition of ICC A117.1.~~

SECTION 305 ACCESSIBILITY FOR EXISTING BUILDINGS

305.1 Scope. The provisions of Sections 305.1 through 305.9 apply to maintenance, *change of occupancy*, *additions* and *alterations* to *existing buildings*, including those identified as *historic buildings*.

Add new text as follows:

305.2 Design. Buildings and facilities shall be designed and constructed to be *accessible* in accordance with this code and the alteration and existing building provisions in ICC A117.1, as applicable.

Revise as follows:

305.8.2 Elevators. Altered elements of existing elevators shall comply with ASME A17.1 ~~and ICC A117.1~~. Such elements shall also be altered in elevators programmed to respond to the same hall call control as the altered elevator.

305.8.3 Platform lifts. Platform (wheelchair) lifts ~~complying with ICC A117.1 and~~ installed in accordance with ASME A18.1 shall be permitted as a component of an accessible route.

Reason: The 2017 A117.1 has separate requirements for new and existing construction. The concern that brought out this change originally that existing buildings would have to automatically upgrade to the new sizes has been resolved.

In addition, by stating that the "existing building" provisions apply, it will be clear which of the technical requirements to include in the standard. "Existing buildings" is defined in the 2017 A117.1 the same as in the IEBC.

existing building: A building erected prior to the date of adoption of this standard, or one for which a legal building permit has been issued.

A few places in the A117.1 use "alterations" instead of "existing buildings". To make sure that it is understood that both apply to existing buildings, both term are called out in this reference.

The "as applicable" is added for the sections that do not have separate provisions for new and existing buildings/alterations.

The references to ICC A117.1 in Section 305.8.2 and 305.8.3 are redundant with this modification and no longer needed.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Since this update to new standard has allowances for existing buildings, this is mostly editorial.

Proposal # 4354

EB8-19

EB9-19

IEBC: 301.3

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Existing Building Code

Revise as follows:

SECTION 301 ADMINISTRATION

301.1 General. The *repair, alteration, change of occupancy, addition* or relocation of all *existing buildings* shall comply with Section 301.2, 301.3, or 301.4.

301.2 Repairs. *Repairs* shall comply with the requirements of Chapter 4.

301.3 Alteration, addition or change of occupancy. The *alteration, addition* or *change of occupancy* of all *existing buildings* shall comply with one of the methods listed in Section 301.3.1, 301.3.2 or 301.3.3 as selected by the applicant. Sections 301.3.1 through 301.3.3 shall not be applied in combination with each other.

Exception: Subject to the approval of the *code official, alterations* complying with the laws in existence at the time the building or the affected portion of the building was built shall be considered in compliance with the provisions of this code. New structural members added as part of the *alteration* shall comply with the International Building Code. This exception shall not apply to ~~alterations that constitute~~ the following:

1. Alterations that constitute accessibility improvements, which shall comply with Section 305.
2. Alterations that constitute substantial improvement in flood hazard areas, which shall comply with Section 503.2, 701.3 or 1301.3.3.
2. ~~This exception shall not apply to the structural~~ Structural provisions of Section 303, Chapter 5 or to the structural provisions of Sections 706, 806 and 906-

Reason: Essentially besides from some structural and flood issues the code official could allow complete exemption from this code. The largest concern is the accessibility pieces which we address in this code because of the ADA will affect them in either case. Without this link we are potentially causing legal issues for many building owners by not requiring compliance with the accessibility provisions of the IEBC for alterations. The change to the structural provisions is a correlation piece since part of the structural provisions was relocated to Section 303 in the 2018 IEBC.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This is already required by the American's with Disabilities Act. It was always the intent of the requirements to apply to existing buildings so that accessibility is improved over time.

Proposal # 4198

EB9-19

EB10-19

IEBC: 301.1.1 (New), 401.1.1 (New), 501.1, 1401.1.1 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Existing Building Code

Revise as follows:

3 PROVISIONS FOR ALL COMPLIANCE METHODS

SECTION 301 ADMINISTRATION

301.1 General. The *repair, alteration, change of occupancy, addition* or relocation of all *existing buildings* shall comply with Section 301.2, 301.3, or 301.4.

Add new text as follows:

301.1.1 Bleachers, grandstands and folding and telescopic seating. Existing bleachers, grandstands and folding and telescopic seating shall comply with ICC 300.

Revise as follows:

4 REPAIRS

SECTION 401 GENERAL

401.1 Scope. *Repairs* shall comply with the requirements of this chapter. *Repairs to historic buildings* need only comply with Chapter 12.

Add new text as follows:

401.1.1 Bleachers, grandstands and folding an telescopic seating. Repairs to existing bleachers, grandstands and folding and telescopic seating shall comply with ICC 300.

Revise as follows:

5 PRESCRIPTIVE COMPLIANCE METHOD

SECTION 501 GENERAL

501.1 Scope. The provisions of this chapter shall control the *alteration, addition and change of occupancy* of *existing buildings* and structures, including *historic buildings* and structures as referenced in Section 301.3.2.

~~**Exception:** Existing bleachers, grandstands and folding and telescopic seating shall comply with ICC 300.~~

14 RELOCATED OR MOVED BUILDINGS

SECTION 1401 GENERAL

1401.1 Scope. This chapter provides requirements for relocated or moved structures, including *relocatable buildings* as defined in Chapter 2.

Add new text as follows:

1401.1.1 Bleachers, grandstands and folding an telescopic seating. Relocated or moved bleachers, grandstands and folding and telescopic seating shall comply with ICC 300.

Reason: The bleacher safety standard includes provisions for new construction as well as maintenance, repair, alterations and relocation of bleachers. The current reference for alterations is only in the prescriptive method. It should be applicable for all methods, thus the addition to Chapter 3. In addition, this is a requirement, not an exception – currently Section 501.1 has this as an exception. ICC 300 includes provisions for repairs and moved bleachers. Therefore, a reference should be added into the chapter for repairs (Chapter 4) and relocated buildings(Chapter 14). These chapters are not covered by Chapter 3.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
As the proposed change is only affecting the location of the pointer for greater clarity, there is no cost impact to the proposed change.

Proposal # 4229

EB10-19

EB11-19

IEBC: 302.3.1 (New)

Proponent: John Williams, representing Healthcare Committee (AHC@iccsafe.org)

2018 International Existing Building Code

Revise as follows:

302.3 Additional codes. *Alterations, repairs, additions and changes of occupancy* to, or relocation of, *existing buildings* and structures shall comply with the provisions for *alterations, repairs, additions and changes of occupancy* or relocation, respectively, in this code and the International Energy Conservation Code , International Fire Code , International Fuel Gas Code , International Mechanical Code , International Plumbing Code , International Private Sewage Disposal Code , International Property Maintenance Code , International Residential Code and NFPA 70. Where provisions of the other codes conflict with provisions of this code, the provisions of this code shall take precedence.

Add new text as follows:

302.3.1 Additional Codes in Healthcare. In existing Group I-2 occupancies, ambulatory healthcare facilities, outpatient clinics and hyperbaric facilities, alterations, repairs, additions and changes of occupancy to, or relocation of, existing buildings and structures shall comply with the provisions for alterations, repairs, additions and changes of occupancy in NFPA 99.

Reason: NFPA 99 is currently in the IFC for maintenance and repair. NFPA 99 specifies additional requirements for building systems in health care facilities than just NFPA 70. In order to meet federal conditions of participation health care facilities must comply with system and equipment according to the requirements listed in NFPA 99, Health Care Facilities Code (K901, K902, K904, K905, K911, K906, K912, K914, K915 and K916). This change will align the electrical systems installation requirements for Outpatient Clinics, Group B Ambulatory Care and Group I-2 facilities. NFPA 99 uses a risk based approach to system design, installation and maintenance in healthcare facilities (Group I-2 facilities, ambulatory care facilities and outpatient clinics). Four levels of systems categories are defined in NFPA 99, based on the risks to patients and caregivers in the facilities. The categories are as follows:

- (1) Category 1: Systems that are expected to be functional at all times. Failure of these systems is likely to cause major injury or death.
- (2) Category 2: Systems are expected to have a high level of reliability. Failures of these systems are likely to cause minor injury to patients or caregivers, however, limited short durations of equipment downtime can be tolerated. Category 2 systems are not critical for life support.
- (3) Category 3: Normal building system reliabilities are expected. Such systems support patient needs, but failure of such equipment or systems would not immediately affect patient care and are not critical for life support.
- (4) Category 4: Such systems have no impact on patient care and would not be noticeable to patients in the event of failure.

The category definitions apply to equipment and systems operations.

A risk assessment should be conducted to evaluate the risk to the patients, staff, and visitors in all healthcare facilities. These categories are not always aligned to occupancy classification. Potential examples of areas/systems and their categories of risk;

- (1) Ambulatory surgical center, where patients undergo general anesthesia, Category 1
- (2) Reconstructive surgeon's office with general anesthesia, Category 1
- (3) Procedural sedation site for outpatient services, Category 2
- (4) Cooling systems in Houston, TX, Category 2
- (5) Cooling systems in Seattle, WA, Category 3
- (6) Heating systems in Chicago, IL Category 2
- (7) Dental office, no general anesthesia, Category 3
- (8) Typical doctor's office/exam room, Category 4
- (9) Group I-2 Condition 2 facilities most systems would be Category 1

This approach more closely aligns system design, performance and maintenance to the safety risk to the public. It does not create significant

additional costs.

This proposal is submitted by the ICC Committee on Healthcare (CHC). The CHC was established by the ICC Board to evaluate and assess contemporary code issues relating to healthcare facilities. This is a joint effort between ICC and the American Society for Healthcare Engineering (ASHE), a subsidiary of the American Hospital Association, to eliminate duplication and conflicts in healthcare regulation. In 2017 and 2018 the CHC held 4 open meetings and numerous conference calls, *which included members of the committees as well as any interested parties, to discuss and debate the proposed changes*. Information on the CHC, including: meeting agendas; minutes; reports; resource documents; presentations; and all other materials developed in conjunction with the CHC effort can be downloaded from the CHC website at: <https://www.iccsafe.org/codes-tech-support/cs/icc-committee-on-healthcare/>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This change aligns with existing federal requirements for the healthcare industry.

Proposal # 4249

EB11-19

EB12-19

IEBC@: 302.5.2 (New), (New)

Proponent: Marcelo M Hirschler, GBH International, representing GBH International (mmh@gbhint.com)

2018 International Existing Building Code

Add new text as follows:

302.5.2 Replacement of exterior wall covering or exterior wall envelope Materials and methods of application used to add or replace an exterior wall covering or exterior wall envelope shall comply with the requirements of Chapter 14 and Chapter 26 of the International Building Code.

Add new definition as follows:

[BF] EXTERIOR WALL COVERING. A material or assembly of materials applied on the exterior side of exterior walls for the purpose of providing a weather-resisting barrier, insulation or for aesthetics, including but not limited to, veneers, siding, exterior insulation and finish systems, architectural trim and embellishments such as cornices, soffits, facias, gutters and leaders.

[BF] EXTERIOR WALL ENVELOPE. A system or assembly of exterior wall components, including exterior wall finish materials, that provides protection of the building structural members, including framing and sheathing materials, and conditioned interior space, from the detrimental effects of the exterior environment.

Reason: Where either replacement of the exterior wall covering or envelope is done for any reason (or where an exterior wall assembly or an exterior wall envelope is being added); either voluntarily by the building owner or because the system no longer performs its required function to protect the building structure and interior from the weather and external environment, this proposal simply requires the new or replaced exterior wall system to meet the minimum performance and safety requirements in IBC Chapters 14 and 26 as applicable.

There were a number of proposals in Group A that were approved for IBC Chapter 14 and 26 to clarify the performance and fire safety testing of exterior walls in response to several fatal fires related to exterior façade/curtain wall fires. These requirements are necessary for the IEBC to ensure the safety of existing buildings when replacement of the exterior wall covering or envelope is performed for any reason. Recent international fires have shown the potential of exterior wall systems to cause severe destruction and potential life loss.

The intent of this proposal is to require a reasonable set of minimum code requirements to ensure fire safety and weather protection for building exterior walls that contain a new building exterior wall envelope; the same requirements that apply to such systems in the IBC Chapters 14 and 26.

This proposal also adds two definitions for clarity. These same definitions are currently included in the IBC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

No cost increase to construction as this proposal does not specify that an exterior wall covering or envelope must be replaced. When an addition or replacement is necessary because the system does not exist or no longer performs its required function to protect the building structure and interior from the weather and external environment, this proposal simply requires the replacement to meet the minimum performance and safety requirements in IBC Chapters 14 and 26, as applicable.

Proposal # 4724

EB12-19

EB13-19

IEBC@: 302.5.2 (New)

Proponent: Marcelo M Hirschler, GBH International, representing GBH International (mmh@gbhint.com)

2018 International Existing Building Code

Add new text as follows:

302.5.2 High rise buildings Where an exterior wall envelope is added to, or replaced, in a building with an occupied floor exceeding 75 feet above the lowest level of fire department vehicle access, an automatic sprinkler system complying with Section 903.3.1.1 of the *International Building Code* shall be required throughout the building.

Reason: Many existing high-rise buildings were constructed before automatic fire sprinkler systems were required. Many of these buildings would have been constructed without an exterior wall envelope and would not have had possible flame spread outside the exterior wall. If an exterior wall envelope is being added the fire hazard is increased and the protection offered by an automatic fire sprinkler system would be important to lower the increased fire hazard.

This proposal would require that the high-rise building now be protected with an automatic fire sprinkler system. It is recognized that fire sprinklers would not suppress or control a fire in the building exterior, but they would help control interior fires and thereby reduce the hazard resulting from those fires venting out windows or other openings and be a source of flame spread along the exterior wall system, or even ignition of the system (if it contains combustible components, such as foam plastic insulation).

Where an existing exterior wall envelope is being replaced by a new system, the potential still exists for increased fire hazard. This proposal would also require that the building now be protected by an automatic fire sprinkler system.

Cost Impact: The code change proposal will increase the cost of construction

This proposal would add to the cost of construction for any building undergoing an exterior wall envelopment addition or replacement if the building is not already equipped with an automatic fire sprinkler system. There would be no added cost of construction for buildings that are protected with an automatic fire sprinkler system.

Proposal # 4725

EB13-19

EB14-19

IEBC: SECTION 303 (New), 303.1 (New), 502.8, 1106.1, 1106.1.1, 1106.1.2, 1301.2.3.1

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Marc Levitan, representing the ICC 500 Storm Shelter Development Committee

2018 International Existing Building Code

Add new text as follows:

SECTION 303 **STORM SHELTERS**

303.1 Storm shelters. This section applies to the construction of storm shelters constructed as rooms or spaces within *existing buildings* for the purpose of providing protection during storms that produce high winds, such as tornadoes and hurricanes. Such structures shall be designated to be hurricane shelters, tornado shelters, or combined hurricane and tornado shelters. Such structures shall be constructed in accordance with this code and ICC 500.

SECTION 502 **ADDITIONS**

Delete without substitution:

~~**502.8 Additions to Group E facilities.** For additions to Group E occupancies, storm shelters shall be provided in accordance with Section 1106.1.~~

~~SECTION 1106~~ **~~STORM SHELTERS~~**

Revise as follows:

~~1106.1~~ **303.2 Addition to a Group E occupancy.** Where an *addition* is added to an existing Group E occupancy located in an area where the shelter design wind speed for tornados is 250 mph in accordance with Figure 304.2(1) of ICC 500 and the occupant load in the *addition* is 50 or more, the *addition* shall have a storm shelter constructed in accordance with ICC 500.

Exceptions:

1. Group E day care facilities.
2. Group E occupancies accessory to places of religious worship.
3. Additions meeting the requirements for shelter design in ICC 500.

~~1106.1.1~~ **303.2.1 Required occupant capacity.** The required occupant capacity of the storm shelter shall include all buildings on the site, and shall be the greater of the following:

1. The total occupant load of the classrooms, vocational rooms and offices in the Group E occupancy.
2. The occupant load of any indoor assembly space that is associated with the Group E occupancy.

Exceptions:

1. Where an *addition* is being added on an existing Group E site, and where the *addition* is not of sufficient size to accommodate the required occupant capacity of the storm shelter for all of the buildings on-site, the storm shelter shall at a minimum accommodate the required capacity for the addition.
2. Where *approved* by the *code official*, the required occupant capacity of the shelter shall be permitted to be reduced by the occupant capacity of any existing storm shelters on the site.

~~1106.1.2~~ **303.2.2 Location.** Storm shelters shall be located within the buildings they serve, or shall be located where the maximum distance of travel from not fewer than one exterior door of each building to a door of the shelter serving that building does not exceed 1,000 feet (305 m).

SECTION 1301 **GENERAL**

1301.2.3 Additions. *Additions* to *existing buildings* shall comply with the requirements of the International Building Code or the International Residential Code for new construction. The combined height and area of the *existing building* and the new *addition* shall not exceed the height and area allowed by Chapter 5 of the International Building Code. Where a fire wall that complies with Section 706 of the International Building Code is

provided between the *addition* and the *existing building*, the *addition* shall be considered a separate building.

Delete without substitution:

~~1301.2.3.1 Additions to Group E facilities. For additions to Group E occupancies, storm shelters shall be provided in accordance with Section 1106.1.~~

Reason: Where storm shelters are required in Group E additions was added to the 2018 IEBC Section 502.8, 1106 and 1301.2.3.1. There needs to be a reference to ICC 500 if someone builds a storm shelter inside an existing building – either voluntarily or to meet the occupant capacity requirement or travel distances set up in 1106. This new text is not a requirement for a shelter, but instead what to do if one is provided. The language is similar to Section IBC Section 423. The last sentence in Section 303.1 would also clarify the difference between and shelters for after the storm and a storm shelter. This is consistent with IBC Section 423 and the revisions in G59-18. Since this requirement is in the prescriptive method and the work area method, it is suggested to move all the requirements to Chapter 3 as a new section on storm shelters.

This proposal is submitted by the ICC Building Code Action Committee (BCAC) and the ICC 500 Code Development Committee.

BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

The ICC 500 Standards Development committee is responsible for the development of the ICC/NSSA Standard for the Design and Construction of Storm Shelters. The committee is currently working on the development of the 2020 edition. In 2017 the ICC 500 committee held 7 open conference calls. In addition, there were numerous Working Group meetings and conference calls, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/standards-development/is-stm>.

Cost Impact: The code change proposal will increase the cost of construction

If someone builds a shelter voluntarily in an existing building, this might increase the cost over a shelter that did not comply with ICC 500. However, this is a necessary safety requirement for all storm shelters.

Proposal # 4327

EB14-19

EB15-19

IEBC@: [BS] 303.3

Proponent: Terry Kozlowski, representing Southern Nevada Chapter; Amanda Moss, representing SN-ICC Member; Cassidy Wilson, representing SN-ICC Member; Nenad Mirkovic, representing City of Las Vegas; Valarie Evans, representing Southern Nevada Chapter

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Revise as follows:

[BS] 303.3 Seismic evaluation and design procedures. Where required, seismic evaluation or design shall be based on the procedures and criteria in this section, regardless of which compliance method is used.

Exception: Where a Change of occupancy to Group A with an occupant load not to exceed 500 occurs in an existing one-story building a seismic evaluation is not required.

Reason: More than 12,000 stores in 2018 and 50% of the 1,200 shopping malls across the U.S. are expected to close by 2023. This alarming trend will impact future redevelopment efforts in these existing structures. This proposal will promote the redevelopment efforts of municipalities, by reducing the construction cost without compromising security and safety of the occupants.

This proposal does not adversely impact any of the architectural and/or fire design requirements. This proposal will increase the threshold from 300 to 500 occupants.

The 300 occupant load threshold may be based on the 1942 Boston fire (Exhibit D) due to the number of fatalities. Fire sprinkler, fire alarm, interior finish and structural design provisions in the code provide more protection in today's structures.

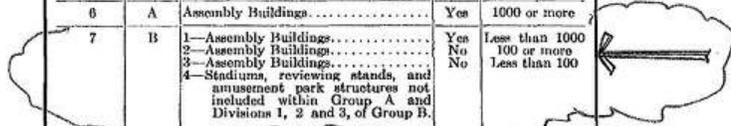
We looked to the life safety egress provisions where 500 is the threshold for when a 3rd exit is required as a good point to upgrade the structural threshold. 500 is also consistent with the current Risk Category III threshold for post 12th grade educational occupancies.

The following link states the IBC and/or IEBC: "is a model code that provides minimum requirements to safeguard the public health, safety and general welfare of the occupants of new and existing buildings and structures..." https://en.wikipedia.org/wiki/List_of_earthquakes_in_the_United_States

When reviewing a list of notable earthquakes and fatalities associated with events from January 26, 1700 to January 23, 2018 (318 years), there have been approximately 3,919 fatalities https://en.wikipedia.org/wiki/List_of_earthquakes_in_the_United_States. In comparison, the following link shows motor vehicle deaths in the U.S. for the last 11 years. https://en.wikipedia.org/wiki/Motor_vehicle_fatality_rate_in_U.S._by_year In 2017 alone, there were 37,133 vehicle deaths. The following link (2007-2016) show there were 145 fire-related fatalities and 1,550 injuries in non-residential fires. https://www.usfa.fema.gov/downloads/pdf/statistics/nonres_bldg_fire_estimates.pdf These statistics provide comparison in historical data as to the number of deaths in structures during earthquakes..

TABLE NO. 5-A—GROUPS OF OCCUPANCY

Chapter Reference	Group	OCCUPANCY		
		DIVISION	Work- ing Stage	
6	A	Assembly Buildings.....	Yes	Seating Capacity in Any One Room 1000 or more
7	B	1—Assembly Buildings.....	Yes	Less than 1000 100 or more Less than 100
		2—Assembly Buildings.....	No	
		3—Assembly Buildings.....	No	
		4—Stadiums, reviewing stands, and amusement park structures not included within Group A and Divisions 1, 2 and 3, of Group B.	No	
8	C	Any building used for school purposes, involving assemblage for instruction, education, or recreation		
9	D	1—Jails, prisons, reformatories, houses of correction, and buildings where personal liberties of inmates are similarly restrained.....		
		2—Hospitals, sanitariums, old peoples homes, orphanages, nurseries, and similar buildings (each accommodating more than six).....		
10	E	Public garages, paint or petroleum storage, dry cleaning plants using flammable liquids, paint shops, and spray painting rooms and shops..... Planing mills, box factories, wood-working and mattress factories... Storage of hazardous and highly flammable or explosive materials and liquids.....		
11	F	Wholesale and retail stores, office buildings, restaurants, undertaking parlors, printing plants, municipal police and fire stations... Gasoline filling and service stations, factories and workshops using materials not highly flammable or combustible..... Storage and sales rooms for combustible goods.....		
12	G	Ice plants, power plants, pumping plants, cold storage, and creameries..... Factories and workshops using incombustible and non-explosive materials..... Storage and sales rooms of incombustible and non-explosive materials.		
13	H	Hotels, apartment houses, dormitories, lodging houses..... Convents and monasteries (each accommodating more than ten persons).....		
14	I	Dwellings.....		
16	J	1—Private garages, sheds and minor buildings used as accessories only when not over one thousand square feet (1000 sq. ft.) in area.. 2—Fences over six feet (6') high, tanks and towers.		



1943 UBC
 APP'D 6/1942
 PUBLISHED 5/1943

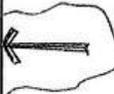
EXHIBIT "B"

Table 5-A

UNIFORM BUILDING CODE

TABLE NO. 5-A—GROUPS OF OCCUPANCY

Chapter Reference	Group	OCCUPANCY	
		DIVISION	Seating Capacity in Any One Room
6	A	Assembly Buildings.....	Yes 1000 or more
7	B	1—Assembly Buildings.....	Yes
		2—Assembly Buildings.....	No
		3—Assembly Buildings.....	No
		4—Stadiums, reviewing stands, and amusement park structures not included within Group A and Divisions 1, 2 and 3, of Group B.	No
8	C	Any building used for school purposes, involving assemblage for instruction, education, or recreation....	
9	D	1—Jails, prisons, reformatories, houses of correction, and buildings where personal liberties of inmates are similarly restrained.....	
		2—Nurseries for children under six; hospitals, sanitariums, and similar buildings (each accommodating six or more persons); kindergartens.....	
10	E	Public garages, paint or petroleum storage, dry cleaning plants using flammable liquids, paint shops, and spray painting rooms and shops..... Planing mills, box factories, wood-working and mattress factories... Storage of hazardous and highly flammable or explosive materials and liquids.....	
11	F	Wholesale and retail stores, office buildings, restaurants, undertaking parlors, printing plants, municipal police and fire stations... Gasoline filling and service stations, factories and workshops using materials not highly flammable or combustible..... Storage and sales rooms for combustible goods.....	
12	G	Ice plants, power plants, pumping plants, cold storage, and creameries..... Factories and workshops using incombustible and non-explosive materials..... Storage and sales rooms of incombustible and non-explosive materials.	
13	H	1—Homes for aged, orphanages, dormitories for children over six (each accommodating six or more persons).....	
		2—Hotels, apartment houses, dormitories, lodging houses, convents, monasteries (each accommodating 10 or more persons).....	
14	I	Dwellings.....	
15	J	1—Private garages, sheds and minor buildings used as accessories only when not over one thousand square feet (1000 sq. ft.) in area..	
		2—Fences over six feet (6') high, tanks and towers.....	



1946 UBC
 APP'D 9/1945
 PRINTED 1/1946

1949 UBC
 AS MFD 10/1948
 PUBLISHED 1/1949

TABLE NO. 5-A—WALL AND OPENING PROTECTION BASED ON OCCUPANCY*

Group	OCCUPANCY	Divi- sion	FIRE RESISTANCE OF EXTERIOR WALLS		PROTECTION OF OPENINGS IN EXTERIOR WALLS	
			Time Period (Hours)	Distance to Property Line	Opening Protection	Distance to Property Line
A	Any assembly building with a stage and an occupant load of 1000 or more in the building.	1	4	Any Location	No Openings	Less than 5'
	1—Any assembly building with a stage and an occupant load of less than 1000 in the building.		4	Less than 5'	E or F	5' to 10'
	2—Any assembly building without a stage and having an occupant load of 300 or more in the building.		2	5' to 10'	E or F	5' to 10'
	3—Any assembly building without a stage and having an occupant load of less than 300 in the building, including such buildings used for school purposes less than four hours per week.		2	Less than 5'	No Openings	Less than 5'
B	4—Stadiums, reviewing stands, and amusement park structures not included within Group A nor Divisions 1, 2 and 3, Group B, occupants.	1	1	Less than 10'	E or F	Less than 10'
	Any building used for school purposes more than four hours per week involving assemblies for instruction, education, or recreation.		4	Less than 5'	No Openings	Less than 5'
C	1—Mental hospitals, jails, prisons, reformatories, houses of correction, and buildings where personal liberties of inmates are similarly restrained.	1	4	Less than 5'	No Openings	Less than 5'
	2—Nurseries for children under six, hospitals, sanitariums, mental sanitariums conforming to Sec. 2618 (1), and similar buildings (each accommodating six or more persons).		1	5' or more	E or F	5' to 10'

Table 5-A

UNIFORM BUILDING CODE

Group	Occupancy	Divi- sion	Time Period (Hours)	Distance to Property Line	Opening Protection	Distance to Property Line
B	1—Paint or petroleum storage, dry cleaning plants using flammable liquids, paint shops and spray painting rooms and shops; blasting mills, box factories, wood-working and mattress factories.	1 & 2	2	5' to 10'	E or F	10' to 20'
	2—Aircraft hangars where no repair work is done except welding, or the use of highly flammable liquids.		1	10' to 20'	E or F	10' to 20'
C	2—Public garages, storage of hazardous and highly flammable or explosive materials and liquids.	2	1	Less than 5'	No Openings	Less than 5'
	1—Wholesale and retail stores, office buildings, restaurants, undertaking parlors, printing plants, police and fire stations; gasoline filling and service stations, factories and workshops using materials not highly flammable or combustible; storage and sales rooms for combustible goods, retail stores without bulk handling.		1	5' to 10'	E or F	5' to 10'
D	2—Aircraft hangars where no repair work is done except welding, or the use of highly flammable liquids.	2	1	Less than 20'	E or F	Less than 20'
	1—Ice plants, power plants, pumping plants, cold storage, and creameries, factories and workshops using combustible and non-explosive materials. Storage and sales rooms of non-combustible and non-explosive materials.		1	Less than 5'	No Openings	Less than 5'
E	1—Homes for aged, orphanages, dormitories for children over six (each accommodating six or more persons).	1 & 2	1	Less than 5'	No Openings	Less than 5'
	2—Hotels, apartment houses, dormitories, lodging houses, convents, monasteries (each accommodating 10 or more persons).		1	Less than 5'	E or F	5' to 10'
F	Dwellings	1	1	Less than 5'	No Openings	Less than 5'
	1—Private garages, sheds and minor buildings used as workshops only which not over one thousand square feet (1000 sq. ft.) in area.		1	**	Less than 5'	No Openings
G	2—Purses over six feet (6') high, baths and toilets.	1	**	Less than 5'	No Openings	Less than 5'

1949 EDITION

Table 5-A

* For additional restrictions see Chapters under Occupancy, Fire Zones and Types of Construction.
 ** Or may be protected on the exterior with materials approved for one-hour fire-resistive construction.

- Bibliography:**
1. 1927 UBC (occupancy Group C-1) it is seating capacity in any one room of less than 500 (Exhibit "B");
 2. 1943 UBC (occupancy Group B-2) it is seating capacity in any one room of 100 or more (Exhibit "B");
 3. November 1942 Boston Night Club Fire (see LA Times form 11/29/1942, Exhibit "A") It should be noted that the 1943 UBC was approved for printing on 10/1942, prior to the fire);
 4. 1946 UBC, occupancy Group B-2 with seating capacity in any one room of 300 or more and occupancy Group B-3 with seating capacity in any one room of less than 300 (Exhibit "B");
 5. 1949 IBC occupancy Group B-2 with an occupant load in in the building of 300 or more and occupancy Group B-3 with an occupant load in the building of less than 300 (Exhibit "B").

Cost Impact: The code change proposal will decrease the cost of construction
 This proposal will decrease the cost of construction for structures with an occupant load of less than 500 by eliminating the requirement of seismic analysis and potential additional costs associated with improvements to existing structures.

EB16-19

IEBC®: 303.4 (New); IBC®: ACI Chapter 35 (New)

Proponent: Stephen Szoke, American Concrete Institute, representing American Concrete Institute (steve.szoke@concrete.org); Kenneth Lozen, International Concrete Repair Institute, representing International Concrete Repair Institute (kenl@icri.org); Charles Hanskat, American Shotcrete Association, representing American Shotcrete Association (charles.hanskat@shotcrete.org); Randy Shackelford, P.E., Simpson Strong-Tie Co., representing Simpson Strong-Tie Co. (rshackelford@strongtie.com); Keith Kesner, CVM Engineers, representing CVM Professional; David Whitmore, Vector Corrosion Technologies Ltd., representing Vector Corrosion Technologies Ltd. (davidw@vector-corrosion.com); Kyle Stanish, Klein & Hoffman, representing Klein & Hoffman (kstanish@kleinandhoffman.com); Garth Fallis, Vector Construction Ltd., representing Vector Construction Ltd. (garthf@vector-construction.com); Matt Miltenberger, Vector Corrosion Services Inc., representing Vector Corrosion Services Inc. 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(davidd@seal-eng.com); Jay Paul, Klein and Hoffman, Inc., representing Klein and Hoffman, Inc. (jayhpaul@comcast.net); Stephen Descoteaux, Mistry Associates, Inc., representing Mistry Associates, Inc.; bruce collins, Restruction Corporation, representing Restruction Corporation (bruce@restruction.com); Roderic Ellman, Mueser rutledge Consulting Engineers, representing Mueser Rutledge Consulting Engineers (rellman@mrce.com); John Kennedy, representing Kennedy Consulting Group LLC Principal (jkennedy@kennedycg.com); Gene Stevens, J. R. Harris and Co., representing J. R. Harris and Co. 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THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Add new text as follows:

303.4 Concrete evaluation and design procedures. Evaluation and design of repairs of structural concrete in compliance with ACI 562 and this code shall be permitted. ACI 562 shall not be used to comply with provisions of this code that involve the classification of earthquake damage or the evaluation or retrofit of structures using load combinations that include earthquake load effects. The following Sections of ACI 562 are not applicable:

1. Section 1.3.8 for seismic resistance
2. Section 4.1.4 for determining the rehabilitation category of work
3. Section 4.7 for additions
4. Section 4.8 for alterations
5. Section 4.9 for change in occupancy

2018 International Building Code

Add new standard(s) as follows:

ACI

American Concrete Institute
38800 Country Club Drive
Farmington Hills MI 48331

562-19: Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures

Reason: Concept – This code change proposal adds ACI 562: *Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures*, to establish minimum requirements for the design, construction, repair, and rehabilitation of concrete structural elements in buildings for various levels of desired performance as deemed appropriate for the project. In addition to improved life safety, the requirements clearly define objectives and anticipated performance for the code official, owners, designers, contractors and installers. The proposed language is permissive, allowing other methods to be used to comply with the intent of the building code. Further Section 104.11 of the IEBC allows for alternative design methods:

"104.11 Alternative materials, design and methods of construction, and equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design, or method of construction shall be approved where the code official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method, or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety. Where the alternative material, design or method of construction is not approved, the code official shall respond in writing, stating the reasons why the alternative was not approved."

The public discussion version of this standards is available at: www.concrete.org/publications/standards/upcomingstandards.aspx

Background – In 2006, the repair industry approached ACI asking for a concrete repair and rehabilitation code that would improve the overall quality of concrete repairs by establishing common requirements and establishing clear responsibilities between owners, designers, and contractors. This code would also provide building code officials with a reference by which to evaluate rehabilitated concrete structures. ACI, following its rigorous American National Standards Institute accredited standards development process assembled a code committee with balanced representation and produced the first official code in 2012. The committee members reviewed and considered numerous reports and publications related to concrete repair and rehabilitation to identify and develop requirements consistent with current industry practice. The committee has received feedback from users of the code and are now completing their third version of this code, ACI 562-19.

Scope – ACI 562-19 complements the IEBC by providing specific direction on how to design concrete repairs and how to handle the unique construction problems associated with repair. This standard helps the designer assess the existing structure in accordance with the IEBC. The standard then provides the requirements that bridge the inconsistencies and gaps in acceptable criteria that occur from the two following situations that a designer must solve: one, repairing a structure according to the original building code used at the time it was built using today's construction methods and materials; or, repairing a structure built according to an older building code but repaired according to the latest building code. Note that ACI 562 does not directly address the evaluation of lateral-force resisting systems in high seismic areas. ASCE 41 is the appropriate standard for this situation as stated in the IEBC and ACI 562.

Benefits – There are many benefits that ACI 562 provides for the designer, owner, contractor, materials providers, building code official and the public. A few of these benefits are:

- Provides a level of expectation of life safety to the public in buildings where repairs or rehabilitation is performed on concrete structural elements.
- Provides clearly defined, uniform requirements aimed at extending the service life of existing structures.
- Provides minimum requirements for safety and quality of concrete repair.
- Establishes clear responsibilities between owners, designers, and contractors.
- Provides building code officials with a means to evaluate rehabilitation designs.
- Provides specific repair requirements that often result in less costly repairs compared to repairs required to meet only new construction requirements.

Flexibility – ACI 562 permits flexibility in evaluation, design, construction and repair materials to provide economies while establishing expected performance for the service-life of the rehabilitation or repairs.

Resources – Also, there many resources that complement ACI 562. Among these are:

- *Concrete Repair Manual: Fourth Edition 2013*
- ACI 563-18, *Specifications for Repair of Structural Concrete in Buildings*
- MNL-3(16) *Guide to the Code for Assessment, Repair, and Rehabilitation of Existing Concrete Structures*

These resources are readily available to provide greater understanding of assessment, repair and rehabilitation of concrete structural elements. ACI MNL-3 provides case studies demonstrating the ease of use of ACI 562. Numerous technical notes, reports, guides, and specifications that provide background information and technical support are available through other organizations, such as American Society of Civil Engineers, British Research Establishment, Concrete Society, International Concrete Repair Institute, National Association of Corrosion Engineers, Post-Tensioning Institute, Society for Protective Coatings, and US Army Corps of Engineers. Many of these organizations publications related to concrete repair can be found in the Concrete Repair Manual.

Sustainability - Reference of ACI 562 in the IEBC will help improve the confidence of owners, builders, and developers regarding effective repairs, upgrades, and reuse of existing buildings in lieu of demolition and replacement. Typically, extending the life of existing buildings is substantially more sustainable than demolition and new construction. Adoption of ACI 562 by reference is needed to help facilitate efforts that conserve energy and resources while maintaining a minimum level of requirements to ensure reasonable levels of life safety, and welfare are afforded to the public.

State and Local Adoptions – Jurisdictions see the need for these requirements. As the model for state and local adoptions, the IEBC should include this reference with appropriate charging language. ACI 562 is already being used in several jurisdictions:

Hawaii: Hawaii was the first state to adopt ACI 562 by reference. The following provisions are included in the State Building Code Council HAWAII STATE BUILDING CODE, which became effective on November 13, 2018:

“3401.6 Alternative compliance.

- 1) Work performed in accordance with the International Existing Building Code shall be deemed to comply with the provisions of this chapter.
- 2) Work performed in accordance with the 2016 version of the American Concrete Institute Committee 562, “Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures” shall be deemed to comply with this chapter when used as a supplement to the requirements of this chapter or the International Existing Building Code. Wherever the term International Existing Building Code (IEBC) is used in ACI 562-16, it shall mean International Existing Building Code or Chapter 34 of the International Building Code.”

Ohio: The Ohio Board of Building Standards Ohio adopted rule changes identified as Amendments Group 95. Included in this group is:

3401.6 Concrete evaluation and design procedures. Evaluation and design of structural concrete repairs and rehabilitation shall be in compliance with Chapter 34 and ACI 562.

ACI, a professional technical society, has developed this standard in response to industry needs and to help assure minimum levels of life safety results where repairs and rehabilitation are associated with concrete structural elements. For this reason and the other benefits identified in this reason statement, ACI recommends this code change proposal for committee approval as submitted.

New York City: The New York City Buildings Department issued *BUILDINGS BULLETIN 2015-017* in December 2017 Conditions of Acceptance for Fiber Reinforced Cementitious Matrix strengthening systems.

FRCM shall comply with the NYC Construction Codes and the following applicable provisions:

A. Design

1. FRCM system shall be designed in accordance with the ACI 549.4R-132 Guide for the Design and Construction of Externally Bonded Fabric-Reinforced Cementitious Matrix (FRCM) Systems for Repair and Strengthening Concrete and Masonry Structures with properties used for design obtained from tests performed in accordance with AC 434. Fire-resistance-rating and interior finish requirements shall be in accordance with the NYC Construction Codes, manufacturer’s recommendations and the conditions of the required listing.
2. For repairs and upgrade achieved with unprotected external FRCM, the increase in flexural or shear strength provided by the external reinforcing system shall not exceed 50% of the existing structural capacity of the member prior to strengthening. This increase should be checked before applying the strength reduction factor.
3. Careful consideration should be given to determine reasonable strengthening limits. These limits are imposed to guard against collapse of the structure should bond or other failure of the FRCM system occur due to damage, vandalism, or other causes. The required strength of a structure without repair should be as specified in in accordance with ACI 562 *Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures* Section 5.5.

Recommendation – ACI, a professional technical society, has developed this ACI 562 in response to industry needs and to help assure minimum levels of life safety, health, and welfare for the public. For this reason and the other benefits identified in this reason statement, ACI recommends this code change proposal for committee approval as submitted.

Bibliography: Concrete Repair Manual - 4th Edition: 2-Volume Set, ACI and ICRI, 2013, 2093 pp.

https://www.concrete.org/store/productdetail.aspx?ItemID=RPMN13PACK&Format=HARD_COPY

Guide to the Code for Assessment, Repair, and Rehabilitation of Existing Concrete Buildings, ACI and ICRI, 2016, 176 pp.

<https://www.concrete.org/store/productdetail.aspx?ItemID=MNL316&Language=English>

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The use of this referenced standard should in many cases reduce the cost of repair. Too often in the process of repair, there is insufficient information to determine acceptance criteria that is amicable to both the owner and the building code official. The result is the determination that the repair must meet the latest building code requirements for new construction. This standard increases the options available for repair and provides the acceptance criteria necessary to permit these options. A case study that illustrates this point: "ACI 562 has been referenced in expert reports for litigation cases, resulting in significantly reduced financial settlements. Denver-based J. R. Harris & Company recently used the code as a standard in several litigation reports assessing damages in existing concrete structures. As an approved consensus standard, according to American National Standards Institute (ANSI) procedures, ACI 562-13 has been accepted as the source standard to use for damage assessment and repair on individual projects by Greenwood Village and Pikes Peak Regional Building Departments in Colorado. Based on this acceptance, the consulting engineer was able to cite the code in their recommendation for structural remediation and determination of damages. In one case involving rehabilitation work on four buildings with faulty construction, J.R. Harris was able to reduce the repair costs from \$12 million to \$3 million, with a repair plan based on the lesser of the demand-capacity ratio based on either the original or current building code per ACI 562."

Staff Analysis: A review of the standard proposed for inclusion in the code, ACI 562-19, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2018.

Proposal # 3964

EB16-19

EB17-19

IEBC@: CHAPTER 3, SECTION 301, 301.1, SECTION 302, 302.1, SECTION 503, 503.1

Proponent: Gina Hilberry, Scoping Task Group of ICC/A117.1 Standard Development Committee, representing United Cerebral Palsy (gina@cohenhilberry.com); Rick Lupton, representing Self (sparkylupton@msn.com); Marsha Mazz, representing United Spinal Association (m.mazz@verizon.net); Gene Boecker, representing Code Consultants, Inc.(geneb@codeconsultants.com)

2018 International Existing Building Code

CHAPTER 3 PROVISIONS FOR ALL COMPLIANCE METHODS

Revise as follows:

SECTION 301 ADMINISTRATION SCOPE

301.1 General-Applicability ~~The repair, alteration, change of occupancy, addition or relocation of all existing buildings shall comply with Section 301.2, 301.3, or 301.4. The provisions of Sections 302 through 305 shall apply to all alterations, repairs, additions, relocation of structures and changes of occupancy regardless of compliance method.~~

SECTION 302 GENERAL PROVISIONS

Delete without substitution:

~~**302.1 Applicability.** The provisions of Section 302 apply to all alterations, repairs, additions, relocations of structures and changes of occupancy regardless of compliance method.~~

SECTION 503 ALTERATIONS

Revise as follows:

~~**503.1 General.** Except as provided by Section 302.4, 302.5 or this section, alterations~~ **Alterations** to any building or structure shall comply with the requirements of the International Building Code for new construction. *Alterations* shall be such that the *existing building* or structure is not less complying with the provisions of the International Building Code than the *existing building* or structure was prior to the *alteration*.

Exceptions:

1. An existing stairway shall not be required to comply with the requirements of Section 1011 of the International Building Code where the existing space and construction does not allow a reduction in pitch or slope.
2. Handrails otherwise required to comply with Section 1011.11 of the International Building Code shall not be required to comply with the requirements of Section 1014.6 of the International Building Code regarding full extension of the handrails where such extensions would be hazardous because of plan configuration.
3. Where provided in below-grade transportation stations, existing and new escalators shall have a clear width of less than 32 inches (815 mm).

Reason: An intent of the IEBC changes creating the 2018 edition was to make the provisions of Chapter 3 applicable to all existing building work regardless of the compliance method chosen. Our group's concern was that the route a code user must follow to get to requirements of Section 305 was unclear. Section 305 contains provisions which are 'exceptions' from compliance with the IBC and the ICC A117.1 standard; thus the text of 503.1 is incomplete because it doesn't like you to exceptions in Section 305. Section 305 is similar to 302.4 and 302.5 in that something less than full compliance with IBC is allowed. We noticed that the other compliance methods had no link within them to Chapter 3.

The real problem, and the solution, is in the beginning of Chapter 3 where it fails to clearly state its purpose except in the title to the chapter. Titles are not code. It is essential that Section 301.1 state that Chapter 3 applies to all compliance methods as the title states.

We further noticed that 302.1 had such language covering Section 302 – but the rest of the chapter has no such statement. This proposal fixes it. Once stated in Section 301.1, it isn't needed in 302. Once stated in 301, exceptions aren't needed in 503 or in any of the other compliance methods. We also recommend the title of 301 be changed to either Scope or Applicability. Administration is something for Chapter 1 and not appropriate here.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The change provides an editorial correction to make sure the user understands that Section 305 also allows construction of alterations to a different and lesser technical requirement. And to make sure that the text of the Chapter is corrected to reflect the title – provisions for All Compliance Methods.

EB18-19

IEBC@: 303.4 (New), [BS] 401.3

Proponent: David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Add new text as follows:

303.4 Flood Loads Within *flood hazard areas* as established in Chapter 16 of the IBC, all existing buildings, structures and portions of buildings and structures, including substantial improvement and restoration of substantial damage to buildings and structures, shall be designed and constructed to resist the effects of flood hazards and flood loads. For buildings that are located in more than one *flood hazard area*, the provisions associated with the most restrictive *flood hazard area* shall apply.

[BS] 401.3 Flood hazard areas. In flood hazard areas, *repairs* that constitute *substantial improvement* shall require that the building comply with Section 1612 of the International Building Code, or Section R322 of the International Residential Code, as applicable.

Reason: The IEBC does not include specific criteria for structures damaged by flood. New Section 303.4 will provide guidance and specific limitations on how flood loads must be addressed in existing buildings within flood hazard areas when undergoing substantial improvements and restoration of substantial damage.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This change will clarify how the code is to be applied when existing structures are undergoing restoration or renovations due to flood damage when located in a flood zone. Currently the code is silent.

Proposal # 5406

EB18-19

EB19-19

IEBC®: SECTION 305, 305.1, 305.2, 305.3, 305.4, 305.4.1, 305.4.2, 305.5, 305.6, 305.8, 305.8.1, 305.8.2, 305.8.3, 305.8.4, 305.8.5, TABLE 305.8.5, 305.8.6, 305.8.7, 305.8.8, 305.8.9, 305.8.10, 305.8.11, 305.8.12, 305.8.13, 305.8.14, 305.8.15, 305.7.16 (New), 305.7, 305.9, 305.9.1, 305.9.2, 305.9.3, 305.9.4

Proponent: Eirene Knott, representing Metropolitan Kansas City Chapter of the ICC (Eirene.Knott@brrarch.com)

2018 International Existing Building Code

Revise as follows:

SECTION 305 ACCESSIBILITY FOR EXISTING BUILDINGS

305.1 Scope. The provisions of Sections 305.1 through 305.9 apply to maintenance, *change of occupancy*, *additions* and *alterations* to *existing buildings*, including those identified as *historic buildings*.

305.2 Maintenance of facilities. A *facility* that is constructed or altered to be *accessible* shall be maintained *accessible* during occupancy.

305.3 Extent of application. An *alteration* of an existing *facility* shall not impose a requirement for greater accessibility than that which would be required for new construction. *Alterations* shall not reduce or have the effect of reducing accessibility of a *facility* or portion of a *facility*.

305.4 Change of occupancy. *Existing buildings* that undergo a change of group or occupancy shall comply with this section.

Exception: Type B dwelling or sleeping units required by Section 1107 of the International Building Code are not required to be provided in *existing buildings* and facilities undergoing a *change of occupancy* in conjunction with *alterations* where the *work area* is 50 percent or less of the aggregate area of the building.

305.4.1 Partial change of occupancy. Where a portion of the building is changed to a new occupancy classification, any *alterations* shall comply with Sections 305.6, 305.7 and 305.8.

305.4.2 Complete change of occupancy. Where an entire building undergoes a *change of occupancy*, it shall comply with Section 305.4.1 and shall have all of the following accessible features:

1. Not fewer than one accessible building entrance.
2. Not fewer than one accessible route from an accessible building entrance to *primary function areas*.
3. Signage complying with Section 1111 of the International Building Code.
4. Accessible parking, where parking is being provided.
5. Not fewer than one accessible passenger loading zone, where loading zones are provided.
6. Not fewer than one accessible route connecting accessible parking and accessible passenger loading zones to an accessible entrance.

Where it is *technically infeasible* to comply with the new construction standards for any of these requirements for a change of group or occupancy, Items 1 through 6 shall conform to the requirements to the maximum extent technically feasible.

Exception: The accessible features listed in Items 1 through 6 are not required for an accessible route to Type B units.

305.5 Additions. Provisions for new construction shall apply to *additions*. An *addition* that affects the accessibility to, or contains an area of, a *primary function* shall comply with the requirements in Section ~~305.7~~-305.8.

305.6 Alterations. A *facility* that is altered shall comply with the applicable provisions in Chapter 11 of the International Building Code, unless *technically infeasible*. Where compliance with this section is *technically infeasible*, the *alteration* shall provide access to the maximum extent technically feasible.

Exceptions:

1. The altered element or space is not required to be on an accessible route, unless required by Section ~~305.7~~-305.8.
2. Accessible means of egress required by Chapter 10 of the International Building Code are not required to be provided in existing facilities.
3. The *alteration* to Type A individually owned dwelling units within a Group R-2 occupancy shall be permitted to meet the provision for a Type B dwelling unit.
4. Type B dwelling or sleeping units required by Section 1107 of the International Building Code are not required to be provided in *existing buildings* and facilities undergoing *alterations* where the *work area* is 50 percent or less of the aggregate area of the building.

305.8.305.7 Scoping for alterations. The provisions of Sections 305.8.1 through 305.8.15 shall apply to *alterations* to *existing buildings* and *facilities*.

305.8.1 305.7.1 Entrances. Where an *alteration* includes alterations to an entrance that is not accessible, and the *facility* has an *accessible* entrance, the altered entrance is not required to be *accessible* unless required by Section 305.7. Signs complying with Section 1111 of the International Building Code shall be provided.

305.8.2 305.7.2 Elevators. Altered elements of existing elevators shall comply with ASME A17.1 and ICC A117.1. Such elements shall also be altered in elevators programmed to respond to the same hall call control as the altered elevator.

305.8.3 305.7.3 Platform lifts. Platform (wheelchair) lifts complying with ICC A117.1 and installed in accordance with ASME A18.1 shall be permitted as a component of an accessible route.

305.8.4 305.7.4 Stairways and escalators in existing buildings. Where an escalator or stairway is added where none existed previously and major structural modifications are necessary for installation, an accessible route shall be provided between the levels served by the escalator or stairways in accordance with Section 1104.4 of the International Building Code.

305.8.5 305.7.5 Ramps. Where slopes steeper than allowed by Section 1012.2 of the International Building Code are necessitated by space limitations, the slope of ramps in or providing access to existing facilities shall comply with Table ~~305.8.5-305.7.5~~.

**TABLE 305.8.5 305.7.5
RAMPS**

SLOPE	MAXIMUM RISE
Steeper than 1:10 but not steeper than 1:8	3 inches
Steeper than 1:12 but not steeper than 1:10	6 inches

For SI: 1 inch = 25.4 mm.

305.8.6 305.7.6 Accessible dwelling or sleeping units. Where Group I-1, I-2, I-3, R-1, R-2 or R-4 dwelling or sleeping units are being altered or added, the requirements of Section 1107 of the International Building Code for Accessible units apply only to the quantity of spaces being altered or added.

305.8.7 305.7.7 Type A dwelling or sleeping units. Where more than 20 Group R-2 dwelling or sleeping units are being altered or added, the requirements of Section 1107 of the International Building Code for Type A units apply only to the quantity of the spaces being altered or added.

305.8.8 305.7.8 Type B dwelling or sleeping units. Where four or more Group I-1, I-2, R-1, R-2, R-3 or R-4 dwelling or sleeping units are being added, the requirements of Section 1107 of the International Building Code for Type B units apply only to the quantity of the spaces being added. Where Group I-1, I-2, R-1, R-2, R-3 or R-4 dwelling or sleeping units are being altered and where the *work area* is greater than 50 percent of the aggregate area of the building, the requirements of Section 1107 of the International Building Code for Type B units apply only to the quantity of the spaces being altered.

305.8.9 305.7.9 Jury boxes and witness stands. In *alterations*, accessible wheelchair spaces are not required to be located within the defined area of raised jury boxes or witness stands and shall be permitted to be located outside these spaces where the ramp or lift access restricts or projects into the required means of egress.

305.8.10 305.7.10 Toilet rooms. Where it is *technically infeasible* to alter existing toilet and bathing rooms to be *accessible*, an *accessible* family or assisted-use toilet or bathing room constructed in accordance with Section 1109.2.1 of the International Building Code is permitted. The family or assisted-use toilet or bathing room shall be located on the same floor and in the same area as the existing toilet or bathing rooms. At the inaccessible toilet and bathing rooms, directional signs indicating the location of the nearest family or assisted-use toilet room or bathing room shall be provided. These directional signs shall include the International Symbol of Accessibility and sign characters shall meet the visual character requirements in accordance with ICC A117.1.

305.8.11 305.7.11 Additional toilet and bathing facilities. In assembly and mercantile occupancies, where additional toilet fixtures are added, not fewer than one accessible family or assisted-use toilet room shall be provided where required by Section 1109.2.1 of the International Building Code. In recreational facilities, where additional bathing rooms are being added, not fewer than one family or assisted-use bathing room shall be provided where required by Section 1109.2.1 of the International Building Code.

305.8.12 305.7.12 Dressing, fitting and locker rooms. Where it is *technically infeasible* to provide accessible dressing, fitting or locker rooms at the same location as similar types of rooms, one accessible room on the same level shall be provided. Where separate-sex facilities are provided, accessible rooms for each sex shall be provided. Separate-sex facilities are not required where only unisex rooms are provided.

305.8.13 305.7.13 Fuel dispensers. Operable parts of replacement fuel dispensers shall be permitted to be 54 inches (1370 mm) maximum, measuring from the surface of the vehicular way where fuel dispensers are installed on existing curbs.

~~305.8-14~~ **305.7.14 Thresholds.** The maximum height of thresholds at doorways shall be $\frac{3}{4}$ inch (19.1 mm). Such thresholds shall have beveled edges on each side.

~~305.8-15~~ **305.7.15 Amusement rides.** Where the structural or operational characteristics of an amusement ride are altered to the extent that the amusement ride's performance differs from that specified by the manufacturer or the original design, the amusement ride shall comply with requirements for new construction in Section 1110.4.8 of the International Building Code.

Add new text as follows:

305.7.16 Dining Areas. An accessible route shall be provided throughout the dining area.

Exception: An accessible route to raised or sunken areas or to outdoor seating areas is not required provided the same services and decor are provided in an accessible space.

Revise as follows:

~~305.7~~ **305.8 Alterations affecting an area containing a primary function.** Where an *alteration* affects the accessibility to, or contains an area of *primary function*, the route to the *primary function* area shall be *accessible*. The accessible route to the *primary function* area shall include toilet facilities and drinking fountains serving the area of *primary function*.

Exceptions:

1. The costs of providing the *accessible* route are not required to exceed 20 percent of the costs of the *alterations* affecting the area of *primary function*.
2. This provision does not apply to *alterations* limited solely to windows, hardware, operating controls, electrical outlets and signs.
3. This provision does not apply to *alterations* limited solely to mechanical systems, electrical systems, installation or *alteration* of fire protection systems and abatement of hazardous materials.
4. This provision does not apply to *alterations* undertaken for the primary purpose of increasing the accessibility of a *facility*.
5. This provision does not apply to altered areas limited to Type B dwelling and sleeping units.

305.9 Historic buildings. These provisions shall apply to *facilities* designated as historic structures that undergo *alterations* or a *change of occupancy*, unless *technically infeasible*. Where compliance with the requirements for accessible routes, entrances or toilet rooms would threaten or destroy the historic significance of the *facility*, as determined by the authority having jurisdiction, the alternative requirements of Sections 305.9.1 through 305.9.4 for that element shall be permitted.

Exception: Type B dwelling or sleeping units required by Section 1107 of the International Building Code are not required to be provided in historic buildings.

305.9.1 Site arrival points. Not fewer than one accessible route from a site arrival point to an accessible entrance shall be provided.

305.9.2 Multiple-level buildings and facilities. An accessible route from an accessible entrance to public spaces on the level of the accessible entrance shall be provided.

305.9.3 Entrances. Not fewer than one main entrance shall be accessible.

Exception: If a public entrance cannot be made accessible, an accessible entrance that is unlocked while the building is occupied shall be provided; or, a locked accessible entrance with a notification system or remote monitoring shall be provided.

Signs complying with Section 1111 of the International Building Code shall be provided at the public entrance and the accessible entrance.

305.9.4 Toilet and bathing facilities. Where toilet rooms are provided, not fewer than one accessible family or assisted-use toilet room complying with Section 1109.2.1 of the International Building Code shall be provided.

Reason: The way the accessibility provisions currently read in the 2018, it's not clear as to when the primary function requirements apply except as directed by Section 305.4.1 for a partial change of occupancy. By relocating the provisions to occur after the list of scoping items, the user can more easily follow the flow of what code language will apply to their project. As it is currently written, it is not clear as to when Section 305.8 (scoping for alterations) will apply. If the flow is changed to be as follows, it makes more sense to the end user:

305.4 - Change of occupancy

305.5 - Additions

305.6 - Alterations

305.7 - Scoping for alterations

305.8 - Alterations affecting a primary function

305.9 - Historic buildings

I also added language to address dining areas, which was in the 2015 IEBC. I re-wrote the language to that it is not writing the exception within the requirement but rather what the requirement is with the exception being provided.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is just reformatting current language so there is no impact to the construction cost.

Proposal # 3971

EB19-19

EB20-19

IEBC®: SECTION 305, 305.6, 305.7, 305.6.2 (New), 305.6.3 (New), 305.6.4 (New), 305.6.5 (New), 305.8, 305.8.1, 305.8.2, 305.8.3, 305.8.4, 305.8.5, TABLE 305.8.5, 305.6.11 (New), 305.8.6, 305.8.7, 305.8.8, 305.8.9, 305.8.10, 305.8.11, 305.8.12, 305.8.13, 305.8.14, 305.8.15, 305.9, 305.9.1, 305.9.2, 305.9.3, 305.9.4

Proponent: Gina Hilberry, Scoping Task Group of ICC/A117.1 Standard Development Committee, representing United Cerebral Palsy (gina@cohenhilberry.com); Rick Lupton, representing Self (sparkylupton@msn.com); Marsha Mazz, representing United Spinal Association (m.mazz@verizon.net); Gene Boecker, representing Code Consultants, Inc.(geneb@codeconsultants.com)

2018 International Existing Building Code

SECTION 305 ACCESSIBILITY FOR EXISTING BUILDINGS

Revise as follows:

305.6 Alterations. A *facility* that is altered shall comply with the applicable provisions in Chapter 11 of the International Building Code, ICC A117.1 and the provisions of Sections 305.6.1 through 305.6.19, unless *technically infeasible*. Where compliance with this section is *technically infeasible*, the *alteration* shall provide access to the maximum extent technically feasible.

~~Exceptions:~~

- ~~1. The altered element or space is not required to be on an accessible route, unless required by Section 305.7.~~
- ~~2. Accessible means of egress required by Chapter 10 of the International Building Code are not required to be provided in existing facilities.~~
- ~~3. The alteration to Type A individually owned dwelling units within a Group R-2 occupancy shall be permitted to meet the provision for a Type B dwelling unit.~~
- ~~4. Type B dwelling or sleeping units required by Section 1107 of the International Building Code are not required to be provided in existing buildings and facilities undergoing alterations where the work area is 50 percent or less of the aggregate area of the building.~~

~~305.7~~ 305.6.1 Alterations affecting an area containing a primary function. Where an *alteration* affects the accessibility to, or contains an area of *primary function*, the route to the *primary function* area shall be *accessible*. The accessible route to the *primary function* area shall include toilet facilities and drinking fountains serving the area of *primary function*.

~~Exceptions:~~

- ~~1. The costs of providing the accessible route are not required to exceed 20 percent of the costs of the alterations affecting the area of primary function.~~
- ~~2. This provision does not apply to alterations limited solely to windows, hardware, operating controls, electrical outlets and signs.~~
- ~~3. This provision does not apply to alterations limited solely to mechanical systems, electrical systems, installation or alteration of fire protection systems and abatement of hazardous materials.~~
- ~~4. This provision does not apply to alterations undertaken for the primary purpose of increasing the accessibility of a facility.~~
- ~~5. This provision does not apply to altered areas limited to Type B dwelling and sleeping units.~~

Add new text as follows:

305.6.2 Accessible route. The altered element or space is not required to be on an accessible route, unless required by Section 305.6.1.

305.6.3 Accessible means of egress Accessible means of egress required by Chapter 10 of the International Building Code are not required to be provided in existing facilities.

305.6.4 Alteration of Type A units The alteration to Type A individually owned dwelling units within a Group R-2 occupancy shall be permitted to meet the provision for a Type B dwelling unit.

305.6.5 Type B units Type B dwelling or sleeping units required by Section 1107 of the International Building Code are not required to be provided in existing buildings and facilities undergoing alterations where the work area is 50 percent or less of the aggregate area of the building.

Delete without substitution:

~~305.8 Scoping for alterations.~~ The provisions of Sections 305.8.1 through 305.8.15 shall apply to alterations to existing buildings and facilities.

Revise as follows:

~~305.8.1~~ 305.6.6 Entrances. Where an *alteration* includes alterations to an entrance that is not accessible, and the *facility* has an *accessible*

entrance, the altered entrance is not required to be *accessible* unless required by Section ~~305.7-~~305.6.1. Signs complying with Section 1111 of the International Building Code shall be provided.

~~305.8.2~~ 305.6.7 **Elevators.** Altered elements of existing elevators shall comply with ASME A17.1 and ICC A117.1. Such elements shall also be altered in elevators programmed to respond to the same hall call control as the altered elevator.

~~305.8.3~~ 305.6.8 **Platform lifts.** Platform (wheelchair) lifts complying with ICC A117.1 and installed in accordance with ASME A18.1 shall be permitted as a component of an accessible route.

~~305.8.4~~ 305.6.9 **Stairways and escalators in existing buildings.** Where an escalator or stairway is added where none existed previously and major structural modifications are necessary for installation, an accessible route shall be provided between the levels served by the escalator or stairways in accordance with Section 1104.4 of the International Building Code.

~~305.8.5~~ 305.6.10 **Ramps.** Where slopes steeper than allowed by Section 1012.2 of the International Building Code are necessitated by space limitations, the slope of ramps in or providing access to existing facilities shall comply with Table ~~305.8.5-~~305.6.10.

**TABLE ~~305.8.5~~ 305.6.10
RAMPS**

SLOPE	MAXIMUM RISE
Steeper than 1:10 but not steeper than 1:8	3 inches
Steeper than 1:12 but not steeper than 1:10	6 inches

For SI: 1 inch = 25.4 mm.

Add new text as follows:

305.6.11 **Determination of number of units** Where Chapter 11 of the International Building Code requires Accessible, Type A or Type B units, where units are being altered or added, the number of Accessible, Type A and Type B units shall be determined in accordance with Sections 305.6.11.1 through 305.6.11.3.

Revise as follows:

~~305.8.6~~ 305.6.11.1 **Accessible dwelling or sleeping units.** Where Group I-1, I-2, I-3, R-1, R-2 or R-4 dwelling or sleeping units are being altered or added, the requirements of Section 1107 of the International Building Code for Accessible units apply only to the quantity of spaces being altered or added.

~~305.8.7~~ 305.6.11.2 **Type A dwelling or sleeping units.** Where more than 20 Group R-2 dwelling or sleeping units are being altered or added, the requirements of Section 1107 of the International Building Code for Type A units apply only to the quantity of the spaces being altered or added.

~~305.8.8~~ 305.6.11.3 **Type B dwelling or sleeping units.** Where four or more Group I-1, I-2, R-1, R-2, R-3 or R-4 dwelling or sleeping units are being added, the requirements of Section 1107 of the International Building Code for Type B units apply only to the quantity of the spaces being added. Where Group I-1, I-2, R-1, R-2, R-3 or R-4 dwelling or sleeping units are being altered and where the *work area* is greater than 50 percent of the aggregate area of the building, the requirements of Section 1107 of the International Building Code for Type B units apply only to the quantity of the spaces being altered.

~~305.8.9~~ 305.6.12 **Jury boxes and witness stands.** In *alterations*, accessible wheelchair spaces are not required to be located within the defined area of raised jury boxes or witness stands and shall be permitted to be located outside these spaces where the ramp or lift access restricts or projects into the required means of egress.

~~305.8.10~~ 305.6.13 **Toilet rooms.** Where it is *technically infeasible* to alter existing toilet and bathing rooms to be *accessible*, an *accessible* family or assisted-use toilet or bathing room constructed in accordance with Section 1109.2.1 of the International Building Code is permitted. The family or assisted-use toilet or bathing room shall be located on the same floor and in the same area as the existing toilet or bathing rooms. At the inaccessible toilet and bathing rooms, directional signs indicating the location of the nearest family or assisted-use toilet room or bathing room shall be provided. These directional signs shall include the International Symbol of Accessibility and sign characters shall meet the visual character requirements in accordance with ICC A117.1.

~~305.8.11~~ 305.6.14 **Additional toilet and bathing facilities.** In assembly and mercantile occupancies, where additional toilet fixtures are added, not fewer than one accessible family or assisted-use toilet room shall be provided where required by Section 1109.2.1 of the International Building Code. In recreational facilities, where additional bathing rooms are being added, not fewer than one family or assisted-use bathing room shall be provided where required by Section 1109.2.1 of the International Building Code.

~~305.8.12~~ 305.6.15 **Dressing, fitting and locker rooms.** Where it is *technically infeasible* to provide accessible dressing, fitting or locker rooms at the same location as similar types of rooms, one accessible room on the same level shall be provided. Where separate-sex facilities are provided,

accessible rooms for each sex shall be provided. Separate-sex facilities are not required where only unisex rooms are provided.

~~305.8-13~~ **305.6.16 Fuel dispensers.** Operable parts of replacement fuel dispensers shall be permitted to be 54 inches (1370 mm) maximum, measuring from the surface of the vehicular way where fuel dispensers are installed on existing curbs.

~~305.8-14~~ **305.6.17 Thresholds.** The maximum height of thresholds at doorways shall be $\frac{3}{4}$ inch (19.1 mm). Such thresholds shall have beveled edges on each side.

~~305.8-15~~ **305.6.18 Amusement rides.** Where the structural or operational characteristics of an amusement ride are altered to the extent that the amusement ride's performance differs from that specified by the manufacturer or the original design, the amusement ride shall comply with requirements for new construction in Section 1110.4.8 of the International Building Code.

305.9 305.6.19 Historic buildings. These provisions shall apply to *facilities* designated as historic structures that undergo *alterations* or a *change of occupancy*, unless *technically infeasible*. Where compliance with the requirements for accessible routes, entrances or toilet rooms would threaten or destroy the historic significance of the *facility*, as determined by the authority having jurisdiction, the alternative requirements of Sections ~~305.9-1~~ **305.6.19.1** through ~~305.9-4~~ **305.6.19.4** for that element shall be permitted.

Exception: Type B dwelling or sleeping units required by Section 1107 of the International Building Code are not required to be provided in historic buildings.

~~305.9-1~~ **305.6.19.1 Site arrival points.** Not fewer than one accessible route from a site arrival point to an accessible entrance shall be provided.

~~305.9-2~~ **305.6.19.2 Multiple-level buildings and facilities.** An accessible route from an accessible entrance to public spaces on the level of the accessible entrance shall be provided.

~~305.9-3~~ **305.6.19.3 Entrances.** Not fewer than one main entrance shall be accessible.

Exception: If a public entrance cannot be made accessible, an accessible entrance that is unlocked while the building is occupied shall be provided; or, a locked accessible entrance with a notification system or remote monitoring shall be provided.

Signs complying with Section 1111 of the International Building Code shall be provided at the public entrance and the accessible entrance.

~~305.9-4~~ **305.6.19.4 Toilet and bathing facilities.** Where toilet rooms are provided, not fewer than one accessible family or assisted-use toilet room complying with Section 1109.2.1 of the International Building Code shall be provided.

Reason: Sections 305.6 through 305.9 all address alterations but there is no connection between the sections. This is a problem when trying to determine the purpose of 305.8. Section 305.8 is titled 'Scoping for alterations', however many of the 15 provisions which follow are technical exceptions. Some of them are additional technical requirements. Eleven of the 15 are only found in the IEBC and four of them duplicate exceptions contained in the ICC A117.1 standard. Three of the 15 are telling the user how to calculate a requirement where not all units need to be accessible. The intent of this proposal is editorial. It is simply to provide connections between all of the Sections of 305 specifically addressing alterations. Substantive changes to these sections are found in companion proposals. This proposal does the following.

- It renumbers Section 305.7 to 305.6.1 to indicate that it is a subset set of the alterations section. There is a companion proposal to revise the language of 305.6.1 to be more consistent with the corresponding ADA requirement.
- It changes the 4 exceptions now found in Section 305.6 into the next four subsections – 305.6.2 through 305.6.5. Having titled subsections allow for quicker access for code users than sorting through numbered exceptions.
- It deletes the confusing lead in provisions of 305.8 and relocates its various provisions as the next subsections – 305.6.6 through 305.6.18. We have submitted a companion proposal which would delete four of these 9 because they are redundant with exceptions in the ICC A117.1 standard.
- It renumbers Section 305.9 and its subsections to be 305.6.19 because it contains a set of provisions and exceptions unique to historic buildings.
- Finally, it groups 3 provisions into a new subsection 305.6.11 All 3 of these sections provide a calculation methodology for determining the number of required dwelling and/or sleeping units

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The intent of this proposal is to be 100% editorial by reorganizing existing provisions into a more logical format.

EB21-19

IEBC@: 305.1, 305.2

Proponent: Dawn Anderson, representing self (gonedawning@yahoo.com); Gene Boecker, representing Code Consultants, Inc. (geneb@codeconsultants.com); Dan Buuck, representing National Association of Home Builders (dbuuck@nahb.org); David Collins, representing the American Institute of Architects (dcollins@preview-group.com); Marsha Mazz, representing United Spinal Association (m.mazz@verizon.net)

2018 International Existing Building Code

Revise as follows:

305.1 Scope. The provisions of Sections 305.1 through 305.9 apply to ~~maintenance~~ repair, *change of occupancy*, *additions* and *alterations* to *existing buildings*, including those identified as *historic buildings*.

305.2 ~~Maintenance~~ Repair of facilities. A *facility* that is constructed or altered to be *accessible* shall be maintained *accessible* during occupancy.

Reason: Repair is defined in the I-codes as:

[A] REPAIR. The reconstruction, replacement or renewal of any part of an *existing building* for the purpose of its maintenance or to correct damage.

Repair includes maintenance. In addition, Chapter 4 of the IEBC is titled 'Repair'. This would clarify how the accessibility requirements are addressed for Chapter 4. Maintenance does not require additional revisions for the path of travel.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The IEBC addresses repairs, not maintenance. This is a terminology change only.

Proposal # 4355

EB21-19

EB22-19

IEBC@: 305.2, 305.6, 305.9

Proponent: Dawn Anderson, representing self (gonedawning@yahoo.com); Gene Boecker, representing Code Consultants, Inc. (geneb@codeconsultants.com); Dan Buuck, representing National Association of Home Builders (dbuuck@nahb.org); David Collins, representing the American Institute of Architects (dcollins@preview-group.com); Marsha Mazz, representing United Spinal Association (m.mazz@verizon.net)

2018 International Existing Building Code

Revise as follows:

305.2 Maintenance of facilities. A *facility* that is constructed or altered to be *accessible* shall be maintained *accessible* during occupancy. Required accessible means of egress shall be maintained at all times during construction, demolition, remodeling or alterations and additions to any building.

Exception: Existing means of egress need not be maintained where *approved* temporary means of egress and accessible means of egress systems and facilities are provided.

305.6 Alterations. A *facility* that is altered shall comply with the applicable provisions in Chapter 11 of the International Building Code, unless *technically infeasible*. Where compliance with this section is *technically infeasible*, the *alteration* shall provide access to the maximum extent technically feasible.

Exceptions:

1. The altered element or space is not required to be on an accessible route, unless required by Section 305.7.
2. Accessible means of egress required by Chapter 10 of the International Building Code are not required to be ~~provided~~ added in existing facilities.
3. The *alteration* to Type A individually owned dwelling units within a Group R-2 occupancy shall be permitted to meet the provision for a Type B dwelling unit.
4. Type B dwelling or sleeping units required by Section 1107 of the International Building Code are not required to be provided in *existing buildings* and facilities undergoing *alterations* where the *work area* is 50 percent or less of the aggregate area of the building.

305.9 Historic buildings. These provisions shall apply to *facilities* designated as historic structures that undergo *alterations* or a *change of occupancy*, unless *technically infeasible*. Where compliance with the requirements for accessible routes, entrances or toilet rooms would threaten or destroy the historic significance of the *facility*, as determined by the authority having jurisdiction, the alternative requirements of Sections 305.9.1 through 305.9.4 for that element shall be permitted.

Exceptions: ~~Exception:~~

1. Accessible means of egress required by Chapter 10 of the *International Building Code* are not required to be provided in historic buildings.
2. Type B dwelling or sleeping units required by Section 1107 of the International Building Code are not required to be provided in historic buildings.

Reason: Building that have been built since 1990 have had to have accessible means of egress. Therefore, it should be clear that those accessible means of egress need to be maintained the same way we are asking for the route into the space to remain accessible. The language is the same at that used in IEBC Section 1505.2.

The change to Section 305.6 would effectively not allow for someone to remove an accessible means of egress from an existing building. At the same time, it would not ask for the addition of an accessible means of egress in buildings that were so old that they did not have them. These buildings will continue to be addressed through the fire and safety evacuation requirements in IFC Chapter 4.

The change to Section 305.9 would allow the same exception for historic buildings as currently allowed for existing buildings.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is already required in new construction. This may be in place in many existing buildings.

Proposal # 4413

EB22-19

EB23-19

IEBC@: SECTION 305, 305.2, 305.2.1 (New), 305.3

Proponent: Gina Hilberry, Scoping Task Group of ICC/A117.1 Standard Development Committee, representing United Cerebral Palsy (gina@cohenhilberry.com); Rick Lupton, representing Self (sparkylupton@msn.com); Marsha Mazz, representing United Spinal Association (m.mazz@verizon.net); Gene Boecker, representing Code Consultants, Inc.(geneb@codeconsultants.com)

2018 International Existing Building Code

SECTION 305 ACCESSIBILITY FOR EXISTING BUILDINGS

305.2 Maintenance of facilities. A *facility* that is constructed or altered to be *accessible* shall be maintained *accessible* during occupancy.

Add new text as follows:

305.2.1 Prohibited reduction in accessibility An alteration that decreases or has the effect of decreasing accessibility of a building, facility or element, thereof, below the requirements for new construction at the time of the alteration is prohibited. The number of accessible elements need not exceed that required for new construction at the time of alteration.

Revise as follows:

305.3 Extent of application. An *alteration* of an existing *facility* shall not impose a requirement for greater accessibility than that which would be required for new construction. ~~Alterations shall not reduce or have the effect of reducing accessibility of a facility or portion of a facility.~~

Reason: The existing second sentence of Section 305.3 is a distinct limitation from that imposed by the first sentence. It is an important limitation and therefore needs to be its own section. The first sentence of new section 305.2.1 is identical to that found in 305.3 of the 2018 code with one key exception. We propose adding 'or element thereof' to the text to make it clear that it's not just overall accessibility, but also accessibility of individual elements such as a water closet compartment, an elevator, a dwelling unit, or a building entrance which can not be reduced. The second sentence of the new Section 305.2.1 is new. It's purpose is to address the situation where the number of required accessible elements was reduced between editions of the code. For example, the number of required accessible hotel sleeping room has been reduced between the early and current editions of the IBC. The exception would allow the number of accessible hotel rooms built under the 2003 IBC, to be reduced during an alteration to the number required under the 2018 IBC

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Separating out the text into Section 305.2.1 and adding the elements reference is, on the whole, an editorial clarification of the existing text. The new second sentence might reduce costs of an alteration because fewer accessible elements may be needed. Such costs would be minor and hard to quantify.

Proposal # 4982

EB23-19

EB24-19

IEBC@: 305.4, 305.4.1

Proponent: Gina Hilberry, Scoping Task Group of ICC/A117.1 Standard Development Committee, representing United Cerebral Palsy (gina@cohenhilberry.com); Rick Lupton, representing Self (sparkylupton@msn.com); Marsha Mazz, representing United Spinal Association (m.mazz@verizon.net); Gene Boecker, representing Code Consultants, Inc.(geneb@codeconsultants.com)

2018 International Existing Building Code

Revise as follows:

305.4 Change of occupancy. *Existing buildings* that undergo a change of group or occupancy shall comply with ~~this section~~. Sections 305.4.1 or 305.4.2, as applicable.

Exception: Type B dwelling or sleeping units required by Section 1107 of the International Building Code are not required to be provided in *existing buildings* and facilities undergoing a *change of occupancy* in conjunction with *alterations* where the *work area* is 50 percent or less of the aggregate area of the building.

305.4.1 Partial change of occupancy. Where a portion of the building is changed to a new occupancy classification, any *alterations* shall comply with Sections 305.3, 305.6, 305.7 and 305.8.

Reason: The proposal is intended as editorial revisions making the code application clearer to all users.

First - In 305.4 changing 'this section' to specific references to the 2 subsections clarifies what is being required.

Second – In Section 305.4.1, we have added Section 305.3 to those for which compliance is required. Section 305.3 addresses limits to alterations which must be considered for all alterations. We have a companion proposal which splits the requirements of Section 305.3 into two sections; it would be our intent that this proposed reference addition in 305.4.1 also reference both sections.

The reference within Section 305.4.2 takes the user back to Section 305.4.1, therefore the added reference is also picked up for complete changes of occupancy.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The changes are editorial. They help users get to the correct sections and to not miss key requirements.

Proposal # 5087

EB24-19

EB25-19

IEBC@: 305.4 (New), 305.4.1 (New), 305.4.2 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Existing Building Code

Revise as follows:

305.4 Change of occupancy. Existing buildings that undergo a change of group or occupancy shall comply with this ~~section~~, Sections 305.6, 305.7 and 305.8.

Exception: Type B dwelling or sleeping units required by Section 1107 of the International Building Code are not required to be provided in existing buildings and facilities undergoing a *change of occupancy* in conjunction with *alterations* where the *work area* is 50 percent or less of the aggregate area of the building.

Delete without substitution:

~~**305.4.1 Partial change of occupancy.** Where a portion of the building is changed to a new occupancy classification, any *alterations* shall comply with Sections 305.6, 305.7 and 305.8.~~

~~**305.4.2 Complete change of occupancy.** Where an entire building undergoes a *change of occupancy*, it shall comply with Section 305.4.1 and shall have all of the following accessible features:~~

- ~~1- Not fewer than one accessible building entrance.~~
- ~~2- Not fewer than one accessible route from an accessible building entrance to *primary function areas*.~~
- ~~3- Signage complying with Section 1111 of the International Building Code.~~
- ~~4- Accessible parking, where parking is being provided.~~
- ~~5- Not fewer than one accessible passenger loading zone, where loading zones are provided.~~
- ~~6- Not fewer than one accessible route connecting accessible parking and accessible passenger loading zones to an accessible entrance.~~

~~Where it is *technically infeasible* to comply with the new construction standards for any of these requirements for a change of group or occupancy, items 1 through 6 shall conform to the requirements to the maximum extent technically feasible.~~

~~**Exception:** The accessible features listed in Items 1 through 6 are not required for an accessible route to Type B units.~~

Reason: There are several arguments to simplify this section.

What this does administratively is take a change of occupancy and make it consistent with requirements for an alteration. This allows flexibility for small properties.

- The federal requirements in the 2010 ADA Standard do not address a change of occupancy – they treat all alterations the same. There is no justification for ICC to require a business in stand alone building to provide additional requirements past what is expected for a business in a multi-tenant building.
- The list in Section 305.4.2 basically lists all the elements in accessible routes, which is addressed in Section 305.7, but does not include bathrooms and drinking fountains. Therefore, it is unclear as to if renovations to those items are required in a complete change of occupancy, where they would be on the list for an alteration and a partial change of occupancy. This list does not add any clarification of improvements to the code.
- This could also be read that a complete change of occupancy would never have to fix the toilet rooms or drinking fountains since it is not in the list. If the alterations are small, allowing someone to spend money to fix the toilet rooms is addressed the needs of many individuals with mobility issue.
- If the part of the route missing is an elevator or extensive front ramp, the cost could make the existing building remain vacant since this section could be viewed as not tied to the 20% maximum cost allowance.
- The arguments against revising this section in past code cycles have all been around the issue of a change of occupancy with no alterations. Many building departments are not involved in changes of occupancy that do not include alterations. Even in jurisdictions that look at this, they do not require alterations for occupancies with lesser hazards. How much should you ask someone to spend if there are no construction costs? If it is a higher hazard, there will mostly likely be alterations – so just use those requirements.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will decrease the cost of construction

Requiring the six route requirements in Section 305.4.2 for small buildings that undergo a change of occupancy can be a large cost. It is more appropriate to limit the cost of the route to 20% of the alteration - which this change will allow. In large buildings, this change will have minimal impact since they are more likely to already have the accessible route - or the cost will be a much smaller portion of their budget.

Proposal # 4233

EB25-19

EB26-19

IEBC@: 305.4, 305.6, 305.8.8

Proponent: Dawn Anderson, representing self (gonedawning@yahoo.com); Gene Boecker, representing Code Consultants, Inc. (geneb@codeconsultants.com); Dan Buuck, representing National Association of Home Builders (dbuuck@nahb.org); David Collins, representing the American Institute of Architects (dcollins@preview-group.com); Marsha Mazz, representing United Spinal Association (m.mazz@verizon.net)

2018 International Existing Building Code

Revise as follows:

305.4 Change of occupancy. *Existing buildings* that undergo a change of group or occupancy shall comply with this section.

Exception: Type B dwelling or sleeping units required by Section 1107 of the International Building Code are not required to be provided in *existing buildings* and facilities undergoing a *change of occupancy* in conjunction with *alterations* where the *work area* is 50 percent or less of the ~~aggregate area of the building~~ area.

305.6 Alterations. A *facility* that is altered shall comply with the applicable provisions in Chapter 11 of the International Building Code, unless *technically infeasible*. Where compliance with this section is *technically infeasible*, the *alteration* shall provide access to the maximum extent technically feasible.

Exceptions:

1. The altered element or space is not required to be on an accessible route, unless required by Section 305.7.
2. Accessible means of egress required by Chapter 10 of the International Building Code are not required to be provided in existing facilities.
3. The *alteration* to Type A individually owned dwelling units within a Group R-2 occupancy shall be permitted to meet the provision for a Type B dwelling unit.
4. Type B dwelling or sleeping units required by Section 1107 of the International Building Code are not required to be provided in *existing buildings* and facilities undergoing *alterations* where the *work area* is 50 percent or less of the ~~aggregate area of the building~~ area.

305.8.8 Type B dwelling or sleeping units. Where four or more Group I-1, I-2, R-1, R-2, R-3 or R-4 dwelling or sleeping units are being added, the requirements of Section 1107 of the International Building Code for Type B units apply only to the quantity of the spaces being added. Where Group I-1, I-2, R-1, R-2, R-3 or R-4 dwelling or sleeping units are being altered and where the *work area* is greater than 50 percent of the ~~aggregate building area of the building~~, the requirements of Section 1107 of the International Building Code for Type B units apply only to the quantity of the spaces being altered.

Reason: When the provisions were combined last cycle, the language specific to the work area method was lost. This is a clarification by using the exact verbiage that describes a Level 3 alteration in Section 604.1.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This change is editorial.

Proposal # 4368

EB26-19

EB27-19

IEBC@: 305.4.2

Proponent: Gina Hilberry, Scoping Task Group of ICC/A117.1 Standard Development Committee, representing United Cerebral Palsy (gina@cohenhilberry.com); Rick Lupton, representing Self (sparkylupton@msn.com); Marsha Mazz, representing United Spinal Association (m.mazz@verizon.net); Gene Boecker, representing Code Consultants, Inc.(geneb@codeconsultants.com)

2018 International Existing Building Code

Revise as follows:

305.4.2 Complete change of occupancy. Where an entire building undergoes a *change of occupancy*, it shall comply with Section 305.4.1 and shall have all of the following accessible features:

1. Not fewer than one accessible building entrance.
2. Not fewer than one accessible route from an accessible building entrance to *primary function* areas.
3. Signage complying with Section 1111 of the International Building Code.
4. Accessible parking, where parking is being provided.
5. Not fewer than one accessible passenger loading zone, where loading zones are provided.
6. Not fewer than one accessible route connecting accessible parking and accessible passenger loading zones to an accessible entrance.

Where it is *technically infeasible* to comply with the new construction standards for any of these requirements for a change of group or occupancy, Items 1 through 6 shall conform to the requirements to the maximum extent technically feasible.

~~**Exception:** The accessible features listed in Items 1 through 6 are not required for an accessible route to Type B units.~~

Reason: There is no compelling reason to exempt buildings undergoing a complete change of occupancy to a Group R-2 apartment building for providing these 6 listed provisions. It must be first noted that Section 305.4 already exempts buildings where the work area is less than 50%.

305.4 Change of occupancy. *Existing buildings* that undergo a change of group or occupancy shall comply with this section.

Exception: Type B dwelling or sleeping units required by Section 1107 of the *International Building Code* are not required to be provided in *existing buildings* and facilities undergoing a *change of occupancy* in conjunction with *alterations* where the *work area* is 50 percent or less of the aggregate area of the building.

Where the action is a complete change of occupancy – such as an old warehouse to new condominiums, why should there not be an accessible entrance; accessible routes to the new units, signage where appropriate; parking and loading zones where provided and routes to such parking and loading? In all likelihood, these features will be added or altered. Please note that this only applies where there is a change of occupancy for the entire space. This does not impose improvements to the path of travel under Section 305.7 for remodeling areas of primary function. There remains an exception for R-2 uses in Section 305.7.

Cost Impact: The code change proposal will increase the cost of construction

The deletion of the exception may cause an increase in cost of some changes of occupancy to a Group R-2 building. We think it would be unlikely that a complete change of occupancy to residential where Type B (and likely Type A) units would be provided would not provide an accessible route to those units, nor have an accessible entrance to the building. The cost increase may result in reconfiguring existing parking to provide accessible spaces and providing a route to parking and loading locations.

Proposal # 5089

EB27-19

EB28-19

IEBC@: 305.6

Proponent: Gina Hilberry, Scoping Task Group of ICC/A117.1 Standard Development Committee, representing United Cerebral Palsy (gina@cohenhilberry.com); Rick Lupton, representing Self (sparkylupton@msn.com); Marsha Mazz, representing United Spinal Association (m.mazz@verizon.net); Gene Boecker, representing Code Consultants, Inc.(geneb@codeconsultants.com)

2018 International Existing Building Code

Revise as follows:

305.6 Alterations. A *facility* that is altered shall comply with the applicable provisions in Chapter 11 of the International Building Code, unless *technically infeasible*. Where compliance with this section is *technically infeasible*, the *alteration* shall provide access to the maximum extent technically feasible.

Exceptions:

- ~~1. The altered element or space is not required to be on an accessible route, unless required by Section 305.7.~~
2. Accessible means of egress required by Chapter 10 of the International Building Code are not required to be provided in existing facilities.
3. The *alteration* to Type A individually owned dwelling units within a Group R-2 occupancy shall be permitted to meet the provision for a Type B dwelling unit.
4. Type B dwelling or sleeping units required by Section 1107 of the International Building Code are not required to be provided in *existing buildings* and facilities undergoing *alterations* where the *work area* is 50 percent or less of the aggregate area of the building.

Reason: The proposal eliminates exception 1 to the provision of alteration of accessible features in the IEBC. The exception isn't needed for a few reasons:

1. It serves as a pointer to Section 305.7. Since compliance with 305.7 is applicable to any alteration affecting the area of primary function, the accessible route will be addressed through compliance with Section 305.7. No pointer is needed.
2. It may have been intended to say that an altered element still has to meet accessibility standards even if an accessible route isn't provided. Such is covered in Chapter 11 of the IBC and the ICC A117.1 standard.
3. It is confusing as an exception. Exceptions should point to something less stringent, but by pointing to Section 305.7, it address something that is more stringent.

As the code user can get to the issues addressed by the exception without the exception, it should just go away.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The deletion of the exception doesn't change compliance requirements found elsewhere in the IEBC and the IBC, the code just will lose an unclear pointer.

Proposal # 5092

EB28-19

EB29-19

IEBC@: 305.7

Proponent: Gina Hilberry, Scoping Task Group of ICC/A117.1 Standard Development Committee, representing United Cerebral Palsy (gina@cohenhilberry.com); Rick Lupton, representing Self (sparkylupton@msn.com); Marsha Mazz, representing United Spinal Association (m.mazz@verizon.net); Gene Boecker, representing Code Consultants, Inc.(geneb@codeconsultants.com)

2018 International Existing Building Code

Revise as follows:

305.7 Alterations affecting an area containing a primary function. Where an *alteration* affects the accessibility to, or contains an area of *primary function*, ~~the route~~ an accessible path of travel to the *primary function* area shall be ~~accessible~~ provided. The accessible ~~route~~ path of travel to the *primary function* area shall include the accessible route, toilet facilities and drinking fountains serving the area of *primary function*.

Exceptions:

1. The costs of providing the ~~accessible route~~ path of travel are not required to exceed 20 percent of the costs of the *alterations* affecting the area of *primary function*.
2. ~~This provision~~ The requirement to provide an accessible path of travel does not apply to ~~alterations~~ where alterations within the primary function area are limited solely to windows, hardware, operating controls, electrical outlets and signs.
3. ~~This provision does not apply to alterations limited solely to signs~~, mechanical systems, electrical systems, installation or alteration of fire protection systems and abatement of hazardous materials.
4. This provision does not apply to *alterations* undertaken for the primary purpose of increasing the accessibility of a *facility*.
5. This provision does not apply to altered areas limited to Type B dwelling and sleeping units.

Reason: The IEBC code is unclear with respect to this requirement which derives from the ADA. The term used in the ADA is 'path of travel'. In the ADA it includes the accessible route to the primary function area as well as the telephones, toilet facilities and drinking fountains which serve the area of primary function. Saying 'accessible route' as it does in exception 1 is misleading. Path of travel could be defined in Chapter 2, but the last sentence of 305.7 is essentially the definition. As the term is not used elsewhere in the code, a chapter 2 definition seems unnecessary. Telephones are not included in the IEBC text because they are not typically part of the building regulated by the local building official. Telephone requirements for new construction are in Appendix E of the IBC.

Exception 3 is merged into exception 2 as they are both simply lists of elements exempt from the path of travel requirements.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is primarily an editorial clarification of an existing requirement.

Proposal # 5099

EB29-19

EB30-19

IEBC@: 305.8.4

Proponent: Gina Hilberry, Scoping Task Group of ICC/A117.1 Standard Development Committee, representing United Cerebral Palsy (gina@cohenhilberry.com); Rick Lupton, representing Self (sparkylupton@msn.com); Marsha Mazz, representing United Spinal Association (m.mazz@verizon.net); Gene Boecker, representing Code Consultants, Inc.(geneb@codeconsultants.com)

2018 International Existing Building Code

Revise as follows:

305.8.4 Stairways and escalators in existing buildings. Where an escalator or stairway is added where none existed previously and major structural modifications are necessary for installation, an accessible route ~~shall be provided between the levels served by the escalator or stairways in accordance~~ complying with Section 1104.4 of the International Building Code ~~is required between levels served by such escalator or stairway.~~

Reason: We believe the intent of this section is to require an accessible route between stories where none now exists; but to not require additional accessible routes where one is already provided. The language is convoluted and unclear. We believe that the language can be simplified to send the users to Section 1104.4 of the IBC. Section 1104.4 provides all the direction and exceptions needed to clarify application of this section.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The intent is to provide clarity to this section through an editorial revision

Proposal # 5095

EB30-19

EB31-19

IEBC@: SECTION 305, 305.8.5, TABLE 305.8.5, 305.8.9, 305.8.13, 305.8.14

Proponent: Gina Hilberry, Scoping Task Group of ICC/A117.1 Standard Development Committee, representing United Cerebral Palsy (gina@cohenhilberry.com); Rick Lupton, representing Self (sparkylupton@msn.com); Marsha Mazz, representing United Spinal Association (m.mazz@verizon.net); Gene Boecker, representing Code Consultants, Inc.(geneb@codeconsultants.com)

2018 International Existing Building Code

SECTION 305 ACCESSIBILITY FOR EXISTING BUILDINGS

Delete without substitution:

~~305.8.5 Ramps. Where slopes steeper than allowed by Section 1012.2 of the International Building Code are necessitated by space limitations, the slope of ramps in or providing access to existing facilities shall comply with Table 305.8.5.~~

**TABLE 305.8.5
RAMPS**

SLOPE	MAXIMUM RISE
Steeper than 1:10 but not steeper than 1:8	3 inches
Steeper than 1:12 but not steeper than 1:10	6 inches

For SI: 1 inch = 25.4 mm.

~~305.8.9 Jury boxes and witness stands. In alterations, accessible wheelchair spaces are not required to be located within the defined area of raised jury boxes or witness stands and shall be permitted to be located outside these spaces where the ramp or lift access restricts or projects into the required means of egress.~~

~~305.8.13 Fuel dispensers. Operable parts of replacement fuel dispensers shall be permitted to be 54 inches (1370 mm) maximum, measuring from the surface of the vehicular way where fuel dispensers are installed on existing curbs.~~

~~305.8.14 Thresholds. The maximum height of thresholds at doorways shall be $\frac{3}{4}$ inch (19.1 mm). Such thresholds shall have beveled edges on each side.~~

Reason: Sections 305.8.5, 305.8.9, 305.8.13 and 305.8.14 are redundant with the A117.1 standard. For some of these, the standard provisions are a more comprehensive statement of the technical exemption for existing buildings and alterations. In addition these are "technical" exceptions, and not as the Title of 305.8 alludes to them being changes to the "scoping" of where accessible features are required. Therefore we propose deleting these four sections. The text of the equivalent provisions in the standard can be located as follows:

IEBC Sec. A117.1 Sec.

305.8.5 405.2, Exception; Table 405.2

305.8.9 807.3, Exception

305.8.13 308.3, Exception 2

305.8.14 404.2.4, Exception

Cost Impact: The code change proposal will not increase or decrease the cost of construction. These are editorial revisions. No requirements are being added or exceptions deleted. The provisions deleted here are still found in the ICC A117.1 standard.

Proposal # 5093

EB31-19

EB32-19

IEBC@: 305.8.10, 305.8.11 (New), 305.9.4, 305.9.5 (New)

Proponent: Dawn Anderson, representing self (gonedawning@yahoo.com); Gene Boecker, representing Code Consultants, Inc. (geneb@codeconsultants.com); Dan Buuck, representing National Association of Home Builders (dbuuck@nahb.org); David Collins, representing the American Institute of Architects (dcollins@preview-group.com); Marsha Mazz, representing United Spinal Association (m.mazz@verizon.net)

2018 International Existing Building Code

Revise as follows:

305.8.10 Toilet rooms. Where it is *technically infeasible* to alter existing toilet ~~and bathing~~ rooms to be *accessible*, ~~an one accessible single user toilet room or one accessible~~ family or assisted-use toilet ~~or bathing~~ room constructed in accordance with Section 1109.2.1 of the International Building Code is permitted. ~~The family or assisted-use toilet or bathing~~ This toilet room shall be located on the same floor and in the same area as the existing toilet ~~or bathing~~ rooms. At the inaccessible toilet ~~and bathing~~ rooms, directional signs indicating the location of the nearest ~~family or assisted-use~~ such toilet room or bathing room shall be provided. These directional signs shall include the International Symbol of Accessibility and sign characters shall meet the visual character requirements in accordance with ICC A117.1.

Add new text as follows:

305.8.11 Bathing rooms. Where it is *technically infeasible* to alter existing bathing rooms to be *accessible*, one accessible single user bathing room or one accessible family or assisted-use bathing room constructed in accordance with Section 1109.2.1 of the *International Building Code* is permitted. This accessible bathing room shall be located on the same floor and in the same area as the existing bathing rooms. At the inaccessible bathing rooms, directional signs indicating the location of the nearest such bathing room shall be provided. These directional signs shall include the International Symbol of Accessibility and sign characters shall meet the visual character requirements in accordance with ICC A117.1.

Revise as follows:

305.9.4 Toilet ~~and bathing~~ facilities. Where toilet rooms are provided, not fewer than one accessible single user toilet room or one accessible family or assisted-use toilet room complying with Section 1109.2.1 of the International Building Code shall be provided.

Add new text as follows:

305.9.5 Bathing facilities. Where bathing rooms are provided, not fewer than one accessible single user bathing room or one accessible family or assisted-use bathing rooms complying with Section 1109.2.1 of the *International Building Code* shall be provided.

Reason: The intent of this proposal is to clarify the code and coordinate with the terminology in the IPC. The proposal splits the requirements for toilet rooms and bathing rooms into separate sections for clarity. Historically, this requirement originally said 'unisex' toilet rooms were permitted but was revised many cycles ago to use the term 'family or assisted use' for consistency. The IPC now requires all single-occupant toilet rooms to be gender neutral. It is arguable if a family or assisted use toilet room is for a single user or not. Family or assisted use toilet rooms can include a urinal and a toilet, or both adult and child fixtures. Most of the time, an accessible family or assisted use and an accessible single user toilet rooms are technically exactly the same. The current language has caused questions about if this option in the code is only allowed where family assisted use toilet rooms are required in the IBC (Groups A and M), and/or allowed to meet the fixture counts. The IPC has also been revised to allow both single-user and family or assisted toilet rooms to count towards the required fixture count.

For historic buildings (Section 305.9.4), the same issue exists. In addition, while the title included 'bathing rooms' the text did not. Providing separate sections will allow for consistency for existing building and historic buildings that include shower facilities for occupants.

Below is the language in the 2018 IPC

403.1.2 Single-user toilet facility and bathing room fixtures. The plumbing fixtures located in single-user toilet facilities and bathing rooms, including family or assisted use toilet and bathing rooms that are required by Section 1109.2.1 of the *International Building Code*, shall contribute toward the total number of required plumbing fixtures for a building or tenant space. Single-user toilet facilities and bathing rooms, and family or assisted-use toilet rooms and bathing rooms shall be identified for use by either sex.

403.2.1 Family or assisted-use toilet facilities serving as separate facilities. Where a building or tenant space requires a separate toilet facility for each sex and each toilet facility is required to have only one water closet, two family or assisted-use toilet facilities shall be permitted to serve as the required separate facilities. Family or assisted use toilet facilities shall not be required to be identified for exclusive use by either sex as required by Section 403.4.

403.4 Signage. Required *public* facilities shall be provided with signs that designate the sex, as required by Section 403.2. Signs shall be readily visible and located near the entrance to each toilet facility. Signs for accessible toilet facilities shall comply with Section 1111 of the *International Building Code*.

403.4.1 Directional signage. Directional signage indicating the route to the required *public* toilet facilities shall be posted in a lobby, corridor, aisle or

similar space, such that the sign can be readily seen from the main entrance to the building or tenant space.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is mostly an editorial clarification and coordination with IPC terms.

Proposal # 4370

EB32-19

EB33-19

IEBC@: 305.8.2

Proponent: Kevin Brinkman, representing National Elevator Industry, Inc. (klbrinkman@neii.org)

2018 International Existing Building Code

Delete without substitution:

~~**305.8.2 Elevators.** Altered elements of existing elevators shall comply with ASME A17.1 and ICC A117.1. Such elements shall also be altered in elevators programmed to respond to the same hall call control as the altered elevator.~~

Reason: This requirement is not necessary and may conflict with the ASME A17.1/CSA B44 Safety Code for Elevators and Escalators. A17.1/B44 already has detailed requirements for alterations. All elevators in a group may not be the same. Some cars may serve additional landings, have different size cars, or other features. It may not be feasible to comply with A117 due to variations or in older equipment. This requirement is overly restrictive and adds unnecessary cost to building owners. It may deter buildings owners from making improvements to one elevator due to the additional cost of having to update all other elevators in the group and therefore, reduce accessibility.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This code change proposal will not increase or decrease the cost of construction because elevator alterations are already addressed in ASME A17.1/CSA B44.

Proposal # 4736

EB33-19

EB34-19

IEBC@: 305.8.2 (New), 305.9.1

Proponent: Dawn Anderson, representing self (gonedawning@yahoo.com); Gene Boecker, representing Code Consultants, Inc. (geneb@codeconsultants.com); Dan Buuck, representing National Association of Home Builders (dbuuck@nahb.org); David Collins, representing the American Institute of Architects (dcollins@preview-group.com); Marsha Mazz, representing United Spinal Association (m.mazz@verizon.net)

2018 International Existing Building Code

Add new text as follows:

305.8.2 Accessible route. Exterior accessible routes, including curb ramps, shall be not less than 36 inches (914 mm) minimum in width.

Revise as follows:

305.9.1 Site arrival points. Not fewer than one exterior accessible route, including curb ramps from a site arrival point to an accessible entrance shall be provided and shall not be less than 36 inches (914 mm) minimum in width.

Reason: The ICC A117.1 has increased the size of the exterior route from 36" to 48". This change was based on the recommendations from the Public Rights of Way, not the study that revised the other requirements in the standard. Therefore, this provision does not have allowances for existing buildings in the standard. Allowances for existing building for this item was not discussed. This should not result in any significant loss of accessibility.

Changing the width of sidewalks and curb cuts on a site may require extensive reconfiguration of the parking and sidewalks. The required width for means of egress and/or designer input into the needed width of sidewalks should be sufficient for existing sidewalks and curb cuts on private property.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This allows for existing exterior accessible routes to remain at 36" in width.

Proposal # 4388

EB34-19

EB35-19

IEBC@: 305.8.6 (New)

Proponent: Ronald Clements Jr, representing VBCOA (clementsro@chesterfield.gov)

2018 International Existing Building Code

Add new text as follows:

305.8.6 Dining areas. An accessible route is not required to raised or sunken dining areas or outdoor dining areas where accessible dining areas with the same services are provided on the same floor level.

Reason: This provision for dining areas was in the work area method going back to the first edition. It was not in the prescriptive method when that method was introduced in the 2006 edition. When the accessibility provisions were consolidated in chapter 3 the dining area provision was lost; it was section 705.1.5 in the 2015 edition. It appears the loss was not intentional.

Cost Impact: The code change proposal will decrease the cost of construction. This provides another option that could decrease construction cost.

Proposal # 5491

EB35-19

EB36-19

IEBC@: 305.9

Proponent: Dawn Anderson, representing self (gonedawning@yahoo.com); Gene Boecker, representing Code Consultants, Inc. (geneb@codeconsultants.com); Dan Buuck, representing National Association of Home Builders (dbuuck@nahb.org); David Collins, representing the American Institute of Architects (dcollins@preview-group.com); Marsha Mazz, representing United Spinal Association (m.mazz@verizon.net)

2018 International Existing Building Code

Revise as follows:

305.9 Historic buildings. These provisions shall apply to *facilities* designated as historic structures that undergo *alterations* or a *change of occupancy*, unless *technically infeasible*. Where compliance with the requirements for accessible routes, entrances or toilet rooms would threaten or destroy the historic significance of the *facility*, as determined by the authority having jurisdiction, the alternative requirements of Sections 305.9.1 through 305.9.4 for that element shall be permitted.

~~Exception:~~ Exceptions:

1. The altered element or space is not required to be on an accessible route, unless required by Sections 305.9.1 or 305.9.2.
2. The *alteration* to Type A individually owned dwelling units within a Group R-2 occupancy shall be permitted to meet the provision for a Type B dwelling unit.
3. Type B dwelling or sleeping units required by Section 1107 of the International Building Code are not required to be provided in historic buildings.

Reason: This proposal is for consistency between the exceptions allowed for existing buildings and historic buildings. These exceptions are in Section 305.6 for existing buildings. This clarifies that an existing historic building can use the same exceptions as existing buildings.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is a clarification.

Proposal # 4395

EB36-19

EB37-19

305.9, 305.9.3, 305.9.5 (New)

Proponent: Dan Buuck, representing National Association of Home Builders (dbuuck@nahb.org); Marsha Mazz, representing United Spinal Association (m.mazz@verizon.net); David Collins, representing The American Institute of Architects (dcollins@preview-group.com); Gene Boecker, representing Code Consultants, Inc. (geneb@codeconsultants.com); Dawn Anderson, representing Mayor's Office on Disability (gonedawning@yahoo.com)

2018 International Existing Building Code

Revise as follows:

305.9 Historic buildings, structures. ~~These provisions shall apply to facilities designated as historic structures that undergo alterations or a change of occupancy, unless technically infeasible.~~ Where compliance with the requirements for accessible routes, entrances or toilet rooms would threaten or destroy the historic significance of the ~~facility~~ historic structure, as determined by the authority having jurisdiction, the alternative requirements of Sections 305.9.1 through 305.9.4 for that element shall be permitted.

~~**Exception:** Type B dwelling or sleeping units required by Section 1107 of the International Building Code are not required to be provided in historic buildings.~~

305.9.1 Site arrival points. Not fewer than one accessible route from a site arrival point to an accessible entrance shall be provided.

305.9.2 Multiple-level buildings and facilities. An accessible route from an accessible entrance to public spaces on the level of the accessible entrance shall be provided.

~~**305.9.3 Entrances.** Not fewer than one main entrance shall be accessible.~~

~~**Exception:** If a public~~ Where an entrance cannot be made accessible in accordance with Section 305.8.1, an accessible entrance that is unlocked while the building is occupied shall be provided; or, a locked accessible entrance with a notification system or remote monitoring shall be provided.

Signs complying with Section 1111 of the International Building Code shall be provided at the public ~~entrance~~ entrances and the accessible entrance.

305.9.4 Toilet and bathing facilities. Where toilet rooms are provided, not fewer than one accessible family or assisted-use toilet room complying with Section 1109.2.1 of the International Building Code shall be provided.

Add new text as follows:

305.9.5 Type B units. Type B dwelling or sleeping units required by Section 1107 of the International Building Code are not required to be provided in historic buildings.

Reason: The provisions for existing buildings should always apply for historic buildings where technically feasible. This is in the rest of the Section 305, so the first sentence is not needed. The requirements for the entrances in 305.9.3 is making a statement instead of an exception for consistent with the format. The exception for Type B units was moved from being an exception to being a statement in the text.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is editorial.

Proposal # 4398

EB37-19

EB38-19

IEBC@: SECTION 306 (New), 306.1 (New)

Proponent: Stephen Thomas, representing Himself (stthomas@coloradocode.net)

2018 International Existing Building Code

Add new text as follows:

SECTION 306 **MEANS OF EGRESS FOR EXISTING BUILDINGS**

306.1 Occupant Load based on Capacity Where approved by the code official, the occupant load of any room, areas, space or story shall be permitted to be established as the number of occupant for which the existing means of egress capacity is adequate. Measures shall be established to prevent occupancy greater than the number and capacity of the means of egress components. Such measures can include, but are not limited to the posting of the occupant load for the room, area, space or story.

Reason: Many shell and core buildings are constructed with the minimum means of egress capacity for the anticipated use. However, when the space is finished, the new use may have spaces with occupant loads higher than originally anticipated. Therefore, the existing egress capacity is not adequate enough for the new space. This proposal provides an option to base the occupant load on the existing capacity of the space. It requires the building official's approval to use this option to reduce possible abuse of the requirement.

For example, if a space has two 36-inch wide doors that provide 34-inches of egress capacity, the maximum occupant load permitted in that space would be 340. In some cases, it is either very expensive or impossible to add an additional means of egress or capacity. If the calculated occupant load was greater than the 340, the building official could approve the reduction of the occupant load to a maximum of 340. They would then determine how that occupant load would be maintained which could include the posting of the occupant load in the space. This happens in office tenant improvements quite often. The original building was designed with an occupant load calculation for business use, but the new tenant space has some assembly functions that increase the occupant load.

This proposal was submitted to the Means of Egress Committee in the Group A Cycle. They felt that the requirement would be better located in the IEBC. Their other concerns were addressed by some revisions to the original language submitted to them.

Cost Impact: The code change proposal will decrease the cost of construction

By allowing the occupant load to be based on the egress capacity, the cost of additional exits or capacity will be eliminated.

Proposal # 5506

EB38-19

EB39-19

IEBC@: SECTION 306 (New), 306.1 (New), 306.1.1 (New), 306.1.2 (New)

Proponent: John Williams, representing Healthcare Committee (AHC@iccsafe.org)

2018 International Existing Building Code

Add new text as follows:

SECTION 306 HEALTHCARE

306.1 General. Healthcare facilities including Group I-2, ambulatory care facilities and outpatient clinics undergoing repair, alterations, additions and change of occupancy shall be in accordance with Sections 306.1.1 and 306.1.2, as applicable.

306.1.1 Existing construction requirements. Existing Group I-2 facilities shall meet the minimum construction requirements in Chapter 11 of the International Fire Code.

306.1.2 Projections in Nursing Home Corridors. In Group I-2, Condition 1 occupancies, where the corridor is at least 96 inches wide, projections into the corridor width are permitted in accordance with Section 407.4.3 of the International Building Code.

Reason: This proposal creates a section in chapter 3 for special requirements for healthcare facilities. Due to federal reimbursement requirements, there are specific existing building issues that must be mitigated before receiving federal funds. These are reflected in Chapter 13 of the IFC, however, not all jurisdictions adopt this chapter. By referencing those requirements in the IEBC, we provide facilities with a greater chance at maintaining federal certification and at the same time ensure basic safety provisions for facilities that house fragile populations. A companion proposal directly references chapter 11 of the IFC in all of the compliance methods. If it is more effective to have the actual technical requirements in this document, this change creates a place for those requirements to live..

The intent of Section 306.2 is to correlate with the federal regulations and the allowances in the IBC for fixed furniture in corridors where special considerations are met.

This proposal is submitted by the ICC Committee on Healthcare (CHC). The CHC was established by the ICC Board to evaluate and assess contemporary code issues relating to healthcare facilities. This is a joint effort between ICC and the American Society for Healthcare Engineering (ASHE), a subsidiary of the American Hospital Association, to eliminate duplication and conflicts in healthcare regulation. In 2017 and 2018 the CHC held 4 open meetings and numerous conference calls, *which included members of the committees as well as any interested parties, to discuss and debate the proposed changes*. Information on the CHC, including: meeting agendas; minutes; reports; resource documents; presentations; and all other materials developed in conjunction with the CHC effort can be downloaded from the CHC website at: <https://www.iccsafe.org/codes-tech-support/cs/icc-committee-on-healthcare/>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is a pointer to the IEBC that indicates the allowances permitted for fixed furniture.

Proposal # 4246

EB39-19

EB40-19

IEBC@: SECTION 306 (New), 306.1 (New), SECTION 307 (New), 307.1 (New), 502.6, 502.7, 503.14, 503.15, 803.4.3, SECTION 804, 804.1, SECTION 1104, 1104.1, SECTION 1105, 1105.1

Proponent: Stephen Thomas, representing Himself (stthomas@coloradocode.net)

2018 International Existing Building Code

Add new text as follows:

SECTION 306 SMOKE ALARMS

306.1 Smoke Alarms Where an alteration, addition, change of occupancy or relocation of a building is made to an existing building or structure of a Group R and I-1 occupancies, the existing building shall be provided with smoke alarms in accordance with Section 1103.8 of the International Fire Code or Section R314 of the International Residential Code.

SECTION 307 CARBON MONOXIDE DETECTION

307.1 Carbon monoxide alarms. Where an addition, alteration, change of occupancy or relocation of a building is made to Group I-1, I-2, I-4 and R occupancies, the existing building shall be provided with carbon monoxide alarms in accordance with Section 1103.9 of the International Fire Code or Section R315 of the International Residential Code.

Exceptions:

1. Work involving the exterior surfaces of buildings, such as the replacement of roofing or siding, the addition or replacement of windows or doors, or the addition of porches or decks.
2. Installation, alteration or repairs of plumbing or mechanical systems, other than fuel-burning appliances.

Delete without substitution:

~~502.6 Smoke alarms in existing portions of a building.~~ Where an *addition* is made to a building or structure of a Group R or I-1 occupancy, the *existing building* shall be provided with smoke alarms in accordance with Section 1103.8 of the International Fire Code.

~~502.7 Carbon monoxide alarms in existing portions of a building.~~ Where an *addition* is made to a building or structure of Group I-1, I-2, I-4 or R occupancy, the existing building shall be provided with carbon monoxide alarms in accordance with Section 1103.9 of the International Fire Code or Section R315 of the International Residential Code, as applicable.

Exceptions:

- ~~1. Work involving the exterior surfaces of buildings, such as the replacement of roofing or siding, the addition or replacement of windows or doors, or the addition of porches or decks.~~
- ~~2. Installation, alteration or *repairs* of plumbing or mechanical systems, other than fuel-burning appliances.~~

~~503.14 Smoke alarms.~~ Individual sleeping units and individual dwelling units in Group R and I-1 occupancies shall be provided with smoke alarms in accordance with Section 1103.8 of the International Fire Code.

~~503.15 Carbon monoxide alarms.~~ Carbon monoxide alarms shall be provided to protect sleeping units and dwelling units in Group I-1, I-2, I-4 and R occupancies in accordance with Section 1103.9 of the International Fire Code.

Exceptions:

- ~~1. Work involving the exterior surfaces of buildings, such as the replacement of roofing or siding, the addition or replacement of windows or doors, or the addition of porches or decks.~~
- ~~2. Installation, alteration or *repairs* of plumbing or mechanical systems, other than fuel-burning appliances.~~

~~803.4.3 Smoke alarms.~~ Individual sleeping units and individual dwelling units in any *work area* in Group R and I-1 occupancies shall be provided with smoke alarms in accordance with the International Fire Code.

~~Exception:~~ Interconnection of smoke alarms outside of the *work area* shall not be required.

~~SECTION 804~~ ~~CARBON MONOXIDE DETECTION~~

804.1 Carbon monoxide alarms. Any *work area* in Group I-1, I-2, I-4 and R occupancies shall be equipped with carbon monoxide alarms in accordance with Section 1103.9 of the International Fire Code.

Exceptions:

1. ~~Work involving the exterior surfaces of buildings, such as the replacement of roofing or siding, the addition or replacement of windows or doors, or the addition of porches or decks.~~
2. ~~Installation, alteration or *repairs* of plumbing or mechanical systems, other than fuel-burning appliances.~~

~~SECTION 1104~~
~~SMOKE ALARMS IN OCCUPANCY~~
~~GROUPS R AND I-1~~

~~1104.1 Smoke alarms in existing portions of a building.~~ Where an *addition* is made to a building or structure of a Group R or I-1 occupancy, the *existing building* shall be provided with smoke alarms as required by Section 1103.8 of the International Fire Code or Section R314 of the International Residential Code as applicable.

~~SECTION 1105~~
~~CARBON MONOXIDE ALARMS IN~~
~~GROUPS I-1, I-2, I-4 AND R~~

~~1105.1 Carbon monoxide alarms in existing portions of a building.~~ Where an *addition* is made to a building or structure of a Group I-1, I-2, I-4 or R occupancy, the *existing building* shall be equipped with carbon monoxide alarms in accordance with Section 1103.9 of the International Fire Code or Section R315 of the International Residential Code, as applicable.

Reason: Smoke alarms and carbon monoxide alarms are required for all the different options in the IEBC. It does not make sense to have the same requirements duplicated in the different options. Chapter 3 was created to address requirements that were applicable to all of the options. Therefore, this proposal places the requirement for smoke alarms and carbon monoxide alarms in Chapter 3 and deletes the specific requirements elsewhere in the code. This change also maintains the pointer to the fire code for these requirements.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is just a relocation of the requirements into a single location.

Proposal # 5517

EB40-19

EB41-19

IEBC: 401.1.1 (New), 401.1.2 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Existing Building Code

Revise as follows:

SECTION 401 GENERAL

401.1 Scope. *Repairs* shall comply with the requirements of this chapter. *Repairs to historic buildings* need only comply with Chapter 12.

Add new text as follows:

401.1.1 Partial reconstruction. Where damage from fire, earthquake, storm or a similar event has rendered one or more stories of a building, structure or portion thereof as unsafe, reconstruction of such areas shall meet the requirements for a Level 2 or 3 alteration, as applicable.

401.1.2 Complete reconstruction. Where damage from fire, earthquake, storm or similar event has demolished the building structure, or a portion of a building or structure from the foundation to the roof, reconstruction of such areas shall be in accordance with the International Building Code.

Reason: There is a question as to when damage from a fire or other disaster destroying all or a good chunk of a building. Do you have to go back to IBC or can you build back the way it was? This concept is to try and separate repair from new construction requirements at a logical point. Note that this also helps people get the true value for reconstruction as the insurance industry may sometimes classify a new building (or a replacement of the large portion or an entire story) as a repair and funding is limited.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is intended as a clarification of requirements.

Proposal # 4196

EB41-19

EB42-19

IEBC@: 402.1, 404.1, 702.4, 702.7.1 (New), 702.7.2 (New), 702.7.3 (New), 802.5.1, 802.5.2, 805.11, 805.11.1, 805.11.2, 1011.4.1

Proponent: William Warlick, representing Self (william.warlick@slcgov.com)

2018 International Existing Building Code

Add new text as follows:

402.2 Guards An existing *guard* that is unable to resist a concentrated load of 200 pounds (0.89 kN) shall be repaired with like materials.

Work on an existing *guard* shall include augmenting the guard in accordance with the *International Building Code* where the height of the guard is one of the following:

1. Less than 36" above walking surfaces.
2. Less than 30" above the leading edges of stair treads.

404.2 Guards. Existing *guards* shall comply with the strength and height requirements of 402.2.

702.7 Guards Guards shall comply with Sections 702.7.1 through 702.7.3, as applicable.

702.7.1 Minimum requirements. Existing guards shall be altered, augmented or replaced in accordance with the International Building Code where such guards are unable to resist a concentrated load of 200 pounds (0.89 kN), or the height of the guard is one of the following:

1. Less than 36" above walking surfaces, or
2. Less than 30" above the leading edges of stair treads

702.7.2 Elements of an existing guard. The alteration of elements of an existing guard with new elements of the same design shall maintain the guard's strength and height.

702.7.3 New and reconfigured guards. New guards and existing guards that are augmented or otherwise reconfigured, shall comply with the International Building Code.

Revise as follows:

802.5.1 Minimum requirement. Where required Every portion of a floor, such as a balcony or a loading dock, that is more than 30 inches (762 mm) above the floor or grade below and is not provided with guards, or those in which the existing guards are judged to be in danger of collapsing, shall be provided with guards. *Guards* shall be located along open-sided walking surfaces where required in accordance with the *International Building Code*. Where a required guard does not exist, a new guard shall be provided.

802.5.2 Design. Construction Where there are no guards or where existing guards must be replaced, the guards shall be designed and installed in accordance with the International Building Code. *Guards* shall comply with Section 702.7.

805.11 Guards. The requirements of Sections 805.11.1 and 805.11.2-Section 802.5 shall apply to guards from the *work area* floor to, and including, the level of exit discharge but shall be confined to the egress path of any *work area*.

Delete without substitution:

~~**805.11.1 Minimum requirement.** Every open portion of a stairway, landing, or balcony that is more than 30 inches (762 mm) above the floor or grade below and is not provided with guards, or those portions in which existing guards are judged to be in danger of collapsing, shall be provided with guards.~~

~~**805.11.2 Design.** Guards required in accordance with Section 805.11.1 shall be designed and installed in accordance with the International Building Code.~~

Revise as follows:

1011.4.1 Means of egress for change to a higher-hazard category. Where a change of occupancy classification is made to a higher-hazard category (lower number) as shown in Table 1011.4, the means of egress shall comply with the requirements of Chapter 10 of the International Building Code.

Exceptions:

1. Stairways shall be enclosed in compliance with the applicable provisions of Section 903.1.
2. ~~Existing in hazard categories 4 or 5, existing~~ stairways including handrails and guards complying with the requirements of Chapter 9 shall be permitted for continued use subject to approval of the *code official*.
3. Any stairway replacing an existing stairway within a space where the pitch or slope cannot be reduced because of existing

- construction shall not be required to comply with the maximum riser height and minimum tread depth requirements.
4. Existing corridor walls constructed on both sides of wood lath and plaster in good condition or 1/2 inch-thick (12.7 mm) gypsum wallboard shall be permitted. Such walls shall either terminate at the underside of a ceiling of equivalent construction or extend to the underside of the floor or roof next above.
 5. Existing corridor doorways, transoms and other corridor openings shall comply with the requirements in Sections 805.5.1, 805.5.2 and 805.5.3.
 6. Existing dead-end corridors shall comply with the requirements in Section 805.6.
 7. An existing operable window with clear opening area not less than 4 square feet (0.38 m²) and minimum opening height and width of 22 inches (559 mm) and 20 inches (508 mm), respectively, shall be accepted as an emergency escape and rescue opening.

Reason: This code change reduces reliance on determinations by the code official of unsafe conditions by providing baseline measurements. The code is currently vague about *guard* requirements, stating, for example, that, in a change of occupancy, a guard “shall be permitted for continued use subject to approval of the *code official*.” In 1203.10.1 Height, the code states: “Existing guards shall comply with the requirements of Section 704,” but 704 contains no mention of guard height.

Fall safety is considered an area of the I-Codes that is central to life safety. See IBC Section 1015, IRC Section R312, and IMC Sections 304.11 and 306.5.1. Notably, the IEBC also considers fall safety, but from windows only (IEBC 702.4).

While the IEBC generally adheres to the principle that existing construction may remain, there are some areas of the code that depart from this principle for good reasons. One of these reasons is that standards of safety have changed.

The average height of humans has been increasing in recent history,^[i] requiring a higher guard to protect against falling. Because this standard of safety has changed, it would make sense for the IEBC to address this area of the code for existing buildings.

The baseline guard heights we propose are 42” in high hazard category occupancies, 36” above walking surfaces, and 30” above the leading edges of stair treads. While the 42” guard height is provided in the IBC generally, there are situations where a lower guard height is allowed:

A 36” guard height is allowed for guards at the end of aisles in assembly seating areas (1029.16.4), and in individual dwelling units in Group R-2 and R-3 occupancies not more than three stories (1015.3).

A 34” guard height is allowed on the open side of stairs in individual dwelling units in Group R-2 and R-3 occupancies.

Legacy codes provided a 30” guard height at stairs as late as 1985.^[ii] This dimension was later changed to 34”.^[iii]

Legacy codes also provided reduced minimum guard heights for existing buildings. For example: “Existing guardrails ... which are at least 36 inches shall be permitted to remain.” Also: “Guardrails for stairways, exclusive of their landings, may have a height that is not less than 30 inches measured above the nosing of treads.”^[iv]

Existing sections 802.5 and 805.11 are also proposed to be amended in order to incorporate the proposed minimum guard height requirements, to simplify the language, and to remove an incorrect reference to loading docks.^[v]

^[i] “... over the last 150 years the average height of people in industrialized nations has increased approximately 10 centimeters (about four inches).” *Scientific American* “Why are we getting taller as a species?” June 29, 1998.

^[ii] 1985 Uniform Building Code, Sections 3306(j) and 1711.

^[iii] 1988 Uniform Building Code, Sections 3306(j) and 1711.

^[iv] 1997 Uniform Code for Building Conservation, Section 405.2

^[v] IBC 1015.2 Exception 1.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

No cost increase. The proposed changes only clarify the intent of the code, enumerating baseline dimensions that have generally been enforced as determined by code officials.

EB43-19

IEBC@: [BS] 405.2.3.1, [BS] 405.2.3.3, 506.4.2, [BS] 1006.2

Proponent: David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Revise as follows:

[BS] 405.2.3.1 Evaluation. The building shall be evaluated by a registered design professional, and the evaluation findings shall be submitted to the *code official*. The evaluation shall establish whether the damaged building, if repaired to its predamage state, would comply with the provisions of the International Building Code for load combinations that include wind, flood or earthquake effects, except that the seismic forces shall be the reduced seismic forces.

[BS] 405.2.3.3 Extent of repair for noncompliant buildings. If the evaluation does not establish that the building in its predamage condition complies with the provisions of Section 405.2.3.1, then the building shall be retrofitted to comply with the provisions of this section. The wind loads and the flood loads for the *repair* and *retrofit* shall be those required by the building code in effect at the time of original construction, unless the damage was caused by wind, in which case the wind loads and flood loads shall be in accordance with the International Building Code. The seismic loads for this *retrofit* design shall be those required by the building code in effect at the time of original construction, but not less than the reduced seismic forces.

506.4.2 Snow, flood and wind loads. Where a change of occupancy results in a structure being assigned to a higher *risk category*, the structure shall satisfy the requirements of Sections 1608, 1609 and ~~1609~~-1612 of the International Building Code for the new *risk category*.

Exception: Where the area of the new occupancy is less than 10 percent of the building area, compliance with this section is not required. The cumulative effect of occupancy changes over time shall be considered.

[BS] 1006.2 Snow, flood and wind loads. Where a *change of occupancy* results in a structure being assigned to a higher risk category, the structure shall satisfy the requirements of Sections 1608, 1609 and ~~1609~~-1612 of the International Building Code for the new risk category

Exception: Where the area of the new occupancy is less than 10 percent of the building area. The cumulative effect of occupancy changes over time shall be considered.

Reason: Currently the IEBC has no criteria for determining the extent of damage during an evaluation following flood damage, nor how repairs are to be performed for existing noncompliant buildings when due to flood loads. The changes to Sections 405.2.3.1 and 405.2.3.3 will clearly establish what is to be done when the structure is subject to flood damage and must be repaired.

The revisions to Sections 506.4.2 and 1006.2 reflect a concern that flood loads are not addressed when a change of occupancy occurs where the change is to a higher risk category.

Cost Impact: The code change proposal will increase the cost of construction

Sections 405.2.3.1 and 405.2.3.3. This revisions is a clarification of the code by inclusion of specific provisions for performing needed repairs to an existing building will simplify the process of gaining permits and performing the necessary repairs in accordance with the code. These revisions will not increase the cost of construction

Sections 506.4.2 and 1006.2 will now require that when a change occupancy occurs that places the structure in a higher risk category that flood loads must be accounted for therefore this may increase the cost of construction as the IEBC does not typically address this issue currently

Proposal # 5410

EB43-19

EB44-19

IEBC@: [BS] 405.2.4

Proponent: Michael Fillion, representing National Council of Structural Engineers Associations (mrf.structure@verizon.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Revise as follows:

[BS] 405.2.4 Substantial structural damage to gravity load-carrying components. Gravity load-carrying components that have sustained *substantial structural damage* shall be rehabilitated to comply with the applicable provisions for dead, live, and live-snow loads in the International Building Code. ~~Snow loads shall be considered if the *substantial structural damage* was caused by or related to snow load effects.~~ Undamaged gravity load-carrying components that receive dead, live or snow loads from rehabilitated components shall also be rehabilitated if required to comply with the design loads of the *rehabilitation* design.

Reason: What the proposal does: Includes the consideration of snow load effects whether or not the cause of substantial structural damage was related to snow load effects.

Summary of the current problem and why it's unacceptable: The current IEBC is written such that consideration of snow load effects are only included when the substantial structural damage was caused by or related to snow load effects. Snow loads share the same load path as other gravity loads and should be considered when rehabilitating gravity load-carrying components.

How the proposal solves it, in concept: The proposed language requires consideration of snow load effects for all instances of the rehabilitation of gravity load-carrying components after sustaining substantial structural damage.

Point by point explanation and rationale for each change: The current provision requires only dead and live loads be considered when rehabilitating the gravity load-carrying components of a building that have sustained substantial structural damage. This is true even though it is probable that in some cases live loads did not play any part in causing the damage. As such, rehabilitation of the structure should include all applicable gravity design loads so that the rehabilitated structure is in compliance with current load requirements for new construction required by the International Building Code.

Cost Impact: The code change proposal will increase the cost of construction

Cost impact is negligible - potential slight increase if the load combination using snow load controls member design.

Proposal # 5161

EB44-19

EB45-19

IEBC@: 405.2.5 (New)

Proponent: Gwenyth R. Searer, Wiss, Janney, Elstner Associates, Inc., representing myself (gsearer@wje.com)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Add new text as follows:

405.2.5 Disproportionate Upgrade Costs The scope of work required by Sections 405.2.2, 405.2.3, and 405.2.4 need not exceed the scope of work required by Section 405.2.1 by more than 20 percent in terms of cost.

Reason: Arthur Mellen Wellington once wrote that an engineer can do for a dollar what any fool can do for two.

The structural upgrade triggers in the IEBC were expanded yet again last code cycle with the addition of a snow damage trigger and a disproportionate earthquake damage trigger. These triggers were added to the two substantial structural damage triggers that were already present. While triggers seem like a good idea in theory (i.e., while a big repair is being performed, why not upgrade the structure while everything is exposed?), upgrade triggers have been shown to discourage repairs and maintenance (ICBO, 1998) and to result in wildly disproportionate upgrade costs (Searer *et al.*, 2006). After the 1989 Loma Prieta earthquake, the City of Oakland adopted upgrade triggers that were the inspiration of the triggers in the IEBC. The following occurred as a result of the triggers:

- 1) Costs to repair and upgrade the buildings were often many times the cost of repair-only.
- 2) Building owners were unable to fund the upgrades in many cases.
- 3) Buildings were left abandoned, in their damaged states, for many years -- some more than a decade.
- 4) Some engineers gamed the system, trying to make the calculated loss-of-capacity fall under or exceed the triggers, depending on what their clients wanted.
- 5) Engineers, building officials, and owners were unable to agree on how to compute loss-of-structural-capacity.
- 6) Litigation ensued.

Even today, there exist no commonly accepted standards for determining loss-of-capacity.

Design and implementation of mandatory system-wide upgrades is even more problematic. For example, consider an older three-story residential structure with tuck-under parking and a soft story. The gypsum board and stucco walls comprise the lateral force resisting structure. Suppose that this building was required to be seismically upgraded due to the substantial structural damage trigger. An experienced structural engineer would likely conclude that the most economical way to strengthen the structure would be to address the soft/weak story on the ground floor by adding plywood shear walls and possibly steel moment frames on the ground floor, but leaving the top two stories, which lack the soft/weak story conditions, unaltered. This would eliminate the hazard most likely by far to result in collapse of the structure for relatively little cost. However, since the R-value has been set so incredibly low in recent codes to discourage the use of gypsum board and stucco as lateral force resisting elements in new buildings, the substantial structural damage trigger would require seismic upgrade of all floors and possibly the foundations as well in this example. So the solution that a rational engineer would generally propose and the building official would generally accept for a voluntary seismic upgrade and even an upgrade required by a soft/weak story ordinance is precluded because the substantial structural damage trigger has no limits: it requires that the lateral force resisting system be brought to at least 75 percent of current code or repair of the building is not permitted. Further, it often makes little sense to spend very large sums of money on older existing buildings that in general have much smaller remaining useful lives than newer buildings.

Engineering is supposed to be about weighing costs and benefits, and making decisions that reduce risk and make economic sense. Simply requiring engineers (and the building owners that have to foot the bills) to upgrade the vast majority of the lateral force-resisting system (including undamaged elements) in a damaged building makes little engineering sense.

A much better way to address potential future hazards in existing building stock is to have a rational cut-off in the amount of money that needs to be spent on triggered upgrades. Building owners and engineers can then make informed decisions about where that money should be spent. In the example above, the knowledgeable engineer would likely recommend strengthening the ground floor, where the soft/weak conditions are present, and would be able to exclude the portions of the structure that do not make sense to strengthen (e.g., the upper two floors).

This cut-off would be similar to the ADA/accessibility 20-percent limit. Architects and building officials often deal with this limit in the alteration of

existing buildings. The trigger is both effective (i.e., it addresses problems with accessibility) and limited/reasonable (i.e., it cannot result in costs many times the cost of the alteration). The architect and the owner then make the decisions regarding which components of the building should be improved with respect to alterations while considering the available budget. If architects, building owners, and building officials can deal with reasonable limitations regarding accessibility like this, one would hope that engineers, building owners, and building officials should also be able to deal with a similar reasonable cap on the costs of structural upgrades.

Bibliography: International Conference of Building Officials (ICBO), 1998. *Handbook to the Uniform Building Code: An Illustrative Commentary*, ICBO, Whittier, California.

Searer, G.R., Paret, T.F., Freeman, S.A., Gilmartin, U.M., 2006. "Evaluation of the Effects of Oakland's Earthquake Damage Repair Ordinance", 8th US Conference on Earthquake Engineering, San Francisco, California.

Cost Impact: The code change proposal will decrease the cost of construction

Limiting the economic impact caused by the existing structural damage repair triggers will reduce the cost of construction.

Proposal # 5341

EB45-19

EB46-19

IEBC@: 406.1.4 (New), 408.3 (New)

Proponent: John Williams, representing Healthcare Committee (AHC@iccsafe.org)

2018 International Existing Building Code

Delete and substitute as follows:

~~**406.1.4 Group I-2 receptacles.** Receptacles in patient bed locations of Group I-2 that are not “hospital grade” shall be replaced with “hospital grade” receptacles, as required by NFPA 99 and Article 517 of NFPA 70.~~

406.1.4 Healthcare facilities. Portions of electrical systems being repaired in Group I-2, ambulatory care facilities and outpatient clinics shall comply with NFPA 99 requirements for repairs.

Add new text as follows:

408.3 Healthcare facilities. Portions of Medical Gas systems being repaired in Group I-2, ambulatory care facilities and outpatient clinics shall comply with NFPA 99 requirements for repairs.

Reason: NFPA 99 specifies broader requirements for electrical systems in existing buildings beyond just hospital grade receptacles in bed locations. This includes requirements tamperproof receptacles in pediatrics, and additional requirements for surgery. NFPA 99 defines requirements for existing facilities. In order to meet federal conditions of participation health care facilities must comply with the electrical systems and equipment and medical gas systems must be installed according to the requirements listed in NFPA 99, Health Care Facilities Code (K912, and K917). This change will align the electrical and medical gas (K909 and K910) systems installation requirements for Outpatient Clinics, Group B Ambulatory Care and Group I-2 facilities. NFPA 99 defines when repairs are made to these systems requirement for component replacement, means and methods of repairs and safety requirements.

NFPA 99 uses a risk based approach to system design, installation and maintenance in healthcare facilities (Group I-2 facilities, ambulatory care facilities and outpatient clinics). Four levels of systems categories are defined in NFPA 99, based on the risks to patients and caregivers in the facilities. The categories are as follows:

- (1) Category 1: Systems that are expected to be functional at all times. Failure of these systems is likely to cause major injury or death.
- (2) Category 2: Systems are expected to have a high level of reliability. Failures of these systems are likely to cause minor injury to patients or caregivers, however, limited short durations of equipment downtime can be tolerated. Category 2 systems are not critical for life support.
- (3) Category 3: Normal building system reliabilities are expected. Such systems support patient needs, but failure of such equipment or systems would not immediately affect patient care and are not critical for life support.
- (4) Category 4: Such systems have no impact on patient care and would not be noticeable to patients in the event of failure.

The category definitions apply to equipment and systems operations.

A risk assessment should be conducted to evaluate the risk to the patients, staff, and visitors in all healthcare facilities. These categories are not always aligned to occupancy classification. Potential examples of areas/systems and their categories of risk;

- (1) Ambulatory surgical center, where patients undergo general anesthesia, Category 1
- (2) Reconstructive surgeon's office with general anesthesia, Category 1
- (3) Procedural sedation site for outpatient services, Category 2
- (4) Cooling systems in Houston, TX, Category 2
- (5) Cooling systems in Seattle, WA, Category 3
- (6) Heating systems in Chicago, IL Category 2
- (7) Dental office, no general anesthesia, Category 3
- (8) Typical doctor's office/exam room, Category 4
- (9) Group I-2 Condition 2 facilities most systems would be Category 1

This approach more closely aligns system design, performance and maintenance to the safety risk to the public. It does not create significant additional costs.

This proposal is submitted by the ICC Committee on Healthcare (CHC). The CHC was established by the ICC Board to evaluate and assess contemporary code issues relating to healthcare facilities. This is a joint effort between ICC and the American Society for Healthcare Engineering (ASHE), a subsidiary of the American Hospital Association, to eliminate duplication and conflicts in healthcare regulation. In 2017 and 2018 the CHC held 4 open meetings and numerous conference calls, *which included members of the committees as well as any interested parties, to discuss and debate the proposed changes*. Information on the CHC, including: meeting agendas; minutes; reports; resource documents; presentations; and all other materials developed in conjunction with the CHC effort can be downloaded from the CHC website at: <https://www.iccsafe.org/codes-tech-support/cs/icc-committee-on-healthcare/>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This change aligns with existing federal requirements for the healthcare industry.

Proposal # 4241

EB46-19

EB47-19

IEBC@: 406.1.4 (New), 802.3 (New), 805.4.1.2 (New), 1301.6.4 (New), 1301.6.21 (New), 1301.6.21.1 (New), TABLE 1301.6.21.1 (New), 1301.6.21.1.1 (New), 1301.6.21.2 (New), TABLE 1301.6.21.2 (New), 1301.6.21.2.1 (New), 1301.6.21.3 (New), TABLE 1301.6.21.3 (New), 1301.6.21.3.1 (New), 1301.7 (New), TABLE 1301.7

Proponent: John Williams, representing Healthcare Committee (AHC@iccsafe.org)

2018 International Existing Building Code

Revise as follows:

406.1.4 Group I-2 receptacles. Receptacles in patient-care recipient bed locations of Group I-2 that are not “hospital grade” shall be replaced with “hospital grade” receptacles, as required by NFPA 99 and Article 517 of NFPA 70.

802.3 Smoke compartments. In Group I-2 occupancies where the *work area* is on a story used for sleeping rooms for more than 30 patients care recipients, the story shall be divided into not less than two compartments by smoke barrier walls in accordance with Section 407.5 of the International Building Code as required for new construction.

805.4.1.2 Group I-2. In buildings of Group I-2 occupancy, any patient-care recipient sleeping room or suite of patient-care recipient rooms greater than 1,000 square feet (93 m²) within the *work area* shall have not fewer than two egress doorways.

1301.6.4 Tenant and dwelling unit separations. Evaluate the fire-resistance rating of floors and walls separating tenants, including dwelling units, and not evaluated under Sections 1301.6.3 and 1301.6.5. Group I-2 occupancies shall evaluate the rating of the separations between patient-care recipient sleeping rooms.

Under the categories and occupancies in Table 1301.6.4, determine the appropriate value and enter that value in Table 1301.7 under Safety Parameter 1301.6.4, Tenant and Dwelling Unit Separation, for fire safety, means of egress, and general safety.

1301.6.21 Patient-Care recipient ability, concentration, smoke compartment location and ratio to attendant. In I-2 occupancies, the ability of patients care recipients, their concentration and ratio to attendants shall be evaluated and applied in accordance with this section. Evaluate each smoke compartment using the categories in Sections 1301.6.21.1, 1301.6.21.2 and 1301.6.21.3 and enter the value in Table ~~1301.7~~-1301.7. To determine the safety factor, multiply the three values together; if the sum is 9 or greater, compliance has failed.

1301.6.21.1 Patient-Care recipient ability for self-preservation. Evaluate the ability of the patients-care recipients for self-preservation in each smoke compartment in an emergency. Under the categories and occupancies in Table 1301.6.21.1, determine the appropriate value and enter that value in Table 1301.7 under Safety Parameter 1301.6.21.1, Patient-Care recipient Ability for Self-preservation, for means of egress and general safety.

TABLE 1301.6.21.1
PATIENT-CARE RECIPIENT ABILITY VALUES

OCCUPANCY	CATEGORIES		
	a	b	c
I-2	1	2	3

1301.6.21.1.1 Categories. The categories for patient-care recipient ability for self-preservation are:

1. Category a—(mobile) Patients-Care recipients are capable of self-preservation without assistance.
2. Category b—(not mobile) Patients-Care recipients rely on assistance for evacuation or relocation.
3. Category c—(not movable) Patients-Care recipients cannot be evacuated or relocated.

1301.6.21.2 Patient-Care recipient concentration. Evaluate the concentration of patients in each smoke compartment under Section 1301.6.21.2. Under the categories and occupancies in Table 1301.6.21.2 determine the appropriate value and enter that value in Table 1301.7 under Safety Parameter 1301.6.21.2, Patient-Care Recipient Concentration, for means of egress and general safety.

TABLE 1301.6.21.2
PATIENT-CARE RECIPIENT CONCENTRATION VALUES

OCCUPANCY	CATEGORIES		
	a	b	c
I-2	1	2	3

1301.6.21.2.1 Categories: The categories for patient-care recipient concentration are:

1. Category a—smoke compartment has 1 to 10 ~~patients-~~ care recipients.
2. Category b—smoke compartment has more than 10 to 40 ~~patients-~~ care recipients.
3. Category c—smoke compartment has more than 40 ~~patients-~~ care recipients.

1301.6.21.3 ~~Attendant-to-patient~~ Attendant-to-care recipient ratio. Evaluate the ~~attendant-to-patient~~ attendant-to-care recipient ratio for each compartment under Section 1301.6.21.3. Under the categories and occupancies in Table 1301.6.21.3 determine the appropriate value and enter that value in Table 1301.7 under Safety Parameter 1301.6.21.3, ~~Attendant-to-patient~~ Attendant-to-care recipient Ratio, for means of egress and general safety.

**TABLE 1301.6.21.3
ATTENDANT-TO-PATIENT ~~ATTENDANT-TO-CARE~~ RECIPIENT RATIO VALUES**

OCCUPANCY	CATEGORIES		
	a	b	c
I-2	1	2	3

1301.6.21.3.1 Categories. The categories for attendant-to-patient concentrations are:

1. Category a ~~attendant-to-patient a~~ attendant-to-care recipient concentration is 1:5.
2. Category b ~~attendant-to-patient b~~ attendant-to-care recipient concentration is 1:6 to 1:10.
3. Category c ~~attendant-to-patient c~~ attendant-to-care recipient concentration is greater than 1:10 or no patients.

1301.7 Building score. After determining the appropriate data from Section 1301.6, enter those data in Table 1301.7 and total the building score.

**TABLE 1301.7
SUMMARY SHEET—BUILDING CODE**

Existing occupancy: _____		Proposed occupancy: _____	
Year building was constructed: _____		Number of stories: _____ Height in feet: _____	
Type of construction: _____		Area per floor: _____	
Percentage of open perimeter increase: _____ %			
Completely suppressed:		Corridor wall rating: _____	
Yes _____ No _____		Type: _____	
Compartmentation:		Required door closers:	
Yes _____ No _____ _____		Yes _____ No _____	
Fire-resistance rating of vertical opening enclosures: _____			
Type of HVAC system: _____, serving number of floors: _____			
Automatic fire detection:		Type and location: _____	
Yes _____ No _____		Type: _____	
Fire alarm system:		Type: _____	
Yes _____ No _____		Type: _____	
Smoke control:		Type: _____	
Yes _____ No _____		Type: _____	
Adequate exit routes:		Dead ends: _____	
Yes _____ No _____		Yes _____ No _____	
Maximum exit access travel distance: _____		Elevator controls: _____	
Yes _____ No _____ _____		Yes _____ No _____	
Means of egress emergency lighting:		Mixed occupancies: _____	
Yes _____ No _____ _____		Yes _____ No _____	
Standpipes:		Patient C are recipient ability for self-preservation: _____	
Yes _____ No _____ _____		_____	
Incidental use:		Patient C are recipient concentration: _____	
Yes _____ No _____ _____		_____	
Smoke compartmentation less than 22,500 sq. feet (2092 m ²):		Attendant-to- patient <u>care recipient</u> ratio: _____	
Yes _____ No _____ _____		_____	

SAFETY PARAMETERS	FIRE SAFETY (FS)	MEANS OF EGRESS (ME)	GENERAL SAFETY (GS)
1301.6.1 Building height			
1301.6.2 Building area			
1301.6.3 Compartmentation			
1301.6.4 Tenant and dwelling unit separations			
1301.6.5 Corridor walls			
1301.6.6 Vertical openings			
1301.6.7 HVAC systems			
1301.6.8 Automatic fire detection			
1301.6.9 Fire alarm system			
1301.6.10 Smoke control	****		
1301.6.11 Means of egress	****		
1301.6.12 Dead ends	****		
1301.6.13 Maximum exit access travel distance	****		
1301.6.14 Elevator control			
1301.6.15 Means of egress emergency lighting	****		
1301.6.16 Mixed occupancies		****	
1301.6.17 Automatic sprinklers		÷ 2 =	
1301.6.18 Standpipes			
1301.6.19 Incidental use			
1301.6.20 Smoke compartmentation			
1301.6.21.1 Patient <u>C are recipient</u> ability for self-preservation ^a	****		
1301.6.21.2 Patient <u>C are recipient</u> concentration ^a	****		
1301.6.21.3 Attendant-to-patient <u>c are recipient</u> ratio ^a	****		
Building score—total value			

*** *No applicable value to be inserted.

- a. Only applicable to Group I-2 occupancies.

Reason:

The purpose of this proposal is to coordinate the terminology for healthcare in the IBC and IFC with the IEBC. Care recipient is more appropriate when speaking about the persons receiving care in nursing homes and hospitals.

This proposal is submitted by the ICC Committee on Healthcare (CHC). The CHC was established by the ICC Board to evaluate and assess contemporary code issues relating to healthcare facilities. This is a joint effort between ICC and the American Society for Healthcare Engineering (ASHE), a subsidiary of the American Hospital Association, to eliminate duplication and conflicts in healthcare regulation. In 2017 and 2018 the CHC held 4 open meetings and numerous conference calls, *which included members of the committees as well as any interested parties, to discuss and debate the proposed changes*. Information on the CHC, including: meeting agendas; minutes; reports; resource documents; presentations; and all other materials developed in conjunction with the CHC effort can be downloaded from the CHC website at: <https://www.iccsafe.org/codes-tech-support/cs/icc-committee-on-healthcare/>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is editorial.

EB48-19

IEBC@: 501.3 (New), 1301.3.2

Proponent: Eirene Knott, representing Myself (Eirene.Knott@brrarch.com)

2018 International Existing Building Code

Add new text as follows:

501.3 Compliance with other codes In accordance with Section 301.3.1, this provisions of Chapter 11 of the International Fire Code shall also apply to this compliance method.

Revise as follows:

1301.3.2 Compliance with other codes. Buildings that are evaluated in accordance with this section shall comply with Chapter 11 of the International Fire Code and the International Property Maintenance Code .

Reason: While Section 301.3.1 and 1301.3.2 point the user to the IFC for use with the prescriptive and performance compliance methods, most users will assume that all the provisions in the IFC will apply under these methods. If the provisions of Chapter 11 of the IFC can be met, along with the provisions of either Chapter 5 for the prescriptive method or Chapter 13 for the performance method, then the building is compliant. This code change is simply adding pointers to the appropriate sections of the IFC for compliance under the prescriptive method.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This code change is adding language to provide a pointer to the prescriptive provisions of the IFC for existing buildings that is already referenced in Section 301.3.1.

Proposal # 5544

EB48-19

EB49-19

IEBC@: 501.3 (New), SECTION 706 (New), 706.1 (New), 807.3 (New), 809.2 (New)

Proponent: John Williams, representing Healthcare Committee (AHC@iccsafe.org)

2018 International Existing Building Code

Add new text as follows:

501.3 Healthcare facilities. In Group I-2 facilities, ambulatory care facilities and outpatient clinics, any altered or added portion of an existing electrical or medical gas systems shall be required to meet installation and equipment requirements in NFPA 99.

SECTION 706 ELECTRICAL

706.1 Healthcare facilities. In Group I-2 facilities, ambulatory care facilities and outpatient clinics, any altered, portion of an existing electrical systems shall be required to meet installation and equipment requirements in NFPA 99

807.3 Healthcare facilities. In Group I-2 facilities, ambulatory care facilities and outpatient clinics, any added portion of an existing electrical systems shall be required to meet installation and equipment requirements in NFPA 99.

809.2 Healthcare facilities. In Group I-2 facilities, ambulatory care facilities and outpatient clinics, any added portion of an existing medical gas systems shall be required to meet installation and equipment requirements in NFPA 99.

Reason: In order to meet federal conditions of participation health care facilities must comply with the electrical systems and equipment and medical gas systems and equipment must be installed according to the requirements listed in NFPA 99, Health Care Facilities Code (K 323, K901, K902, K903, K904, K905, K909, K910, K913, K915, K916 K923, K925 and K927). This change will align the electrical and medical gas systems installation requirements for Outpatient Clinics, Group B Ambulatory Care and Group I-2 facilities.

NFPA 99 uses a risk based approach to system design, installation and maintenance in healthcare facilities (Group I-2 facilities, ambulatory care facilities and outpatient clinics). Four levels of systems categories are defined in NFPA 99, based on the risks to patients and caregivers in the facilities. The categories are as follows:

- (1) Category 1: Systems that are expected to be functional at all times. Failure of these systems is likely to cause major injury or death.
- (2) Category 2: Systems are expected to have a high level of reliability. Failures of these systems are likely to cause minor injury to patients or caregivers, however, limited short durations of equipment downtime can be tolerated. Category 2 systems are not critical for life support.
- (3) Category 3: Normal building system reliabilities are expected. Such systems support patient needs, but failure of such equipment or systems would not immediately affect patient care and are not critical for life support.
- (4) Category 4: Such systems have no impact on patient care and would not be noticeable to patients in the event of failure.

The category definitions apply to equipment and systems operations.

A risk assessment should be conducted to evaluate the risk to the patients, staff, and visitors in all healthcare facilities. These categories are not always aligned to occupancy classification. Potential examples of areas/systems and their categories of risk;

- (1) Ambulatory surgical center, where patients undergo general anesthesia, Category 1
- (2) Reconstructive surgeon's office with general anesthesia, Category 1
- (3) Procedural sedation site for outpatient services, Category 2
- (4) Cooling systems in Houston, TX, Category 2
- (5) Cooling systems in Seattle, WA, Category 3
- (6) Heating systems in Chicago, IL Category 2
- (7) Dental office, no general anesthesia, Category 3
- (8) Typical doctor's office/exam room, Category 4

(9) Group I-2 Condition 2 facilities most systems would be Category 1

This approach more closely aligns system design, performance and maintenance to the safety risk to the public. It does not create significant additional costs.

This proposal is submitted by the ICC Committee on Healthcare (CHC). The CHC was established by the ICC Board to evaluate and assess contemporary code issues relating to healthcare facilities. This is a joint effort between ICC and the American Society for Healthcare Engineering (ASHE), a subsidiary of the American Hospital Association, to eliminate duplication and conflicts in healthcare regulation. In 2017 and 2018 the CHC held 4 open meetings and numerous conference calls, *which included members of the committees as well as any interested parties, to discuss and debate the proposed changes*. Information on the CHC, including: meeting agendas; minutes; reports; resource documents; presentations; and all other materials developed in conjunction with the CHC effort can be downloaded from the CHC website at: <https://www.iccsafe.org/codes-tech-support/cs/icc-committee-on-healthcare/>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This change aligns with existing federal requirements for the healthcare industry.

Proposal # 4240

EB49-19

EB50-19

IEBC@: SECTION 502 (New), 502.1 (New), 502.2 (New), SECTION 602 (New), 602.1 (New), 602.2 (New), 1301.2.5 (New)

Proponent: Eirene Knott, representing Metropolitan Kansas City Chapter of the ICC (Eirene.Knott@brrarch.com)

2018 International Existing Building Code

Add new text as follows:

SECTION 502 Repairs

502.1 Scope. Repairs, as defined by Chapter 2, include the patching or restoration or replacement of damaged materials, elements, equipment or fixtures for the purpose of maintaining such components in good or sound condition with respect to existing loads or performance requirements.

502.2 Application. Repairs shall comply with the provisions of Chapter 4.

SECTION 602 Repairs

602.1 Scope. Repairs, as defined by Chapter 2, include the patching or restoration or replacement of damaged materials, elements, equipment or fixtures for the purpose of maintaining such components in good or sound condition with respect to existing loads or performance requirements.

602.2 Application. Repairs shall comply with the provisions of Chapter 4.

1301.2.5 Repairs. Repairs shall comply with the provisions of Chapter 4.

Reason: With the 2018 IEBC providing a stand alone chapter specific to repairs, some of the pointers that previously existed appear to have been lost. This code change is providing pointers for all three compliance methods to Chapter 4 for how repairs are to be provided.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. There is no cost impact with this code change as it is only adding text for clarification purposes.

Proposal # 4025

EB50-19

EB51-19

IIBC: 502.9 (New), 503.17 (New), 506.5 (New), 904.3 (New), 1011.4 (New), 1101.4 (New)

Proponent: Dawn Anderson, representing self (gonedawning@yahoo.com); Gene Boecker, representing Code Consultants, Inc. (geneb@codeconsultants.com); Dan Buuck, representing National Association of Home Builders (dbuuck@nahb.org); David Collins, representing the American Institute of Architects (dcollins@preview-group.com); Marsha Mazz, representing United Spinal Association (m.mazz@verizon.net)

2018 International Existing Building Code

SECTION 502 ADDITIONS

502.8 Additions to Group E facilities. For *additions* to Group E occupancies, storm shelters shall be provided in accordance with Section 1106.1.

Add new text as follows:

502.9 Enhanced classroom acoustics. In Group E occupancies, enhanced classroom acoustics shall be provided in all classrooms in the addition with a volume of 20,000 cubic feet (565 m³) or less. Enhanced classroom acoustics shall comply with the reverberation time in Section 808 of ICC A117.1.

SECTION 503 ALTERATIONS

503.17 Enhanced classroom acoustics. In Group E occupancies, where the *work area* exceeds 50 percent of the building area, enhanced classroom acoustics shall be provided in all classrooms with a volume of 20,000 cubic feet (565 m³) or less. Enhanced classroom acoustics shall comply with the reverberation time in Section 808 of ICC A117.1.

SECTION 506 CHANGE OF OCCUPANCY

506.5 Enhanced classroom acoustics. In Group E occupancies, where the *work area* exceeds 50 percent of the building area, enhanced classroom acoustics shall be provided in all classrooms with a volume of 20,000 cubic feet (565 m³) or less. Enhanced classroom acoustics shall comply with the reverberation time in Section 808 of ICC A117.1.

SECTION 903 BUILDING ELEMENTS AND MATERIALS

903.4 Enhanced classroom acoustics. In Group E occupancies, where the *work area* is a Level 3 alteration, enhanced classroom acoustics shall be provided in all classrooms with a volume of 20,000 cubic feet (565 m³) or less. Enhanced classroom acoustics shall comply with the reverberation time in Section 808 of ICC A117.1.

SECTION 1011 CHANGE OF OCCUPANCY CLASSIFICATION

1011.3 Interior finish. In areas of the building undergoing the *change of occupancy* classification, the interior finish of walls and ceilings shall comply with the requirements of the International Building Code for the new occupancy classification.

1011.4 Enhanced classroom acoustics. In Group E occupancies, where the *work area* is a Level 3 alteration, enhanced classroom acoustics shall be provided in all classrooms with a volume of 20,000 cubic feet (565 m³) or less. Enhanced classroom acoustics shall comply with the reverberation time in Section 808 of ICC A117.1.

SECTION 1101 GENERAL

1101.3 Other work. Any *repair* or *alteration* work within an *existing building* to which an *addition* is being made shall comply with the applicable requirements for the work as classified in Chapter 6.

1101.4 Enhanced classroom acoustics. In Group E occupancies, enhanced classroom acoustics shall be provided in all classrooms in the addition with a volume of 20,000 cubic feet (565 m³) or less. Enhanced classroom acoustics shall comply with the reverberation time in Section 808 of ICC A117.1.

Reason: This proposal sets up a new section in the Chapter for Interior Environments; next to the section for sound transmission in residential occupancies. This section is proposed here and not in Chapter 11 because of the benefits of these provisions for all young children – thus following

the codes history of mainstreaming' requirements that may be related to accessibility, but apply broadly.

Research shows that good classroom acoustics are essential to support language acquisition and learning for all children, particularly younger children. For children who have hearing loss and those who use cochlear implants there is no substitute for a good acoustic environment. Assistive technologies typically only amplify the teacher and do not amplify discussions among children or between the teacher and individual child. Children with disabilities not related to hearing, such as autism and learning disabilities may be adversely affected by high ambient noise levels. Students that use a different language at home will also be able to listen more closely to fully understand the teacher and benefit from conversation among peers. Teachers report that a good acoustic environment actually assists in controlling the classroom, reducing the need to raise their voices, and promotes more civil behavior among students. Thus, good acoustic and low background noise in a classroom benefits everyone!

The standard size elementary classroom in the United States holds 25 to 30 students. Many states specify the minimum size at 700 sq.ft. – assuming 20 children in a room. The recommended size for a self-contained classroom is 800 to 960 sq.ft. for grade school; 700 to 840 sq.ft. for secondary school. Some researchers recommend up to 54 sq.ft. per child as optimum – 1620 sq.ft. for a 30 child classroom. Classrooms that are used for activities such as band, orchestra, choir or gym are significantly larger. Some lecture rooms in colleges are large enough to accommodate several hundred students.

The new technical criteria for classroom acoustics in the 2017 ICC A117.1 are limited to classrooms with a size under 20,000 cubic feet; assuming a 10 foot ceiling height, classrooms that are 2000 sq.ft. or less. While acoustics may be important to these larger classrooms, the criteria in ICC A117.1 Section 808 are intended to be applicable to standard size self-contained classrooms. This criteria are also not intended to apply to ancillary learning spaces, such as individual tutoring spaces, or other spaces where students may be, such as corridors or cafeterias.

Technical criteria includes a maximum reverberation time – achieved through either a performance or prescriptive method. The criteria also considers other sound sources – ambient sound and sound sources inside and outside the classrooms.

Below is the text in the IBC and A117.1 for reference.

2021 IBC

SECTION 1207 ENHANCED CLASSROOM ACOUSTICS

1207.1 General. Enhanced classroom acoustics, where required in this section, shall comply with Section 808 of ICC A117.1.

1207.2 Where required. In Group E occupancies, enhanced classroom acoustics shall be provided in all classrooms with a volume of 20,000 cubic feet or less.

2017 ICC A117.1

SECTION 808

ENHANCED ACOUSTICS FOR CLASSROOMS

808.1 General. Classrooms not exceeding 20,000 cubic feet (565 m³) and required to provide enhanced acoustics shall comply with Section 808.

808.2 Reverberation time. Classroom reverberation times shall comply with either Section 808.2.1 or Section 808.2.2, depending on the size of the room.

808.2.1 Performance method. For each of the octave frequency bands with center frequencies of 500, 1000, and 2000 Hz, the reverberation time (T₆₀) shall not exceed the times specified below:

1. 0.6 seconds in classrooms with volumes up to and including 10,000 cubic feet (285 m³).
2. 0.7 seconds in classrooms with volumes of more than 10,000 cubic feet (285 m³), but less than 20,000 cubic feet (566 m³).

Reverberation times shall apply to fully-furnished, unoccupied classrooms. Reverberation times shall be field verified via measurements over a minimum 20 dB decay in each octave frequency band in accordance with ASTM E2235 listed in Section 106.2.13.

808.2.2 Prescriptive method. The Noise Reduction Coefficient (NRC) ratings for floor, wall and ceiling surface finishes shall conform to the following equations:

For a classroom with a volume less than or equal to 10,000 cubic feet (285 m³):

$(NRC_{Floor} \times SFloor) + (NRC_{Ceiling} \times SCeiling) + (NRC_{Wall} \times SWall) \geq Volume/12$

For a classroom with a volume between 10,000 cubic feet (285 m3) and 20,000 cubic feet (565 m3):

$$(NRC_{Floor} \times S_{Floor}) + (NRC_{Ceiling} \times S_{Ceiling}) + (NRC_{Wall} \times S_{Wall}) = \text{Volume}/14$$

Where:

NRC_{Floor} = NRC rating of the floor finish material

S_{Floor} = floor area in square feet

$NRC_{Ceiling}$ = NRC rating of the ceiling finish material

$S_{Ceiling}$ = ceiling area in square feet

NRC_{Wall} = NRC rating of the wall acoustical treatment

S_{Wall} = wall treatment area in square feet

Volume = room volume in cubic feet

Where a floor, ceiling or wall has multiple surface finishes, the NRC x S product for each surface finish shall be added to the left side of the equation.

808.3 Ambient sound level. Classroom ambient sound levels shall comply with Sections 808.3.1 and 808.3.2. Ambient sound levels from sound sources outside and inside the classroom shall be evaluated individually. The greatest one-hour averaged sound levels shall be evaluated at the loudest usable location in the room at a height of 36 inches (915 mm) to 42 inches (1065 mm) above the floor and no closer than 36 inches (915 mm) from any wall, window or object. The ambient sound level limits shall apply to fully-furnished, unoccupied classrooms, and with only permanent HVAC, electrical and plumbing systems functioning. Classroom equipment, including, but not limited to, computers, printers and fish tank pumps shall be turned off during these measurements.

808.3.1 Sound sources outside of the classroom. Classroom ambient sound levels shall not exceed 35 dBA and 55 dBC due to intruding noise from sound sources outside of the classroom, whether from the exterior or from other interior spaces.

808.3.2 Sound sources inside the classroom. Classroom ambient sound levels shall not exceed 35 dBA and 55 dBC for noise from sound sources inside the classroom.

Cost Impact: The code change proposal will increase the cost of construction

There will be acoustic requirements for classrooms, but not all spaces in new schools. Since this encompasses such a broad range of options to comply, the cost may be limited by design choices.

Proposal # 4404

EB51-19

EB52-19

IEBC: 502.7, SECTION 1105, 1105.1, 503.15, 804.1

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Existing Building Code

Revise as follows:

SECTION 502 ADDITIONS

502.7 Carbon monoxide ~~alarms~~ detection in existing portions of a building. Where an *addition* is made to a building or structure of Group I-1, I-2, I-4 or R occupancy and in classrooms in Group E occupancies, the existing building shall be provided with carbon monoxide ~~alarms~~ detection in accordance with Section 1103.9 of the International Fire Code or Section R315 of the International Residential Code, as applicable.

Exceptions:

1. ~~Work involving the exterior surfaces of buildings, such as the replacement of roofing or siding, the addition or replacement of windows or doors, or the addition of porches or decks.~~
2. ~~Installation, alteration or *repairs* of plumbing or mechanical systems, other than fuel-burning appliances.~~

11 ADDITIONS

SECTION 1105 CARBON MONOXIDE ALARMS IN GROUPS I-1, I-2, I-4 AND R DETECTION

1105.1 Carbon monoxide ~~alarms~~ detection in existing portions of a building. Where an *addition* is made to a building or structure of a Group I-1, I-2, I-4 or R occupancy and in classrooms of Group E occupancies, the *existing building* shall be equipped with carbon monoxide ~~alarms~~ detection in accordance with Section 1103.9 of the International Fire Code or Section R315 of the International Residential Code, as applicable.

SECTION 503 ALTERATIONS

503.15 Carbon monoxide ~~alarms~~ detection. ~~Carbon monoxide alarms shall be provided to protect sleeping units and dwelling units. Any work area in Group I-1, I-2, I-4 and R occupancies, and classrooms in Group E occupancies shall be equipped with carbon monoxide detection in~~ accordance with Section 1103.9 of the International Fire Code.

Exceptions:

1. Work involving the exterior surfaces of buildings, such as the replacement of roofing or siding, the addition or replacement of windows or doors, or the addition of porches or decks.
2. Installation, alteration or *repairs* of plumbing or mechanical systems, other than fuel-burning appliances.

8 ALTERATIONS—LEVEL 2

SECTION 804 CARBON MONOXIDE DETECTION

804.1 Carbon monoxide ~~alarms~~ detection. Any work area in Group I-1, I-2, I-4 and R occupancies, and classrooms in Group E occupancies shall be equipped with carbon monoxide ~~alarms~~ detection in accordance with Section 1103.9 of the International Fire Code.

Exceptions:

1. Work involving the exterior surfaces of buildings, such as the replacement of roofing or siding, the addition or replacement of windows or doors, or the addition of porches or decks.
2. Installation, alteration or *repairs* of plumbing or mechanical systems, other than fuel-burning appliances.

Reason: Section 502.7 and 1105.1 deal with additions, and Section 503.15 and 804.1 deal with alterations.

The intent of this proposal is correlation between the IEBC and the IFC. This proposal accomplishes two things. First it correlates the occupancies in which carbon monoxide detection is required in IFC Sections 915 and 1103.9, which essentially adds classrooms in Group E occupancies.

Second, it changes references from “carbon monoxide alarms” to “carbon monoxide detection”. This change in terminology will not preclude carbon monoxide alarms from being provided in applications for which they are listed, but better reflects terminology used in the IFC.

The exceptions are proposed to be deleted from the additions section of the prescriptive method rather than added additions chapter in the work area method since the exceptions are not needed for additions.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will increase the cost of construction

The increased cost will be for providing carbon monoxide detection when classrooms in Group E occupancies are covered by these code sections.

Proposal # 4307

EB52-19

EB53-19

IEBC@: (New), [BS] 503.3

Proponent: Michael Fillion, representing National Council of Structural Engineers Association (mrf.structure@verizon.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Add new definition as follows:

[BS] ROOF COVERING. The covering applied to the roofdeck for weather resistance, fire classification or appearance.

Revise as follows:

[BS] 503.3 Existing structural elements carrying gravity load. Any existing gravity load-carrying structural element for which an *alteration* causes an increase in design dead, live or snow load, including snow drift effects, of more than 5 percent shall be replaced or altered as needed to carry the gravity loads required by the International Building Code for new structures. Any existing gravity load-carrying structural element whose gravity load-carrying capacity is decreased as part of the *alteration* shall be shown to have the capacity to resist the applicable design dead, live and snow loads including snow drift effects required by the International Building Code for new structures.

Exceptions:

1. Buildings of Group R occupancy with not more than five dwelling or sleeping units used solely for residential purposes where the altered building complies with the conventional light-frame construction methods of the International Building Code or the provisions of the International Residential Code.
2. Buildings in which the increased dead load is due entirely to the addition of a second layer of roof covering weighing 3 pounds per square foot (0.1437 kN/m²) or less over an existing single layer of roof covering. This exception shall not apply where insulation is added to the roof assembly.

Reason: In many re-roofing projects, insulation and membrane are placed over an existing roof covering. The weight of the insulation and membrane are usually less than 3 pounds per square foot (0.1437 kN/m².) It has been our observation that some design professionals and building officials are using this exception when insulation is added with the new second layer of roof covering. Addition of insulation increases the thermal resistance (R-value) resulting in a higher Thermal Factor, Ct, which will increase the design roof snow load. Because of this oversight in some instances, we feel it is important to include the IBC roof covering definition and to make it clear that adding insulation is not included in Exception #2.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The intent of this code change proposal is for clarification

Proposal # 5333

EB53-19

EB54-19

IEBC@: [BS] 503.4

Proponent: Ali Fattah, City of San Diego, representing City of San Diego (afattah@sandiego.gov)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Revise as follows:

[BS] 503.4 Existing structural elements carrying lateral load. Except as permitted by Section 503.13, where the *alteration* increases design lateral loads, results in a prohibited structural irregularity as defined in ASCE 7, or decreases the capacity of any existing lateral load-carrying structural element, the structure of the altered building or structure shall meet the requirements of Sections 1609 and 1613 of the International Building Code. Reduced seismic forces shall be permitted.

Exception:

1. Any existing lateral load-carrying structural element whose demand-capacity ratio with the *alteration* considered is not more than 10 percent greater than its demand-capacity ratio with the *alteration* ignored shall be permitted to remain unaltered. For purposes of calculating demand-capacity ratios, the demand shall consider applicable load combinations with design lateral loads or forces in accordance with Sections 1609 and 1613 of the International Building Code. Reduced seismic forces shall be permitted. For purposes of this exception, comparisons of demand-capacity ratios and calculation of design lateral loads, forces and capacities shall account for the cumulative effects of *additions* and *alterations* since original construction.
2. Buildings in which the increase in the demand capacity ratio is due entirely to the addition of roof top supported mechanical equipment individually having an operating weight less than 400 lb and when the total additional weight of all roof top equipment placed after initial construction of the building is less than 10% of the roof design dead load. For purposes of this exception roof shall mean the roof level above a particular story.
3. Replacement of rooftop mechanical equipment where the new equipment has an operating weight equal to or less that the existing equipment to be replaced.

Reason: Building owners and tenants frequently add or replace roof top mechanical equipment as a part of interior tenant improvement work. Most projects only consider the gravity load effects and ignore contributions to roof dead load and as a result increases to the seismic weight that needs to be resisted by the seismic force resisting system. Additionally, engineers performing the structural design for new buildings determine the total accumulated operating weight of roof top equipment and divide the load by the area of the roof and add the weight in psf to the seismic dead weight. As a consequence, new building designs do not account for localized impacts of roof top equipment. This code change merely codifies current practice. ASCE 7 does not require that anchorage and bracing be determined for supported equipment having a weight of 400 lb or less. Most building departments I polled and review staff indicated that the vast majority of engineers focus merely on support and anchorage and typically do so after the first review cycle since only mechanical plans are provided.

Cost Impact: The code change proposal will decrease the cost of construction

The proposal seeks to limit the need for structural analysis of the lateral force resisting system, and to limit the need for a structural upgrade due to the possible increase in seismic forces and thus the demand capacity ratio, to cases where there is a need to add significantly heavy equipment such as a building maintenance equipment (BMU) to wash and replace windows on a high rise or heavy cooling towers. Currently there is not consistency of enforcement where engineers make a judgement call to not verify compliance and often times the building official only reviews support and anchorage for example on a wood retail building or a concrete tilt-up building.

Proposal # 5198

EB54-19

EB55-19

IEBC@: 202 (New), [BS] 503.3

Proponent: Joseph H. Cain, Solar Energy Industries Association (SEIA), representing Solar Energy Industries Association (SEIA)
(JoeCainPE@gmail.com)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Add new definition as follows:

PHOTOVOLTAIC PANEL SYSTEM. A system that incorporates discrete *photovoltaic panels*, that converts solar radiation into electricity, including rack support systems.

Revise as follows:

[BS] 503.3 Existing structural elements carrying gravity load. Any existing gravity load-carrying structural element for which an *alteration* causes an increase in design dead, live or snow load, including snow drift effects, of more than 5 percent shall be replaced or altered as needed to carry the gravity loads required by the International Building Code for new structures. Any existing gravity load-carrying structural element whose gravity load-carrying capacity is decreased as part of the *alteration* shall be shown to have the capacity to resist the applicable design dead, live and snow loads including snow drift effects required by the International Building Code for new structures.

Exceptions:

1. Buildings of Group R occupancy with not more than five dwelling or sleeping units used solely for residential purposes where the altered building complies with the conventional light-frame construction methods of the International Building Code or the provisions of the International Residential Code.
2. Buildings in which the increased dead load is due entirely to the addition of a second layer of roof covering weighing 3 pounds per square foot (0.1437 kN/m²) or less over an existing single layer of roof covering.
3. Buildings in which the increased dead load is due entirely to the addition of a photovoltaic panel system weighing 4 pounds per square foot (0.1916 kN/m²) or less over an existing single layer of roof covering.

Reason: Building codes commonly allow a second layer of roof covering such as composition shingle to be installed over a first layer of roof covering, without any structural analysis. Residential PV systems on high-slope roofs typically have a unit weight approximately the same as a second layer of roof covering.

The added definition of *photovoltaic panel system* is the same as found in the IBC.

Cost Impact: The code change proposal will decrease the cost of construction

By providing exemption from structural engineering analysis for simple cases, this proposal will decrease the soft cost of some renewable energy systems.

Proposal # 5501

EB55-19

EB56-19

IEBC@: (New), [BS] 503.4

Proponent: Ali Fattah, City of San Diego, representing City of San Diego (afattah@sandiego.gov)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Add new definition as follows:

[BS] PHOTOVOLTAIC PANEL SYSTEM. A system that incorporates discrete photovoltaic panels, that converts solar radiation into electricity, including rack support systems.

Revise as follows:

[BS] 503.4 Existing structural elements carrying lateral load. Except as permitted by Section 503.13, where the *alteration* increases design lateral loads, results in a prohibited structural irregularity as defined in ASCE 7, or decreases the capacity of any existing lateral load-carrying structural element, the structure of the altered building or structure shall meet the requirements of Sections 1609 and 1613 of the International Building Code. Reduced seismic forces shall be permitted.

Exception:

1. Any existing lateral load-carrying structural element whose demand-capacity ratio with the *alteration* considered is not more than 10 percent greater than its demand-capacity ratio with the *alteration* ignored shall be permitted to remain unaltered. For purposes of calculating demand-capacity ratios, the demand shall consider applicable load combinations with design lateral loads or forces in accordance with Sections 1609 and 1613 of the International Building Code. Reduced seismic forces shall be permitted. For purposes of this exception, comparisons of demand-capacity ratios and calculation of design lateral loads, forces and capacities shall account for the cumulative effects of *additions* and *alterations* since original construction.
2. The installation of rooftop photovoltaic panel systems where the additional roof dead load due to the system, including ballast where applicable, does not exceed 5 psf and 10% of the dead load of the existing roof. For purposes of this exception roof shall mean the common roof above a common story.

Reason: The IEBC includes a needed exception to exempt existing buildings undergoing alterations from compliance with more current seismic requirements in IBC chapter 16. The existing exception uses demand/capacity ratios (DCR) to identify a threshold below which the alteration is not deemed to be significant enough to require an evaluation and possible upgrade of the existing lateral force resisting system. Demand equates to the load applied to the lateral force resisting system and capacity equates the strength of the lateral force resisting system to resist the lateral load. Demand can be impacted by an increase in gravity load, an alternation that redirects load to existing elements in addition to the loads they resist prior to the alteration (such as for example force transfer around and due to a large floor/roof opening). The capacity of existing lateral force resisting elements can be impacted by alterations that cut into the elements such as for example reducing the length of a shearwall. Roof top solar photovoltaic systems, and especially those with ballast, may increase the demand capacity ratio of lateral force resisting systems due to the location of the installation relative to the existing lines of resistance below the roof. For example a building that includes lateral force resisting systems at the interior of the building in addition to those at the exterior may cause an increased DCR at the interior shearwalls due additional tributary loads. As a consequence and without the proposed code change the installation of a rooftop solar system would require that a qualified engineer identify the existing lateral force resisting system (possibly without plans), determine its capacity and determine the demand and thus demonstrate that the DCR increase is not increased by more than 10%.

This requirement imposes a significant burden on buildings constructed with light framed wood construction since unlike other buildings they do not incorporate heavier concrete or steel floors and roofs or heavier concrete or masonry exterior walls. Heavier walls and roofs will allow the roof top installations to easily satisfy the DCR limit.

While unlike Section 503.3 exception 2 where 3 psf is used this code change uses 5 psf as a load threshold to allow for small-ballasted systems to benefit from proposed exception 2. There is no published data demonstrating that alterations involving the installation of rooftop solar photovoltaic caused a life-safety hazard due to a seismic event. It would be difficult to explain to a building owner that the installation of a rooftop solar system necessitates \$2,000 or more in engineering costs and possible upgrades to the lateral force resisting system. ASCE 7 as well as the IBC recognizes that solar voltaic systems are unique and allow seismic force resistance through friction and allow discounting of the roof live load under the rack-mounted assemblies. This proposed code change offers a similar and reasonable accommodation to light weight components that are hand carried on to a roof and which occupy a portion of the roof.

Cost Impact: The code change proposal will decrease the cost of construction

The proposed code change may eliminate the need to develop detailed structural plans to demonstrate the capacity of the existing lateral force resisting system as well as lateral force resisting system upgrades.

Proposal # 5199

EB57-19

IEBC@: [BS] 503.12, [BS] 706.3.2

Proponent: Michael Fillion, representing National Council of Structural Engineers Associations (mrf.structure@verizon.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Revise as follows:

[BS] 503.12 Roof diaphragms resisting wind loads in high-wind regions. Where the intended *alteration* requires a permit for reroofing and involves removal of roofing materials from more than 50 percent of the roof diaphragm of a building or section of a building located where the ultimate design wind speed is greater than 115 mph (51 m/s) in accordance with Figure 1609.3(1) of the International Building Code or in a special wind region as defined in Section 1609 of the International Building Code, roof diaphragms, connections of the roof diaphragm to roof framing members, and roof-to-wall connections shall be evaluated for the wind loads specified in Section 1609 of the International Building Code, including wind uplift. If the diaphragms and connections in their current condition are not capable of resisting 75 percent of those wind loads, they shall be replaced or strengthened in accordance with the loads specified in Section 1609 of the International Building Code.

Exception: Buildings that have been demonstrated to comply with the wind load provisions in ASCE 7-88 or later editions up to and including ASCE 7-2016.

[BS] 706.3.2 Roof diaphragms resisting wind loads in high-wind regions. Where roofing materials are removed from more than 50 percent of the roof diaphragm or section of a building located where the ultimate design wind speed, *Vult*, determined in accordance with Figure 1609.3(1) of the International Building Code, is greater than 115 mph (51 m/s) or in a special wind region, as defined in Section 1609 of the International Building Code, roof diaphragms, connections of the roof diaphragm to roof framing members, and roof-to-wall connections shall be evaluated for the wind loads specified in the International Building Code, including wind uplift. If the diaphragms and connections in their current condition are not capable of resisting 75 percent of those wind loads, they shall be replaced or strengthened in accordance with the loads specified in the International Building Code.

Exception: Buildings that have been demonstrated to comply with the wind load provisions in ASCE 7-88 or later editions up to and including ASCE 7-2016.

Reason: Provides an exception for buildings that are known to have been designed to comply with, or buildings in which the roof diaphragms can be demonstrated to resist, comprehensive design wind load provisions.

As currently written, this section of the code applies equally to the reroofing of all buildings that meet the reroofing percentages and the location triggers, regardless of when the buildings were constructed.

The proposal adds an exception wherein buildings are exempt from the provision when it is known to comply with, or can be demonstrated to comply with, the comprehensive design wind load provisions that have been included in ASCE 7 since 1988.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Proposal will reduce the number of instances of when building diaphragms need to have an engineering evaluation done.

Staff Analysis: Note that the 1988 through 1995 editions are referenced in various years of the legacy codes (pre I-codes), and the 1988 through the 2016 are referenced in various years of the I-codes.

Proposal # 5555

EB57-19

EB58-19

IEBC@: [BS] 503.12, [BS] 706.3.2

Proponent: Michael Fillion, representing National Council of Structural Engineers Associations (mrf.structure@verizon.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Revise as follows:

[BS] 503.12 Roof diaphragms resisting wind loads in high-wind regions. Where the intended *alteration* requires a permit for reroofing and involves removal of roofing materials from more than 50 percent of the roof diaphragm of a building or section of a building located where the ultimate design wind speed is greater than ~~115-130~~ 130 mph (~~51-58~~ 58 m/s) in accordance with Figure 1609.3(1) of the International Building Code ~~or, and is in a special wind hurricane-prone region as defined in Section 1609-202~~ of the International Building Code, roof diaphragms, connections of the roof diaphragm to roof framing members, and roof-to-wall connections shall be evaluated for the wind loads specified in Section 1609 of the International Building Code, including wind uplift. If the diaphragms and connections in their current condition are not capable of resisting 75 percent of those wind loads, they shall be replaced or strengthened in accordance with the loads specified in Section 1609 of the International Building Code.

[BS] 706.3.2 Roof diaphragms resisting wind loads in high-wind regions. Where roofing materials are removed from more than 50 percent of the roof diaphragm or section of a building located where the ultimate design wind speed, *Vult*, determined in accordance with Figure 1609.3(1) of the International Building Code, is greater than ~~115-130~~ 130 mph (~~51-58~~ 58 m/s) ~~or and is in a special wind hurricane-prone region, as defined in Section 1609-202~~ of the International Building Code, roof diaphragms, connections of the roof diaphragm to roof framing members, and roof-to-wall connections shall be evaluated for the wind loads specified in the International Building Code, including wind uplift. If the diaphragms and connections in their current condition are not capable of resisting 75 percent of those wind loads, they shall be replaced or strengthened in accordance with the loads specified in the International Building Code.

Reason: What the proposal does: Changes the triggering wind speed to that which reasonably coincides with a value above which past experience indicates there is a substantial risk of diaphragm or uplift damage and/or failures in hurricane-prone regions. Also, deletes locations in special wind regions as a trigger and replaces it with locations in hurricane-prone regions where damage from uplift on roofs is a known problem.

Summary of the current problem and why it's unacceptable: Design wind speeds modestly exceeding 115 mph, regardless of geographical location, are not appropriate triggers because there is no historical data indicating that such wind speeds pose any exceptional risk of building diaphragm damage or failure. Wind speeds in special wind regions can vary widely from something less than 115 mph to something much greater than 115 mph. The way the provision is currently written, a building located in a special wind region where the ultimate design wind speed is less than or equal to 115 mph, i.e., exposed to no exceptional wind demands, would be subject to these requirements. Furthermore, there is no historical evidence indicating that diaphragm deficiencies pose any extraordinary threat outside of hurricane-prone regions. The requirement that a building undergo a diaphragm evaluation, involving a significant investigative and analytical effort by an engineer, must be regarded as an extraordinary burden that is only justifiable on the basis of a commensurately extraordinary hazard. Therefore, that burden should be limited to where there is sufficient evidence that a major threat exists. Tying the trigger to hurricane-prone regions limits the provision's scope to known areas of past vulnerability that are threatened by extraordinary winds.

How the proposal solves it, in concept, and a point by point explanation and rationale for each proposed change: Increases the triggering wind speed to greater than 130 mph, a value that is commensurate with the speed above which glazed openings in new buildings must be protected by means of an impact-protective system or impact-resistant glazing. This speed is deemed reasonable because roofs are more likely to sustain significant damage from uplift where they are subjected to significant positive pressures on one side and negative pressures on the other. This speed is also deemed reasonable because prescriptive requirements for wood framed buildings are not permitted where the design wind speed is greater than 130 mph. Removes an onerous requirement for buildings located in areas where design wind speeds are only moderately greater than 115 mph, and limits the requirements of this section to hurricane-prone regions where there is a history of building failures and/or damage from diaphragm deficiencies.

Cost Impact: The code change proposal will decrease the cost of construction
Proposal will reduce the number of instances when roof diaphragms require evaluation and/or upgrade.

Proposal # 5190

EB58-19

EB59-19

IEBC@: 503.16 (New), 802.3 (New)

Proponent: John Williams, representing Healthcare Committee (AHC@iccsafe.org)

2018 International Existing Building Code

Add new text as follows:

503.16 Smoke compartments. In Group I-2 occupancies where the alteration is on a story used for sleeping rooms for more than 30 care recipients, the story shall be divided into not less than two compartments by smoke barrier walls in accordance with Section 407.5 of the International Building Code as required for new construction.

Revise as follows:

802.3 Smoke compartments. In Group I-2 occupancies where the *work area* is on a story used for sleeping rooms for more than 30 ~~patients care~~ recipients, the story shall be divided into not less than two compartments by smoke barrier walls in accordance with Section 407.5 of the International Building Code as required for new construction.

Reason:

The purpose of this proposal is to provide coordination between the prescriptive method and the work area method for smoke compartments. This is also consistent with the IFC and is required for hospital licensure.

This proposal is submitted by the ICC Committee on Healthcare (CHC). The CHC was established by the ICC Board to evaluate and assess contemporary code issues relating to healthcare facilities. This is a joint effort between ICC and the American Society for Healthcare Engineering (ASHE), a subsidiary of the American Hospital Association, to eliminate duplication and conflicts in healthcare regulation. In 2017 and 2018 the CHC held 4 open meetings and numerous conference calls, *which included members of the committees as well as any interested parties, to discuss and debate the proposed changes*. Information on the CHC, including: meeting agendas; minutes; reports; resource documents; presentations; and all other materials developed in conjunction with the CHC effort can be downloaded from the CHC website at: <https://www.iccsafe.org/codes-tech-support/cs/icc-committee-on-healthcare/>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is a licensure requirement for hospitals and nursing homes.

Proposal # 4256

EB59-19

EB60-19

IEBC@: 503.16 (New), 503.16.1 (New), 503.16.2 (New), 503.16.3 (New), 805.10 (New), 805.10.1 (New), 805.10.1.1 (New), 805.10.1.2 (New), 805.10.1.3 (New), 805.10.2 (New)

Proponent: John Williams, representing Healthcare Committee (AHC@iccsafe.org)

2018 International Existing Building Code

Revise as follows:

503.16 Refuge areas. Where *alterations* affect the configuration of an area utilized as a refuge area, the capacity of the refuge area shall not be reduced below the required capacity of the refuge area for horizontal exits in accordance with Section 1026.4 of the International Building Code. Where the horizontal exit also forms a smoke compartment, the capacity of the refuge area for Group I-1, I-2 and I-3 occupancies and Group B ambulatory care facilities shall not be reduced below that required in Sections 503.16.1 through 503.16.3, 407.5.3, 408.6.2, 420.6.1 and 422.3.2 of the International Building Code as applicable.

Delete without substitution:

~~**503.16.1 Smoke compartments.** In Group I-2 and I-3 occupancies, the required capacity of the refuge areas for smoke compartments in accordance with Sections 407.5.1 and 408.6.2 of the International Building Code shall be maintained.~~

~~**503.16.2 Ambulatory care.** In ambulatory care facilities required to be separated by Section 422.2 of the International Building Code, the required capacity of the refuge areas for smoke compartments in accordance with Section 422.3.2 of the International Building Code shall be maintained.~~

~~**503.16.3 Horizontal exits.** The required capacity of the refuge area for horizontal exits in accordance with Section 1026.4 of the International Building Code shall be maintained.~~

Revise as follows:

805.10 Refuge areas. Where *alterations* affect the configuration of an area utilized as a refuge area, the capacity of the refuge area shall not be reduced below the required capacity of the refuge area for horizontal exits in accordance with Section 1026.4 of the International Building Code. Where the horizontal exit also forms a smoke compartment, the capacity of the refuge area for Group I-1, I-2 and I-3 occupancies and Group B ambulatory care facilities shall not be reduced below that required in Sections 805.10.1 and 805.10.2, 407.5.3, 408.6.2, 420.6.1 and 422.3.2 of the International Building Code as applicable.

Delete without substitution:

~~**805.10.1 Capacity.** The required capacity of refuge areas shall be in accordance with Sections 805.10.1.1 through 805.10.1.3.~~

~~**805.10.1.1 Group I-2.** In Group I-2 occupancies, the required capacity of the refuge areas for smoke compartments in accordance with Section 407.5.1 of the International Building Code shall be maintained.~~

~~**805.10.1.2 Group I-3.** In Group I-3 occupancies, the required capacity of the refuge areas for smoke compartments in accordance with Section 408.6.2 of the International Building Code shall be maintained.~~

~~**805.10.1.3 Ambulatory care.** In ambulatory care facilities required to be separated by Section 422.2 of the International Building Code, the required capacity of the refuge areas for smoke compartments in accordance with Section 422.3.2 of the International Building Code shall be maintained.~~

~~**805.10.2 Horizontal exits.** The required capacity of the refuge area for horizontal exits in accordance with Section 1026.4 of the International Building Code shall be maintained.~~

Reason:

The purpose is to make refuge area capacity requirements consistent across the codes. The current IEBC text does not include the provisions for Group I-1. In looking to add that, it seems better to take the approach in IBC Section 1026 and just provide references.

This proposal is submitted by the ICC Committee on Healthcare (CHC). The CHC was established by the ICC Board to evaluate and assess contemporary code issues relating to healthcare facilities. This is a joint effort between ICC and the American Society for Healthcare Engineering (ASHE), a subsidiary of the American Hospital Association, to eliminate duplication and conflicts in healthcare regulation. In 2017 and 2018 the CHC held 4 open meetings and numerous conference calls, *which included members of the committees as well as any interested parties, to discuss and debate the proposed changes*. Information on the CHC, including: meeting agendas; minutes; reports; resource documents; presentations; and all other materials developed in conjunction with the CHC effort can be downloaded from the CHC website at: <https://www.iccsafe.org/codes-tech-support/cs/icc-committee-on-healthcare/>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is a coordination item.

EB61-19

IEBC: 503.17 (New), 701.3 (New), 702.7 (New), 703.2 (New), 703.3 (New), 703.4 (New), 704.2 (New), 704.3 (New), 802.2.2 (New), 802.3

Proponent: John Williams, representing Healthcare Committee (AHC@iccsafe.org)

2018 International Existing Building Code

SECTION 503 ALTERATIONS

Add new text as follows:

503.17 Group I-2. In Group I-2 occupancies, existing elements within the area undergoing alterations shall comply with Chapter 11 of the International Fire Code.

SECTION 701 GENERAL

Add new text as follows:

701.3 Group I-2. In Group I-2 occupancies, existing elements within the work area shall comply with Chapter 11 of the International Fire Code.

SECTION 702 BUILDING ELEMENTS AND MATERIALS

Add new text as follows:

702.7 Group I-2, Condition 2 location. Existing Group I-2, Condition 2 shall not be located on a floor level higher than the floor level limitation in Table 1105.3 of the International Fire Code based on the type of construction.

SECTION 703 FIRE PROTECTION

Add new text as follows:

703.2 Incidental uses in Group I-2. In Group I-2 occupancies, existing incidental use areas within the work area shall comply with Section 1105.4 of the International Fire Code.

703.3 Corridor construction in Group I-2. In Group I-2 occupancies, existing corridors, including openings, within the work area shall comply with Section 1105.5 of the International Fire Code.

703.4 Waste and linen chutes. In Group I-2 occupancies, existing waste and linen chutes shall comply with Sections 1103.4.9 of the International Fire Code.

SECTION 704 MEANS OF EGRESS

Add new text as follows:

704.2 Means of egress in Group I-2. In Group I-2 occupancies, existing means of egress within the work area shall comply with Sections 1105.1 and 1105.6 of the International Fire Code.

704.3 Group I-2 care suites. Care suites in existing Group I-2, Condition 2 occupancies shall comply with Sections 407.4.4 through 407.4.4.6.2 of the International Building Code.

Revise as follows:

SECTION 802 BUILDING ELEMENTS AND MATERIALS

Add new text as follows:

802.2.2 Group I-2 and I-3 occupancies. In Group I-2 and I-3 occupancies, interior vertical openings connecting two or more stories shall comply with Section 1103.4.1 of the International Fire Code.

Revise as follows:

802.3 Smoke compartments. In Group I-2 occupancies where the *work area* is on a story used for sleeping rooms for more than 30 patients, the story shall be divided into not less than two compartments by smoke barrier walls in accordance with Section 407.5 of the International Building Code as required for new construction. Existing smoke barriers shall comply with Section 1105.7.2 through 1105.7.6 of the International Fire Code.

Reason: The Healthcare committee worked over the last several cycles to match the federal requirements for Medicare reimbursement (K-tags) with the IFC requirements for existing buildings. While this is required for most existing hospitals, not everything is caught during survey. A cross check of these basic requirements during the review of alteration projects would be a useful mechanism to increase compliance. Where there are alterations, there is the opportunity to make sure existing elements within the work area comply. Therefore, the requirements for hospitals in IFC Chapter 11 should be referenced in the IEBC.

The scope of this committee is limited to healthcare, so this proposal does not bring in requirements for uses other than that that are addressed in the IFC Chapter 11.

This proposal is submitted by the ICC Committee on Healthcare (CHC). The CHC was established by the ICC Board to evaluate and assess contemporary code issues relating to healthcare facilities. This is a joint effort between ICC and the American Society for Healthcare Engineering (ASHE), a subsidiary of the American Hospital Association, to eliminate duplication and conflicts in healthcare regulation. In 2017 and 2018 the CHC held 4 open meetings and numerous conference calls, *which included members of the committees as well as any interested parties, to discuss and debate the proposed changes.* Information on the CHC, including: meeting agendas; minutes; reports; resource documents; presentations; and all other materials developed in conjunction with the CHC effort can be downloaded from the CHC website at: <https://www.iccsafe.org/codes-tech-support/cs/icc-committee-on-healthcare/>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. These requirements are bare minimum standards for all existing buildings and would be a requirement whether a facility is performing renovations or not.

Proposal # 4260

EB61-19

EB62-19

IEBC@: 503.17 (New), 704.2 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Existing Building Code

Add new text as follows:

503.17 Locking arrangements in educational occupancies. In Group E occupancies, Group B educational occupancies and Group I-4 occupancies, egress doors with locking arrangements designed to keep intruders from entering the room shall comply with Section 1010.1.4.4 of the International Building Code.

704.2 Locking arrangements in educational occupancies. In Group E occupancies, Group B educational occupancies and Group I-4 occupancies, egress doors with locking arrangements designed to keep intruders from entering the room shall comply with Section 1010.1.4.4 of the International Building Code.

Reason: This proposal is intended to correlate with provisions found with the IBC and IFC and provide the necessary tools so that additional security can be provided for lockdowns without compromising the safety of occupants by delaying egress and rescue by first responders. Code Change proposal E48-18 was recently approved as submitted by the Means of Egress committee and revises the IBC and IFC. This proposal provides consistency on this issue within the I-Codes. Note that this concept was introduced into the IEBC as Proposal EB23-15 and was initially approved as modified but was ultimately disapproved during OGCV. This gap needs to be addressed and this will be consistent with the IFC and IBC. The following text is the approved language to the 2018 IBC and IFC that will be within the 2021 I-Codes (E48-18 AS).

2021 International Building Code and International Fire Code

1010.1.4.4 Locking arrangements in educational occupancies. In Group E occupancies, Group B educational occupancies and Group I-4 occupancies, egress doors from classrooms, offices and other occupied rooms with locking arrangements designed to keep intruders from entering the room shall comply with all of the following conditions :

1. The door shall be capable of being unlocked from outside the room with a key or other approved means.
2. The door shall be openable from within the room in accordance with Section 1010.1.9.
3. Modifications shall not be made to listed panic hardware, fire door hardware or door closers.
4. Modifications to fire door assemblies shall be in accordance with NFPA 80.

Remote locking or unlocking of doors from an approved location shall be permitted in addition to the unlocking operation in Item 1.

2021 International Fire Code Revise as follows

1031.2.2 Locking arrangements in educational occupancies. In Group E occupancies, Group B educational occupancies and Group I-4 occupancies, egress doors with locking arrangements designed to keep intruders from entering the room shall comply with Section 1010.1.4.4.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is a correlation with the requirements that will appear in the 2021 IFC.

Proposal # 4353

EB62-19

EB63-19 Part I

PART I — IEBC: 505.2, 505.3, 505.3.1 (New), 505.4, 702.4, 702.5 , 702.5.1 (New), 701.4;
IRC: R310.2.5, AJ102.4.3, AJ102.4.3.1 (New), AJ102.4.4

PART II — IRC@: **R310.6 (New), R310.2.5 (New), SECTION AJ102 (New), AJ102.4 (New), AJ102.4.3 (New), AJ102.4.3.1 (New), AJ102.4.4 (New)**

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD THE IEBC COMMITTEE, PART II WILL BE HEARD BY THE IRC-BUILDING COMMITTEE. PLEASE SEE THE TENTATIVE HEARING ORDERS FOR THE RESPECTIVE COMMITTEES.

2018 International Existing Building Code

Revise as follows:

5 PRESCRIPTIVE COMPLIANCE METHOD

SECTION 505 WINDOWS AND EMERGENCY ESCAPE OPENINGS

505.1 Replacement glass. The installation or replacement of glass shall be as required for new installations.

505.2 Replacement window ~~Window opening control devices on replacement windows.~~ In Group R-2 or R-3 buildings containing dwelling units, and one- and two-family dwellings and townhouses regulated by the International Residential Code , window opening control devices or fall prevention devices complying with ASTM F2090 shall be installed where an existing window is replaced and where all of the following apply to the replacement window:

1. The window is operable.
2. The window replacement includes replacement of the sash and the frame.
3. One of the following applies:
 - 3.1. In Group R-2 or R-3 buildings containing dwelling units, the ~~top~~ bottom of the ~~sill~~ clear opening of the window opening is at a height less than 36 inches (915 mm) above the finished floor.
 - 3.2. In one- and two-family dwellings and townhouses regulated by the International Residential Code , the ~~top~~ bottom of the ~~sill~~ clear opening of the window opening is at a height less than 24 inches (610 mm) above the finished floor.
4. The window will permit openings that will allow passage of a 4-inch-diameter (102 mm) sphere when the window is in its largest opened position.
5. The vertical distance from the ~~top~~ bottom of the ~~sill~~ clear opening of the window opening to the finished grade or other surface below, on the exterior of the building, is greater than 72 inches (1829 mm).
~~The window opening control device, after operation to release the control device allowing the window to fully open, shall not reduce the minimum net clear opening area of the window unit to less than the area required by Section 1030.2 of the International Building Code.~~

~~Exceptions:~~ Exception:

- ~~1. Operable windows where the top~~ bottom of the ~~sill~~ clear opening of the window opening is located more than 75 feet (22 860 mm) above the finished grade or other surface below, on the exterior of the room, space or building, and that are provided with window fall prevention devices that comply with ASTM F2006.
- ~~2. Operable windows with openings that are provided with window fall prevention devices that comply with ASTM F2090.~~

505.3 Replacement window for emergency escape and rescue openings. Where windows are required to provide *emergency escape* and *rescue openings* in Group R-2 and R-3 occupancies and one- and two-family dwellings and townhouses regulated by the International Residential Code, replacement windows shall be exempt from the requirements of Sections 1030.2, ~~1030.3~~ and 1030.4 of the International Building Code and Sections ~~R310.2.1, R310.2.2 and R310.2.3~~ R310.2 and R310.4 of the International Residential Code, provided that the replacement window meets the following conditions:

1. The replacement window is the manufacturer's largest standard size window that will fit within the existing frame or existing rough opening. The replacement window shall be permitted to be of the same operating style as the existing window or a style that provides for an equal or greater window opening area than the existing window.
2. ~~The~~ Where the replacement of the window is ~~not~~ part of a change of occupancy it shall comply with Section 1011.4.6. ~~Window opening control devices complying with ASTM F2090 shall be permitted for use on windows required to provide emergency escape and rescue openings.~~

Add new text as follows:

505.3.1 Control devices. Emergency escape and rescue openings with window opening control devices or fall prevention devices complying with ASTM F2090, after operation to release the control device allowing the window to fully open, shall not reduce the net clear opening area of the window unit. Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys or tools.

Revise as follows:

~~505.4 Emergency escape and rescue openings. Bars, grilles, covers or screens. Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys or tools. Bars, grilles, covers, grates screens or similar devices are permitted to be placed over emergency escape and rescue openings provided that the , bulkhead enclosure or window wells that serve such openings, provided all of the following conditions are met::~~

- ~~1. The~~ minimum net clear opening size complies with the code that was in effect at the time of construction ~~and such~~
- ~~Such~~ devices shall be releasable or removable from the inside without the use of a key, tool or force greater than that which is required for normal operation of the escape and rescue opening.
- Where such ~~bars, grilles, grates or similar~~ devices are installed, they shall not reduce the net clear opening of the emergency escape and rescue openings.
- Smoke alarms shall be installed in accordance with Section 907.2.10 of the International Building Code ~~regardless of the valuation of the alteration.~~

SECTION 702 BUILDING ELEMENTS AND MATERIALS

702.4 Window opening control devices on replacement windows. In Group R-2 or R-3 buildings containing dwelling units and one- and two-family dwellings and townhouses regulated by the International Residential Code, window opening control devices or fall prevention devices complying with ASTM F2090 shall be installed where an existing window is replaced and where all of the following apply to the replacement window:

- The window is operable.
- The window replacement includes replacement of the sash and the frame.
- One of the following applies:
 - In Group R-2 or R-3 buildings containing dwelling units, the ~~top~~ bottom of the ~~sill~~ clear opening of the window opening is at a height less than 36 inches (915 mm) above the finished floor.
 - In one- and two-family dwellings and townhouses regulated by the International Residential Code , ~~the top sill~~ the bottom of the clear opening of the window opening is at a height less than 24 inches (610 mm) above the finished floor.
- The window will permit openings that will allow passage of a 4-inch-diameter (102 mm) sphere when the window is in its largest opened position.
- The vertical distance from the ~~top~~ bottom of the ~~sill~~ clear opening of the window opening to the finished grade or other surface below, on the exterior of the building, is greater than 72 inches (1829 mm):

~~The window opening control device, after operation to release the control device allowing the window to fully open, shall not reduce the minimum net clear opening area of the window unit to less than the area required by Section 1030.2 of the International Building Code.~~

Exceptions: Exception:

- ~~Operable windows where the top~~ bottom of the ~~sill~~ clear opening of the window opening is located more than 75 feet (22 860 mm) above the finished grade or other surface below, on the exterior of the room, space or building, and that are provided with window fall prevention devices that comply with ASTM F2006.
- ~~Operable windows with openings that are provided with window fall prevention devices that comply with ASTM F2090~~

702.5 Replacement window for emergency escape and rescue openings. Where windows are required to provide emergency escape and rescue openings in Group R-2 and R-3 occupancies and one- and two-family dwellings and townhouses regulated by the International Residential Code , replacement windows shall be exempt from the requirements of Sections ~~1030.2, 1030.3~~ 1030.2 and 1030.4 of the International Building Code and Sections ~~R310.2.1, R310.2.2 and R310.2.3~~ R310.2 and R310.4 of the International Residential Code, provided that the replacement window meets the following conditions:

- The replacement window is the manufacturer's largest standard size window that will fit within the existing frame or existing rough opening.
- ~~The~~ Where the replacement window is ~~not~~ part of a change of occupancy it shall comply with Section 1011.4.6.

~~Window opening control devices complying with ASTM F2090 shall be permitted for use on windows required to provide emergency escape and~~

rescue openings

Add new text as follows:

702.5.1 Control devices. Emergency escape and rescue openings with Window opening control devices or fall prevention devices complying with ASTM F2090, after operation to release the control device allowing the window to fully open, shall not reduce the net clear opening area of the window unit. Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys or tools.

Revise as follows:

~~701.4~~ ~~702.6~~ **Emergency escape and rescue openings. Bars, grilles, covers or screens.** ~~Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys or tools. Bars, grilles, grates covers, screens or similar devices are permitted to be placed over emergency escape and rescue openings, shall comply with the bulkhead enclosure or window wells that serve such openings, provided all of the following conditions are met::~~

1. ~~The~~ minimum net clear opening size ~~required by~~ complies with the code that was in effect at the time of construction.
2. Such devices shall be releasable or removable from the inside without the use of a key, tool or force greater than that which is required for normal operation of the escape and rescue opening.
3. Where such ~~bars, grilles, grates or similar~~ devices are installed, they shall not reduce the net clear opening of the emergency escape and rescue openings.
4. Smoke alarms shall be installed in accordance with Section 907.2.10 of the International Building Code ~~regardless of the valuation of the alteration.~~

Proposal # 4157

EB63-19 Part I

EB63-19 Part II

IRC®: R310.6 (New), R310.2.5 (New), SECTION AJ102 (New), AJ102.4 (New), AJ102.4.3 (New), AJ102.4.3.1 (New), AJ102.4.4 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

R310.6 Alterations or repairs of existing basements. An emergency escape and rescue opening is not required where existing *basements* undergo alterations or repairs.

Exception: New sleeping rooms created in an existing *basement* shall be provided with emergency escape and rescue openings in accordance with Section R310.1.

~~R310.2.5~~ R310.7 Replacement windows, windows for emergency escape and rescue openings. Replacement windows installed in buildings meeting the scope of this code shall be exempt from ~~the maximum sill height requirements of Section R310.2.2 and the requirements of Section R310.2.4~~ Section R310.2 and R310.4, provided that the replacement window meets the following conditions:

1. The replacement window is the manufacturer's largest standard size window that will fit within the existing frame or existing rough opening. The replacement window is of the same operating style as the existing window or a style that provides for an equal or greater window opening area than the existing window.
2. ~~The~~ Where the replacement window is not part of a change of occupancy.

SECTION AJ102 COMPLIANCE

AJ102.4 Replacement windows. Regardless of the category of work, where an existing window, including the sash and glazed portion, or safety glazing is replaced, the replacement window or safety glazing shall comply with the requirements of Sections AJ102.4.1 through AJ102.4.4, as applicable.

~~AJ102.4.3~~ Emergency Replacement windows for emergency escape and rescue openings. Where windows are required to provide emergency escape and rescue openings, replacement windows shall be exempt from ~~the maximum sill height requirements of Section R310.2.2 and the requirements of Sections R310.2.1 and R310.2.3~~ provided Sections R310.2 and R310.4 provided that the replacement window meets the following conditions:

1. The replacement window is the manufacturer's largest standard size window that will fit within the existing frame or existing rough opening. The replacement window shall be permitted to be of the same operating style as the existing window or a style that provides for an equal or greater window opening area than the existing window.
2. ~~The~~ Where the replacement window is not part of a change of occupancy. ~~3. Window opening control devices complying with ASTM F2090 shall be permitted for use on windows required to provide emergency escape and rescue openings.~~

Add new text as follows:

AJ102.4.3.1 Control devices. Emergency escape and rescue openings with window opening control devices or fall prevention devices complying with ASTM F2090, after operation to release the control device allowing the window to fully open, shall not reduce the net clear opening area of the window unit. Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys or tools.

Revise as follows:

AJ102.4.4 Window control devices. ~~Where window~~ Window opening control devices or fall prevention devices complying with ASTM F2090 ~~are not provided, window opening control devices complying with ASTM F2090~~ shall be installed where an existing window is replaced and where all of the following apply to the replacement window:

1. The window is operable.
2. The window replacement includes replacement of the sash and the frame.
3. ~~The top~~ bottom of the ~~sill~~ clear opening of the window opening is at a height less than 24 inches (610 mm) above the finished floor.
4. The window will permit openings that will allow passage of a 4-inch-diameter (102 mm) sphere where the window is in its largest opened position.
5. The vertical distance from the ~~top~~ bottom of the ~~sill~~ clear opening of the window opening to the finished grade or other surface below, on the exterior of the building, is greater than 72 inches (1829 mm).

~~The window opening control device, after operation to release the control device allowing the window to fully open, shall not reduce the minimum net clear opening area of the window unit.~~

Reason: The intent of this proposal is coordination with the requirements in existing buildings for the following:

- Replacement windows with opening control devices or fall prevention devices
- Replacement window emergency escape and rescue openings (EEROs)
- Replacement windows that have to comply with both
- Bars and grills over area wells

The main intent of this proposal is to coordinate criteria in the IEBC and IRC. Part of this will be to separate the requirements into distinct sections. They are now mixed. It is not the intent to add items where they are not currently required. IRC appendix J does not address Item 4 and IRC Section 319 does not address Item 1, 3 or 4.

Item 1

IEBC Section 404.2 and 702.4, IRC AJ102.3.3 - F2020 includes provisions for opening control devices and fall prevention devices. By putting this in the main text, Exception 2 is not needed. (Since the IRC only deals with buildings 3 stories or less, it does not need the exception for devices permitted in taller buildings.) The term "bottom of the clear opening" is easier to determine and measure than "top of sill". This term is consistent with the proposals for new windows. The information under Item 5 has been relocated to the section dealing with Item 3.

Item 2

IEBC Section 505.3, 702.5, and IRC AJ102.4.3 and R310.7 - The changes in the references have to technical change. They match the package for IBC and IRC EERO requirements. The language dealing with control devices has been relocated to the section dealing with Item 3.

Item 3

IEBC Section 505.3.1, 702.5.1 and IRC Section AJ102.4.3.1 - This section includes the criteria for opening control devices and fall prevention devices on EEROs.

Item 4

IEBC 505.4 and 702.6. - The revisions are consistent in what was approved for IBC Section 1030.5 and IRC Section 310.4 in the 2018 codes. Section 701.4 should be relocated to the window provisions. That would be consistent with the organization for EEROs in IBC and IRC and the IEBC prescriptive method.

This is one of a series of proposal to coordinate the requirements for emergency escape and rescue openings in the IBC and IRC. While independent issues, if all the proposals are approved, the IRC section would appear as indicated in the reason for the proposal to revise the definition – emergency escape and rescue openings.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This is a correlation item between codes.

Proposal # 5754

EB63-19 Part II

EB64-19

IEBC@: 505.1

Proponent: Timothy Pate, Colorado Chapter Code Change Committee, representing City and County of Broomfield (tpate@broomfield.org)

2018 International Existing Building Code

Revise as follows:

505.1 Replacement ~~glass-~~windows The installation or replacement of ~~glass-~~windows shall be as required for new installations.

Reason: This proposal is to change this section to deal with replacement windows and not glass. First of all replacing glass should be considered a repair and not an alteration so this requirement is not even in the correct chapter. Also it does not make sense to have a requirement in this code since that would appear to require a permit for anytime someone needs to replace a broken window. Consider the amount of new permits a jurisdiction would need to do on a daily basis. It does make sense to change the language to deal with replacement of windows which would be the entire assembly. Most jurisdictions to require permits for these window changeouts in order to make sure both energy code and life safety code are met. Finally I would point out that the 2018 IECC sections C504.2 and R504.2 have an exception to not require glass only replacements in existing sash and frames to meet current energy code and by default not require permits.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This will not increase or decrease cost of construction but will decrease cost of getting permits which will save money for the jurisdictions

Proposal # 4522

EB64-19

EB65-19

IEBC@: 505.2

Proponent: Jeff Inks, representing Window and Door Manufacturers Association (jinks@wdma.com); Jennifer Hatfield, representing American Architectural Manufacturers Association (jen@jhatfieldandassociates.com)

2018 International Existing Building Code

Revise as follows:

505.2 Replacement window opening control devices. In Group R-2 or R-3 buildings containing dwelling units, and one- and two-family dwellings and townhouses regulated by the International Residential Code, window opening control devices complying with ASTM F2090 shall be installed where an existing window, including the sash and glazed portion, is replaced and where all of the following apply to the replacement window:

1. The window is operable.
- ~~2. The window replacement includes replacement of the sash and the frame.~~
- ~~2.3.~~ One of the following applies:
 - ~~2.1.3.1.~~ In Group R-2 or R-3 buildings containing dwelling units, the top of the sill of the window opening is at a height less than 36 inches (915 mm) above the finished floor.
 - ~~2.2.3.2.~~ In one- and two-family dwellings and townhouses regulated by the International Residential Code, the top of the sill of the window opening is at a height less than 24 inches (610 mm) above the finished floor.
- ~~3.4.~~ The window will permit openings that will allow passage of a 4-inch-diameter (102 mm) sphere when the window is in its largest opened position.
- ~~4.5.~~ The vertical distance from the top of the sill of the window opening to the finished grade or other surface below, on the exterior of the building, is greater than 72 inches (1829 mm).

The window opening control device, after operation to release the control device allowing the window to fully open, shall not reduce the minimum net clear opening area of the window unit to less than the area required by Section 1030.2 of the International Building Code.

Exceptions:

1. Operable windows where the top of the sill of the window opening is located more than 75 feet (22 860 mm) above the finished grade or other surface below, on the exterior of the room, space or building, and that are provided with window fall prevention devices that comply with ASTM F2006. .
2. Operable windows with openings that are provided with window fall prevention devices that comply with ASTM F2090.

Reason: This revision makes it clear that regardless of whether replacing the entire existing window (sash and frame), or the sash and glazed portion with an insert window where the existing frame remains, the window fall prevention requirements apply in both applications which is consistent with how the code treats these replacements for energy efficiency.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The intent of this proposal is to ensure window fall prevention requirements are met as intended by the code. It does not have a direct impact on cost.

Proposal # 5401

EB65-19

EB66-19

IEBC@: 506.4.2, [BS] 1006.2

Proponent: Terry Kozlowski, representing Southern Nevada Chapter; Valarie Evans, representing Southern Nevada Chapter; Amanda Moss, representing SN-ICC Member; Cassidy Wilson, representing SN-ICC Member; Nenad Mirkovic, representing City of Las Vegas (nmirkovic@lasvegasnevada.gov)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Revise as follows:

506.4.2 Snow and wind loads. Where a change of occupancy results in a structure being assigned to a higher *risk category*, the structure shall satisfy the requirements of Sections 1608 and 1609 of the International Building Code for the new *risk category*.

Exception Exceptions:

1. Where the area of the new occupancy is less than 10 percent of the building area, compliance with this section is not required. The cumulative effect of occupancy changes over time shall be considered.
2. Change of occupancy to Group A with an occupant load less than 500 in an existing one-story building.

[BS] 1006.2 Snow and wind loads. Where a *change of occupancy* results in a structure being assigned to a higher *risk category*, the structure shall satisfy the requirements of Sections 1608 and 1609 of the *International Building Code* for the new risk category.

Exception Exceptions:

1. Where the area of the new occupancy is less than 10 percent of the building area. The cumulative effect of occupancy changes over time shall be considered.
2. Change of occupancy to Group A with an occupant load less than 500 in an existing one-story building.

Reason: More than 12,000 stores in 2018 and 50% of the 1,200 shopping malls across the U.S. are expected to close by 2023. This alarming trend will impact future redevelopment efforts in these existing structures. This proposal will promote the redevelopment efforts of municipalities, by reducing the construction cost without compromising security and safety of the occupants.

This proposal does not adversely impact any of the architectural and/or fire design requirements. This proposal will increase the threshold from 300 to 500 occupants.

The 300 occupant load threshold may be based on the 1942 Boston fire (Exhibit D) due to the number of fatalities. Fire sprinkler, fire alarm, interior finish and structural design provisions in the code provide more protection in today's structures.

We looked to the life safety egress provisions where 500 is the threshold for when a 3rd exit is required as a good point to upgrade the structural threshold. 500 is also consistent with the current Risk Category III threshold for post 12th grade educational occupancies.

Exhibit A states the IBC and/or IEBC: "is a model code that provides minimum requirements to safeguard the public health, safety and general welfare of the occupants of new and existing buildings and structures..."

When reviewing a list of notable earthquakes and fatalities associated with events from January 26, 1700 to January 23, 2018 (318 years), there have been approximately 3,919 fatalities (Exhibit A). In comparison, Exhibit B shows motor vehicle deaths in the U.S. for the last 11 years. In 2017 alone, there were 37,133 vehicle deaths. Exhibit C (2007-2016) show there were 145 fire-related fatalities and 1,550 injuries in non-residential fires. These statistics provide comparison in historical data as to the number of deaths in structures during earthquakes.

Bibliography: 1. 1927 UBC (occupancy Group C-1) it is seating capacity in any one room of less than 500 (Exhibit "E");

2. 1943 UBC (occupancy Group B-2) it is seating capacity in any one room of 100 or more (Exhibit "E");

3. November 1942 Boston Night Club Fire (see LA Times form 11/29/1942, Exhibit "D") It should be noted that the 1943 UBC was approved for printing on 10/1942, prior to the fire);

4. 1946 UBC, occupancy Group B-2 with seating capacity in any one room of 300 or more and occupancy Group B-3 with seating capacity in any one room of less than 300 (Exhibit "E");

5. 1949 IBC occupancy Group B-2 with an occupant load in in the building of 300 or more and occupancy Group B-3 with an occupant load in the building of less than 300 (Exhibit "E").

Cost Impact: The code change proposal will decrease the cost of construction

This proposal will decrease the cost of construction for structures with an occupant load of less than 500 by eliminating the requirement of seismic analysis and potential additional costs associated with improvements to existing structures.

Proposal # 4415

EB66-19

EB67-19

IEBC@: 506.4.3, [BS]1006.3

Proponent: Terry Kozlowski, representing Southern Nevada Chapter; Valarie Evans, representing Southern Nevada Chapter; Amanda Moss, representing SN-ICC Member; Cassidy Wilson, representing SN-ICC Member; Nenad Mirkovic, representing City of Las Vegas (nmirkovic@lasvegasnevada.gov)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Revise as follows:

506.4.3 Seismic loads (seismic force-resisting system). Where a *change of occupancy* results in a building being assigned to a higher *risk category*, the building shall satisfy the requirements of Section 1613 of the International Building Code for the new *risk category* using full seismic forces.

Exceptions:

1. Where the area of the new occupancy is less than 10 percent of the building area and the new occupancy is not assigned to *Risk Category IV*, compliance with this section is not required. The cumulative effect of occupancy changes over time shall be considered.
2. Where a change of use results in a building being reclassified from *Risk Category I* or *II* to *Risk Category III* and the seismic coefficient, SDS, is less than 0.33, compliance with this section is not required.
3. Unreinforced masonry bearing wall buildings assigned to *Risk Category III* and to Seismic Design Category A or B, shall be permitted to use Appendix Chapter A1 of this code.
4. Change of occupancy to Group A with an occupant load not to exceed 500 in an existing one-story building.

[BS]1006.3 Seismic loads. Where a *change of occupancy* results in a building being assigned to a higher risk category, the building shall satisfy the requirements of Section 1613 of the International Building Code for the new risk category using full seismic forces.

Exceptions:

1. Where a change of use results in a building being reclassified from *Risk Category I* or *II* to *Risk Category III* and the seismic coefficient, SDS, is less than 0.33.
2. Where the area of the new occupancy is less than 10 percent of the building area and the new occupancy is not assigned to *Risk Category IV*. The cumulative effect of occupancy changes over time shall be considered.
3. Unreinforced masonry bearing wall buildings assigned to *Risk Category III* and to Seismic Design Category A or B shall be permitted to use Appendix Chapter A1 of this code.
4. Change of occupancy to Group A with an occupant load not to exceed 500 in an existing one-story building.

Reason: More than 12,000 stores in 2018 and 50% of the 1,200 shopping malls across the U.S. are expected to close by 2023. This alarming trend will impact future redevelopment efforts in these existing structures. This proposal will promote the redevelopment efforts of municipalities, by reducing the construction cost without compromising security and safety of the occupants.

This proposal does not adversely impact any of the architectural and/or fire design requirements. This proposal will increase the threshold from 300 to 500 occupants.

The 300 occupant load threshold may be based on the 1942 Boston fire (Exhibit D) due to the number of fatalities. Fire sprinkler, fire alarm, interior finish and structural design provisions in the code provide more protection in today's structures.

We looked to the life safety egress provisions where 500 is the threshold for when a 3rd exit is required as a good point to upgrade the structural threshold. 500 is also consistent with the current *Risk Category III* threshold for post 12th grade educational occupancies.

Exhibit A states the IBC and/or IEBC: "is a model code that provides minimum requirements to safeguard the public health, safety and general welfare of the occupants of new and existing buildings and structures..."

When reviewing a list of notable earthquakes and fatalities associated with events from January 26, 1700 to January 23, 2018 (318 years), there have been approximately 3,919 fatalities (Exhibit A). In comparison, Exhibit B shows motor vehicle deaths in the U.S. for the last 11 years. In 2017 alone, there were 37,133 vehicle deaths. Exhibit C (2007-2016) show there were 145 fire-related fatalities and 1,550 injuries in non-residential fires. These statistics provide comparison in historical data as to the number of deaths in structures during earthquakes.

Bibliography: 1. 1927 UBC (occupancy Group C-1) it is seating capacity in any one room of less than 500 (Exhibit "E");

2. 1943 UBC (occupancy Group B-2) it is seating capacity in any one room of 100 or more (Exhibit "E");
3. November 1942 Boston Night Club Fire (see LA Times form 11/29/1942, Exhibit "D") It should be noted that the 1943 UBC was approved for printing on 10/1942, prior to the fire);
4. 1946 UBC, occupancy Group B-2 with seating capacity in any one room of 300 or more and occupancy Group B-3 with seating capacity in any one room of less than 300 (Exhibit "E");
5. 1949 IBC occupancy Group B-2 with an occupant load in in the building of 300 or more and occupancy Group B-3 with an occupant load in the building of less than 300 (Exhibit "E").

Cost Impact: The code change proposal will decrease the cost of construction

This proposal will decrease the cost of construction for structures with an occupant load of less than 500 by eliminating the requirement of seismic analysis and potential additional costs associated with improvements to existing structures.

Proposal # 4414

EB67-19

EB68-19

IEBC@: SECTION 506, 506.4.3, SECTION 1006, [BS]1006.3

Proponent: Marko Schotanus, National Council of Structural Engineers Associations, representing National Council of Structural Engineers Associations (mschotanus@ruthchek.com); Michael Fillion (mrf.structure@verizon.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

SECTION 506 CHANGE OF OCCUPANCY

Revise as follows:

506.4.3 Seismic loads (seismic force-resisting system). Where a *change of occupancy* results in a building being assigned to a higher *risk category*, or where the change is from a Group S or Group U occupancy to any occupancy other than Group S or Group U, the building shall satisfy the requirements of Section 1613 of the International Building Code for the new *risk category* using full seismic forces.

Exceptions:

1. Where the area of the new occupancy is less than 10 percent of the building area, the occupant load of the area with the new occupancy is not increased, and the new occupancy is not assigned to *Risk Category* IV, compliance with this section is not required. The cumulative effect of occupancy changes over time shall be considered.
2. Where a change of use results in a building being reclassified from *Risk Category* I or II to *Risk Category* III and the seismic coefficient, SDS, is less than 0.33, compliance with this section is not required.
3. Unreinforced masonry bearing wall buildings assigned to *Risk Category* III and to Seismic Design Category A or B, shall be permitted to use Appendix Chapter A1 of this code.
4. Where the change is from a Group S or Group U occupancy, use of reduced seismic forces shall be permitted.

SECTION 1006 STRUCTURAL

[BS]1006.3 Seismic loads. Where a *change of occupancy* results in a building being assigned to a higher risk category, or where the change is from a Group S or Group U occupancy to any occupancy other than Group S or Group U, the building shall satisfy the requirements of Section 1613 of the International Building Code for the new risk category using full seismic forces.

Exceptions:

1. Where a change of use results in a building being reclassified from *Risk Category* I or II to *Risk Category* III and the seismic coefficient, SDS, is less than 0.33, compliance with this section is not required.
2. Where the area of the new occupancy is less than 10 percent of the building area, the occupant load of the area with the new occupancy is not increased, and the new occupancy is not assigned to *Risk Category* IV. The cumulative effect of occupancy changes over time shall be considered.
3. Unreinforced masonry bearing wall buildings assigned to *Risk Category* III and to Seismic Design Category A or B shall be permitted to use Appendix Chapter A1 of this code.
4. Where the change is from a Group S or Group U occupancy, use of reduced seismic forces shall be permitted.

Reason: Quite often, storage, parking, or utility areas, often unfinished, are converted to occupied residential units or leasable office or commercial space. In a seismically deficient building, such a change represents a significant increase in risk that the code should not ignore. The current proposal revises the change of occupancy trigger, by re-introducing seismic upgrade triggers of the type the code had until 2012 to specifically address conversion from unoccupied space (U and S occupancies) to commercial and residential space (B and R occupancies), but with the allowance of reduced loads. Matching provisions are proposed for the Prescriptive (IEBC Section 506) and Work Area (IEBC Section 1006) methods.

In the 2012 IBC and IEBC, the seismic upgrade triggers for change of occupancy projects were greatly simplified so that an upgrade is triggered only when the change is so significant that it elevates the building into a higher risk category. This was a useful improvement to the previous set of triggers, but it was an over-reach in one regard: Quite often, the ground floor of a residential building is converted from a storage, parking, or utility area, often unfinished, to an occupied residential unit or leasable office or commercial space. Similarly, warehouses are often converted to residences and offices. In a seismically deficient building, the related increase in the number of (actual) occupants represents a significant increase in risk that the code should not ignore.

In the 2009 IEBC (Work Area method), such a change of occupancy would have triggered a full-building seismic upgrade with full code-level loads. Since 2012, however, since such a change would not affect the risk category (it would be II before and after), no evaluation or upgrade is triggered for these cases.

The alteration normally associated with such a change of occupancy also is unlikely to trigger any seismic work.

This proposal re-introduces the seismic upgrade trigger for these specific cases:

- The proposal restores a requirement that was already in the code in 2009 but was removed in 2012. So there is precedent for what this proposal accomplishes.
- Matching provisions are proposed for the Prescriptive (IEBC Section 506) and Work Area (IEBC Section 1006) methods.
- The 10% "small area" exception is modified to prevent gaming, since the cases in question can involve only part of a story.
- An exception to the full-code criteria is added. Since these occupancy changes are less significant than a wholesale shift in risk category, we suggest that the use of reduced seismic loads is appropriate. For many tilt-up warehouses and wood frame apartment buildings, the use of reduced loads allows use of IEBC Appendix Chapters A2 and A4, which will limit the extent of retrofit work, making the triggered retrofit quite feasible.

Cost Impact: The code change proposal will increase the cost of construction

The cost of converting an unfinished space with rare or incidental human occupancy to occupied space would be increased by the cost of a retrofit with reduced forces.

Proposal # 5255

EB68-19

EB69-19

IEBC@: 506.4.3, [BS]1006.3

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Revise as follows:

506.4.3 Seismic loads (seismic force-resisting system). Where a *change of occupancy* results in a building being assigned to a higher *risk category*, or where the change is from a Group S or Group U occupancy to any occupancy other than Group S or Group U, the building shall satisfy the requirements of Section 1613 of the International Building Code for the new *risk category* using full seismic forces.

Exceptions:

1. Where the area of the new occupancy is less than 10 percent of the building area, the occupancy is not changing from a Group S or Group U occupancy, and the new occupancy is not assigned to *Risk Category IV*, compliance with this section is not required. The cumulative effect of occupancy changes over time shall be considered.
2. Where a change of use results in a building being reclassified from *Risk Category I* or *II* to *Risk Category III* and the seismic coefficient, SDS, is less than 0.33, compliance with this section is not required.
3. Unreinforced masonry bearing wall buildings assigned to *Risk Category III* and to Seismic Design Category A or B, shall be permitted to use Appendix Chapter A1 of this code.
4. Where the change is from a Group S or Group U occupancy and there is no change of risk category, use of reduced seismic forces shall be permitted.

[BS]1006.3 Seismic loads. Where a *change of occupancy* results in a building being assigned to a higher risk category, or where the change is from a Group S or Group U occupancy to any occupancy other than Group S or Group U, the building shall satisfy the requirements of Section 1613 of the International Building Code for the new risk category using full seismic forces.

Exceptions:

1. Where a change of use results in a building being reclassified from *Risk Category I* or *II* to *Risk Category III* and the seismic coefficient, SDS, is less than ~~0.33~~ 0.33, compliance with this section is not required.
2. Where the area of the new occupancy is less than 10 percent of the building area, the occupancy is not changing from a Group S or Group U occupancy, and the new occupancy is not assigned to *Risk Category ~~IV~~ IV*, compliance with this section is not required. The cumulative effect of occupancy changes over time shall be considered.
3. Unreinforced masonry bearing wall buildings assigned to *Risk Category III* and to Seismic Design Category A or B shall be permitted to use Appendix Chapter A1 of this code.
4. Where the change is from a Group S or Group U occupancy and there is no change of risk category, use of reduced seismic forces shall be permitted.

Reason: This proposal re-introduces a common sense seismic upgrade trigger of the type the code had until 2012. To make the trigger more feasible, it allows reduced loads.

Since the 2012 IEBC, a change of occupancy project triggers seismic upgrade only when the change is so significant that it bumps the building into a higher risk category. While this is preferable to the pre-2012 triggers (which were arbitrary and needlessly complex), it misses the common case in which an unoccupied storage, parking, or utility area is converted to an occupied residential unit or leasable office or commercial space. In a seismically deficient building, such a change amounts to adding units to substandard buildings -- and often in the ground story where potential collapse poses the greatest safety risk. This is just as risky as building new housing to grossly obsolete seismic standards. The growing interest in accessory dwelling units (ADUs) makes the risk even more urgent. Converting collapse-prone unoccupied space to new occupied space represents a significant increase in risk that the code should not ignore.

However, since Group S, U, R, B, and M occupancies are all typically assigned to *Risk Category II*, a change from S or U to R, B, or M would not trigger any seismic work by the current code. In the 2009 IEBC (Work Area method), such a change would have triggered a full-building seismic upgrade with full code-level loads.

This proposal would re-introduce the seismic upgrade trigger for these specific cases. It makes identical changes to both the Prescriptive and Work Area methods.

The proposal has precedent, since a similar requirement was already in the 2009 IEBC.

The 10% "small area" exception is modified appropriately, to make sure that a change from S or U to occupied space would not escape review just because it is only in the first story of a large building.

Reduced forces are allowed. Since these occupancy changes are less significant than a whole-building shift in risk category, the use of reduced seismic loads is appropriate. (Some might argue that adding units to a building that meets only reduced seismic criteria is still an increase in risk relative to new construction. That is true, but the growth of ADU programs calls for the feasibility afforded by reduced loads. This proposal is meant to facilitate ADU programs, but not for grossly deficient buildings that reduced seismic criteria would catch. For many woodframe apartment buildings, the use of reduced loads also allows IEBC Appendix A4, which would effectively limit any retrofit work to the first story, making the triggered retrofit quite feasible.)

Cost Impact: The code change proposal will increase the cost of construction

The cost of converting an unfinished space to a functional residential unit would be increased by the cost of a retrofit with reduced forces.

Proposal # 5278

EB69-19

EB70-19

IEBC@: 603.1

Proponent: Allison Cook, representing VBCOA; David Collins, representing The American Institute of Architects (dcollins@preview-group.com); Debra McMahon (debra.mcmahon@fairfaxcounty.gov); Kenney Payne, Moseley Architects, representing AIA Virginia (kpayne@moseleyarchitects.com); Ronald Clements Jr, representing Chesterfield County (clementsro@chesterfield.gov); Shaina Abney, representing VBCOA (shaina.abney@fairfaxcounty.gov); Bob Orr, Culpeper County, representing VBCOA (borr@culpepercounty.gov); Charles Vernon, representing VBCOA (cvernon@arlingtonva.us); Michael Williams (mike.williams@harrisonburgva.gov); Christina Jackson, representing City of Norfolk / WICED of VA (christina.reynolds@norfolk.gov)

2018 International Existing Building Code

Revise as follows:

603.1 Scope. Level 2 *alterations* include the ~~reconfiguration of space, the addition or elimination of any door or window, the reconfiguration or extension of any system, or the installation of any additional equipment.~~ equipment; and shall apply where the work area is equal to or less than 50 percent of the building area.

Reason: The use of "work area", which is a defined term, instead of "reconfigured spaces" provides clarification and consistency by using defined terms. The addition of "50% or less" is to align with the scope of a level 3, which applies when the work area that exceeds 50%

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal is only to clarify the language.

Proposal # 5225

EB70-19

EB71-19

IEBC: [A] 105.2, 603.1, 704.2 (New), 801.3 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Existing Building Code

Revise as follows:

[A] 105.2 Work exempt from permit. Exemptions from permit requirements of this code shall not be deemed to grant authorization for any work to be done in any manner in violation of the provisions of this code or any other laws or ordinances of this jurisdiction. Permits shall not be required for the following:

Building:

1. Sidewalks and driveways not more than 30 inches (762 mm) above grade and not over any basement or story below and that are not part of an accessible route.
2. Painting, papering, tiling, carpeting, cabinets, counter tops, and similar finish work.
3. Temporary motion picture, television, and theater stage sets and scenery.
4. Shade cloth structures constructed for nursery or agricultural purposes, and not including service systems.
5. Window awnings supported by an exterior wall of Group R-3 or Group U occupancies.
6. ~~Movable Non-fixed and moveable~~ cases, counters, and partitions not over ~~69-5 feet and 9 inches~~ inches (1753 mm) in height.

Electrical:

1. **Repairs and maintenance:** Minor *repair* work, including the replacement of lamps or the connection of *approved* portable electrical equipment to *approved* permanently installed receptacles.
2. **Radio and television transmitting stations:** The provisions of this code shall not apply to electrical equipment used for radio and television transmissions, but do apply to equipment and wiring for power supply, the installations of towers, and antennas.
3. **Temporary testing systems:** A permit shall not be required for the installation of any temporary system required for the testing or servicing of electrical equipment or apparatus.

Gas:

1. Portable heating appliance.
2. Replacement of any minor part that does not alter approval of equipment or make such equipment unsafe.

Mechanical:

1. Portable heating appliance.
2. Portable ventilation equipment.
3. Portable cooling unit.
4. Steam, hot, or chilled water piping within any heating or cooling equipment regulated by this code.
5. Replacement of any part that does not alter its approval or make it unsafe.
6. Portable evaporative cooler.
7. Self-contained refrigeration system containing 10 pounds (4.54 kg) or less of refrigerant and actuated by motors of 1 horsepower (746 W) or less.

Plumbing:

1. The stopping of leaks in drains, water, soil, waste, or vent pipe; provided, however, that if any concealed trap, drainpipe, water, soil, waste, or vent pipe becomes defective and it becomes necessary to remove and replace the same with new material, such work shall be considered as new work, and a permit shall be obtained and inspection made as provided in this code.
2. The clearing of stoppages or the repairing of leaks in pipes, valves, or fixtures, and the removal and reinstallation of water closets, provided that such *repairs* do not involve or require the replacement or rearrangement of valves, pipes, or fixtures.

603.1 Scope. Level 2 *alterations* include the reconfiguration of space, the addition or elimination of any door or window, the reconfiguration or extension of any system, or the installation of any additional equipment.

Exception: The movement or addition of non-fixed and movable fixtures, cases, racks, counters and partitions not over 5 feet 9 inches (1753mm) in height shall not be considered a Level 2 alteration.

SECTION 704

MEANS OF EGRESS

704.1 General. *Alterations* shall be done in a manner that maintains the level of protection provided for the means of egress.

Add new text as follows:

704.2 Casework. Addition, alteration or reconfiguration of non-fixed and movable cases, counters, and partitions not over 5 feet 9 inches (1753 mm) in height shall maintain the required means of egress path.

801.3 System installations. Requirements related to work area are not applicable where the Level 2 alteration alterations are limited solely to one or more of the following:

1. Mechanical systems, electrical systems, fire protection systems and abatement of hazardous materials.
2. Windows, hardware, operating controls, electrical outlets and signs.
3. Alterations undertaken for the primary purpose of increasing the accessibility of a facility.

Reason: There are many issues of confusion in determining what is considered a “work area.” The definition of “work area” specifically states “reconfiguration of space.” It should address when the floor plan (egress etc.) changes not when a sprinkler system is installed in a building. Also what is included in reconfiguration – furniture/cubicles? Part of the confusion with this issue is that there seems to be a need to establish a **work area** where in some cases none exist. It can still be a level 2 alteration but with no work area associated with it. This does not mean that there are no regulations just that it will not necessarily make some provisions applicable such as those related to egress or move it into a Level 3 alteration situation.

Level 2, as defined in Chapter 6, includes extension of any system. The intent of this proposal is to not throw a project into Level 2 if there is only the movement of casework. The new language in Section 603.1 is to clarify that the movement of casework is not considered reconfiguration of a space and thus moving furniture will not be considered a Level 2 alteration. The addition to Section 704.2 is due to a concern that the movement of casework should not violate allowances for means of egress. Since these elements are exempt from permits (but not code requirements), the change to Section 105.2 is just for consistent terminology.

Section 801.3: If an alteration does not change the physical configuration of a space or is to improve accessibility, this should also not throw a building owner into an additional series of requirements. This allows for building owners to improve their buildings over time.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will decrease the cost of construction

This would allow improvements that did not change the configuration of the space to not trigger Level 2 or 3 requirements.

Proposal # 4199

EB71-19

EB72-19

IEBC@: SECTION 608 (New), 608.1 (New), 608.2 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Existing Building Code

Delete without substitution:

~~SECTION 608~~ ~~RELOCATED BUILDINGS~~

~~**608.1 Scope.** Relocated building provisions shall apply to relocated or moved buildings.~~

~~**608.2 Application.** Relocated buildings shall comply with the provisions of Chapter 14.~~

Reason: Section 301.4 already denotes that outside the three methods that relocated buildings are addressed by Chapter 14.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Editorial change.

Proposal # 4221

EB72-19

EB73-19

IEBC@: 702.4

Proponent: Jeff Inks, representing Window and Door Manufacturers Association (jinks@wdma.com); Jennifer Hatfield, representing American Architectural Manufacturers Association (jen@jhatfieldandassociates.com)

2018 International Existing Building Code

Revise as follows:

702.4 Window opening control devices on replacement windows. In Group R-2 or R-3 buildings containing dwelling units and one- and two-family dwellings and townhouses regulated by the International Residential Code, window opening control devices complying with ASTM F2090 shall be installed where an existing window, including the sash and glazed portion, is replaced and where all of the following apply to the replacement window:

1. The window is operable.
2. ~~The window replacement includes replacement of the sash and the frame.~~
3. One of the following applies:
 - 3.1. In Group R-2 or R-3 buildings containing dwelling units, the top of the sill of the window opening is at a height less than 36 inches (915 mm) above the finished floor.
 - 3.2. In one- and two-family dwellings and townhouses regulated by the International Residential Code, the top sill of the window opening is at a height less than 24 inches (610 mm) above the finished floor.<
4. The window will permit openings that will allow passage of a 4-inch-diameter (102 mm) sphere when the window is in its largest opened position.
5. The vertical distance from the top of the sill of the window opening to the finished grade or other surface below, on the exterior of the building, is greater than 72 inches (1829 mm).

The window opening control device, after operation to release the control device allowing the window to fully open, shall not reduce the minimum net clear opening area of the window unit to less than the area required by Section 1030.2 of the International Building Code.

Exceptions:

1. Operable windows where the top of the sill of the window opening is located more than 75 feet (22 860 mm) above the finished grade or other surface below, on the exterior of the room, space or building, and that are provided with window fall prevention devices that comply with ASTM F2006.
2. Operable windows with openings that are provided with window fall prevention devices that comply with ASTM F2090.

Reason: This revision makes it clear that regardless of whether replacing the entire existing window (sash and frame), or the sash and glazed portion with an insert window where the existing frame remains, the window fall prevention requirements apply in both applications which is consistent with how the code treats these replacements for energy efficiency.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The intent of this proposal is to ensure window fall prevention requirements are met as intended by the code. It does not have a direct impact on cost.

Proposal # 5403

EB73-19

EB74-19

IEBC: 704.1.1 (New), 805.3 (New)

Proponent: John Williams, representing Healthcare Committee (AHC@iccsafe.org)

2018 International Existing Building Code

SECTION 704 MEANS OF EGRESS

704.1 General. *Alterations* shall be done in a manner that maintains the level of protection provided for the means of egress.

Add new text as follows:

704.1.1 Projections in Nursing Home Corridors. In Group I-2, Condition 1 occupancies, where the corridor is at least 96 inches wide, projections into the corridor width are permitted in accordance with Section 407.4.3 of the International Building Code.

SECTION 805 MEANS OF EGRESS

805.1 Scope. The requirements of this section shall be limited to *work areas* that include exits or corridors shared by more than one tenant within the *work area* in which Level 2 *alterations* are being performed, and where specified they shall apply throughout the floor on which the *work areas* are located or otherwise beyond the *work area*.

805.2 General. The means of egress shall comply with the requirements of this section.

Exceptions:

1. Where the *work area* and the means of egress serving it complies with NFPA 101.
2. Means of egress complying with the requirements of the building code under which the building was constructed shall be considered to be compliant means of egress if, in the opinion of the *code official*, they do not constitute a distinct hazard to life.

Add new text as follows:

805.3 Group I-2. In Group I-2 occupancies, in areas where corridors are used for movement of care recipients in beds, the clear width of ramps and corridors shall be not less than 48 inches (1219 mm).

Reason: The purpose of this proposal is to address required corridor width in Group I-2.

The change to Level 1 alterations is to allow for furniture to be added into the corridors in nursing homes. This is currently allowed in the IBC so that seating areas for socialization and to allow for residents to sit down to rest are permitted where the furniture will not block the means of egress.

The change to Level 2 alterations is to allow for existing corridors to remain at the 48" width as permitted in the IFC. It does not make sense to have to make a portion of a corridor wider than the routes leading to and from that portion.

Dead ends are addressed in another proposal to IEBC Section 805.6.

The following text is in the IFC.

IFC

1105.6.3 Ramps. In areas where *ramps* are used for movement of patients in beds, the clear width of the *ramp* shall be not less than 48 inches (1219 mm).

1105.6.4 Corridor width. In areas where *corridors* are used for movement of patients in beds, the clear width of the *corridor* shall be not less than 48 inches (1219 mm).

1105.6.5 Dead-end corridors. In smoke compartments containing patient sleeping rooms and treatment rooms, dead-end *corridors* shall not exceed 30 feet (9144 mm) unless approved by the *fire code official*.

This proposal is submitted by the ICC Committee on Healthcare (CHC). The CHC was established by the ICC Board to evaluate and assess contemporary code issues relating to healthcare facilities. This is a joint effort between ICC and the American Society for Healthcare Engineering (ASHE), a subsidiary of the American Hospital Association, to eliminate duplication and conflicts in healthcare regulation. In 2017 and 2018 the CHC held 4 open meetings and numerous conference calls, *which included members of the committees as well as any interested parties, to discuss and*

debate the proposed changes. Information on the CHC, including: meeting agendas; minutes; reports; resource documents; presentations; and all other materials developed in conjunction with the CHC effort can be downloaded from the CHC website at: <https://www.iccsafe.org/codes-tech-support/cs/icc-committee-on-healthcare/>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This change would allow for additional design options.

Proposal # 4248

EB74-19

EB75-19

IEBC@: [BS] 705.2; IBC@: 1511.2

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Revise as follows:

[BS] ~~705.2~~ 1501.2.1 Structural and construction loads. Structural roof components shall be capable of supporting the roof-covering system and the material and equipment loads that will be encountered during installation of the system.

2018 International Building Code

~~1511.2~~ 3301.2.1. Structural and construction loads. Structural roof components shall be capable of supporting the roof-covering system and the material and equipment loads that will be encountered during installation of the system.

Reason: The proposal moves a provision about construction loads from IEBC Chapter 7 (Alterations – Level 1) to Chapter 15 (Construction Safeguards). Per ICC staff, IEBC Section 705 is linked to IBC Section 1511, so at ICC request, the proposal makes a matching move within the IBC. The motivation for this proposal is simply to make the structural provisions of the IEBC Work Area and Prescriptive methods match as closely as possible – a motivation that received broad support in the last cycle, resulting in greatly improved consistency in the 2018 code.

This provision for reroofing, however, remains out of sync. Currently, the Work Area method has this provision in Section 705.2, but the Prescriptive method has no matching provision.

In the last cycle, proposal EB19-16 would have added a matching provision to the Prescriptive method. The ICC Committee supported the concept but suggested that instead of adding a duplicate provision, Section 705.2 should be moved to Chapter 15 where it made more sense and could serve both methods. Therefore, following the committee's suggestion, a public comment was submitted. At the PCH, the comment was easily approved by a nearly unanimous show of hands, but it received only 65% approval by OGV voters, so EB19-16 As Modified could not be approved despite broad consensus.

(Note: While both parts of this proposal should be approved, it is perhaps worth noting that the IEBC Prescriptive method still lacks reroofing provisions to match those of the Work Area method in Sec 705. To resolve this, one might propose creating a new section in IEBC Chapter 5 to match the remaining provisions in Sec 705. That could be done as a floor modification or as a public comment, but it is outside the initial narrow scope of this proposal. Going even further, one might propose deleting the rest of IBC Sec 1511 because it is entirely about reroofing, which is an Existing Buildings issue, but that, too, is outside the scope of this proposal.)

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal merely relocates existing provisions to more logical places.

Proposal # 4633

EB75-19

EB76-19

IEBC@: [BS] 706.2, (New)

Proponent: Michael Fillion, representing National Council of Structural Engineers Association (mrf.structure@verizon.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Revise as follows:

[BS] 706.2 Addition or replacement of roofing or replacement of equipment. Any existing gravity load-carrying structural element for which an *alteration* causes an increase in design dead, live or snow load, including snow drift effects, of more than 5 percent shall be replaced or altered as needed to carry the gravity loads required by the International Building Code for new structures.

Exceptions:

1. Buildings of Group R occupancy with not more than five dwelling or sleeping units used solely for residential purposes where the altered building complies with the conventional light-frame construction methods of the International Building Code or the provisions of the International Residential Code.
2. Buildings in which the increased dead load is due entirely to the addition of a second layer of roof covering weighing 3 pounds per square foot (0.1437 kN/m²) or less over an existing single layer of roof covering. This exception shall not apply where insulation is added to the roof assembly.

Add new definition as follows:

[BS] ROOF COVERING. The covering applied to the roof deck for weather resistance, fire classification or appearance.

Reason: In many re-roofing projects, insulation and membrane are placed over an existing roof covering. The weight of the insulation and membrane are usually less than 3 pounds per square foot (0.1437 kN.m2).

It has been our observation that some design professionals and building officials are using this exception when insulation is added with the new second layer of roof covering. Addition of insulation increases the thermal resistance (R-value) resulting in a higher Thermal Factor, Ct which will increase the design roof snow load. Because of this oversight in some instances, we feel it is important to include the IBC roof covering definition and to make it clear that adding insulation is not included in Exception #2.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The intent of this code change proposal is for clarification.

Proposal # 5326

EB76-19

EB77-19

IEBC@: 707.1, 810.1, 907.1

Proponent: Allison Cook, representing VBCOA; Kenney Payne, Moseley Architects, representing AIA Virginia (kpayne@moseleyarchitects.com); Ronald Clements Jr, representing Chesterfield County (clementsro@chesterfield.gov); Bob Orr, representing VBCOA (borr@culpepercounty.gov); Charles Vernon, representing VBCOA (cvernon@arlingtonva.us); Michael Williams (mike.williams@harrisonburgva.gov); Debra McMahon (debra.mcmahon@fairfaxcounty.gov); David Collins, representing The American Institute of Architects (dcollins@preview-group.com); Christina Jackson, representing City of Norfolk / WICED of VA (christina.reynolds@norfolk.gov)

2018 International Existing Building Code

Revise as follows:

707.1 Minimum requirements. Level 1 *alterations to existing buildings* or structures do not require the entire building or structure to comply with the energy requirements of the International Energy Conservation Code or International Residential Code. The *alterations* shall conform to the energy requirements of the International Energy Conservation Code or International Residential Code as they relate to new construction only.

Exception: Like materials, assemblies or thicknesses shall be permitted for alterations involving the exterior building thermal envelope, provided no hazard to life, health or property is created. Hazardous materials shall not be used where the code for new construction would not permit their use in buildings of similar occupancy, purpose and location.

810.1 Minimum requirements. Level 2 *alterations to existing buildings* or structures are permitted without requiring the entire building or structure to comply with the energy requirements of the International Energy Conservation Code or International Residential Code. The *alterations* shall conform to the energy requirements of the International Energy Conservation Code or International Residential Code as they relate to new construction only.

Exception: Like materials, assemblies or thicknesses shall be permitted for alterations involving the exterior building thermal envelope, provided no hazard to life, health or property is created. Hazardous materials shall not be used where the code for new construction would not permit their use in buildings of similar occupancy, purpose and location.

907.1 Minimum requirements. Level 3 *alterations to existing buildings* or structures are permitted without requiring the entire building or structure to comply with the energy requirements of the International Energy Conservation Code or International Residential Code. The *alterations* shall conform to the energy requirements of the International Energy Conservation Code or International Residential Code as they relate to new construction only.

Exception: Like materials, assemblies or thicknesses shall be permitted for alterations involving the exterior building thermal envelope, provided no hazard to life, health or property is created. Hazardous materials shall not be used where the code for new construction would not permit their use in buildings of similar occupancy, purpose and location.

Reason: When replacing insulation in the thermal envelope, the energy requirement demands the affected area be in compliance with the International Energy Conservation Code. This can require the tenant to increase the thickness of the wall or roof framing to satisfy the depth of the insulation for proper installation. This would discourage rehabilitation of many older structures.

The purpose of the Existing Building code should be to allow existing buildings to be renovated and occupied while maintaining the level of safety. It should not be to retrofit the tenant space or building to meet today's code.

Cost Impact: The code change proposal will decrease the cost of construction

This should result in a cost savings since a tenant would no longer have to increase the thickness of the wall or roof framing to satisfy the depth of the insulation for proper installation.

Proposal # 5227

EB77-19

EB78-19

IEBC@: 802.4

Proponent: Tim Earl, representing GBH International (tearl@gbhinternational.com)

2018 International Existing Building Code

Revise as follows:

802.4 Interior finish. The interior finish of walls and ceilings in exits and corridors in any *work area* shall comply with the requirements of the International Building Code ↯

Exception: Existing interior finish materials that do not comply with the ~~interior finish~~ requirements of the International Building Code shall be permitted to be treated with an *approved* fire-retardant coating in accordance with the manufacturer's instructions to achieve the required ~~rating-~~fire performance. Compliance with this section shall be demonstrated by testing the fire-retardant coating on the same material and achieving the required performance. Where the same material is not available, testing on a similar material shall be permitted.

Reason: It is important to clarify that, if fire retardant coatings are to be used to achieve improved fire performance, they must have been tested on the actual product (substrate) to which they will be applied. There have been instances of manufacturers applying coatings to a noncombustible surface and running an ASTM E84 test in an attempt to demonstrate compliance. (See figures below). This obviously does not reflect real world performance and is not the intent of the code. This proposal would make the requirement more explicit.

RESULTS:

INTRODUCTION:

This report presents test results of Flame Spread and Smoke Developed Values per ASTM E-84-04. The report also includes Material Identification, Method of Preparation, Mounting and Conditioning of the specimens.

The tests were performed in accordance with the specifications set forth in ASTM E-84-04, Standard Test Method for Surface Burning Characteristics of Building Materials, both as to equipment and test procedure. This test procedure is similar to UL-723, ANSI No. 2.5, NFPA No. 255 and UBC 42-1.

The test results cover two parameters: Flame Spread and Smoke Developed Values during a 10-minute fire exposure. Inorganic cement board and red oak flooring are used as comparative standards and their responses are assigned arbitrary values of 0 and 100, respectively.

PREPARATION AND CONDITIONING:

Three pieces of Hardy Backer Board 21 inches X 8 feet were coated using a flat brush with the clients ~~Paint Additive~~ Paint Additive Flame Retardant and allowed to cure.

The sample was conditioned at 73° ± 5° Fahrenheit and 50 ± 5% relative humidity.

TEST PROCEDURE:

The tunnel was thoroughly pre-heated by burning natural gas. When the brick temperature, sensed by a floor thermocouple, had reached the prescribed 105° Fahrenheit ± 5° Fahrenheit level, the sample was inserted in the tunnel and test conducted in accordance with the standard ASTM E-84-04 procedures.

The operation of the tunnel was checked by performing a 10-minute test with inorganic board on the day of the test.

RESULTS:

TEST RESULTS:

The test results, calculated in accordance with ASTM E-84-04 for Flame Spread and Smoke Developed Values are as follows:

Test Specimen	:	Paint Additive Flame Retardant
Flame Spread Index*	:	0
Smoke Developed Value*	:	10

*Rounded off to the nearest 5 units. Graphs of the Flame Spread, Smoke Developed and Time-Temperature are shown on the attached charts at the end of this report.

OBSERVATIONS:

Ignition was not noted there was charring of the sample during the test.

RATING:

The National Fire Protection Association Life Safety Code 101, Section 6-5.3, "Interior Wall and Ceiling Finish Classification", has a means of classifying materials with respect to Flame Spread and Smoke Developed when tested in accordance with NFPA 255, "Method of Test of Surface Burning Characteristics of Building Materials", (ASTM E-84).

The classifications are as follows:

Class A Interior Wall & Ceiling Finish:	Flame Spread -	0-25
	Smoke Developed -	0-450
Class B Interior Wall & Ceiling Finish:	Flame Spread -	26-75
	Smoke Developed -	0-450
Class C Interior Wall & Ceiling Finish:	Flame Spread -	76-200
	Smoke Developed -	0-450

Since the sample received a Flame Spread of 0 and a Smoke Developed Value of 10, it would fall into the Class A Interior Wall & Ceiling Finish Category.

Cost Impact: The code change proposal will increase the cost of construction

This proposal may increase the cost of construction if people have using flame retardant coatings that have not been tested on the material to which they will be applied.

Proposal # 4921

EB78-19

EB79-19

IEBC@: 802.4, 802.4.1

Proponent: Marcelo Hirschler, GBH International, representing GBH International (mmh@gbhint.com)

2018 International Existing Building Code

Revise as follows:

802.4 Interior finish. The interior finish and trim of walls and ceilings in exits and corridors in any *work area* shall comply with the requirements of the International Building Code .

~~**Exception:** Existing interior finish materials that do not comply with the interior finish requirements of the International Building Code shall be permitted to be treated with an *approved* fire-retardant coating in accordance with the manufacturer's instructions to achieve the required ~~rating~~ fire performance.~~

802.4.1 Supplemental interior finish requirements. Where the *work area* on any floor exceeds 50 percent of the floor area, Section 802.4 shall apply to the interior finish and trim in exits and corridors serving the *work area* throughout the floor.

Exception: Interior finish within tenant spaces that are entirely outside the *work area*.

Reason: The exception is not really a proper exception: the interior finish still must meet the IBC requirements, but that can be achieved by using a fire-retardant coating. The words "and trim" are added for clarification, since it is most likely the intent of the section anyway. The repeated use of "interior finish" is eliminated as unnecessary. The interior finish requirements are based on fire performance in terms of a flame spread index and a smoke developed index (or on results of a room-corner test such as NFPA 286) and are not a rating.

Cost Impact: The code change proposal will increase the cost of construction
This adds the requirement that trim also meet the fire testing in the IBC.

Proposal # 4490

EB79-19

EB80-19

IEBC@: 803.4.4 (New)

Proponent: Thomas Daly, HSCG, representing HSCG (Thomas.Daly@myhscg.com)

2018 International Existing Building Code

Add new text as follows:

803.4.4 Smoke Alarms replacement. Where existing smoke alarms in sleeping units of Group I and R occupancies, requiring only a single smoke alarm without interconnection, are to be replaced, ten-year listed sealed battery powered smoke alarms shall be permitted, as an option.

Reason:

1. The 2018 IFC requires smoke alarms in occupancies other than one and two-family dwellings to be replaced if non-functional or when they have reached 10 years of age. ICC Interpretation 01-18 issued 5.15.18 and re-affirmed 8.15.18 expanded that mandate to impact existing smoke alarms in existing buildings. That Interpretation also indicated that such replacement was deemed 'maintenance' not 'construction'.

As such, the IEBC and, in the next cycle the IPMC, are the requisite codes in which to make this change since the IFC specifies construction requirements for smoke alarms. As the IMPC was included in Group A codes, only the IEBC remains available now to amend.

1. History – 10-yr smoke alarms were first allowed in the 2002 edition of NFPA 72, see Sec. 11.6.1(3) and continue to be allowed, see the 2019 edition of NFPA 72 Sec. 29.9.1(3) and 29.9.2.

This technology gained favor among both fire officials and the public as it precluded the removal of the battery (a known factor in residential fire deaths) and avoided the periodic replacement of such batteries, typically annually, for battery only powered smoke alarms or the back-up battery in 120vac powered smoke alarms (often ignored by property owners).

Since being introduced most major smoke alarm manufacturers have provided this optional 10-yr smoke alarm technology, see for example, Kidde Model i9010, <https://www.kidde.com/home-safety/en/us/products/fire-safety/smoke-alarms/i9010/>

and First Alert Model SA340CN, <https://www.firstalertstore.com/store/products/sa340cn-tamperproof-10-year-smoke-alarm.htm>.

There have been no reported recalls of 10-yr smoke alarms based on a review of the Consumer Product Safety Commission (CPSC) website, see https://cpsc.gov/search?site=cpsc_site&output=xml_no_dtd&getfields=*&tlen=120&client=ek_drupal_01&proxystylesheet=ek_drupal_01&filter=p&query=smoke+alarm+re

As such, 10-yr smoke alarms have a proven track record of reliability.

Further, NFPA studies, see for example <https://www.nfpa.org/News-and-Research/Data-research-and-tools/Detection-and-Signaling/Smoke-Alarms-in-US-Home-Fires>,

indicate the reason for smoke alarm failures and subsequent injuries and deaths in fires are most related to the failure to replace a battery for battery only smoke alarms, the failure of the replacement back-up battery for 120vac models when power failures occur and the removal of batteries for other purposes.

The 10yr battery powered smoke alarm removes these failure mode potentials, so is more reliable and is likely to save lives.

NFPA 72 has permitted 10-yr battery only smoke alarms for more than a decade and our Work Group has been directed by the FCAC to align the I-Codes with NFPA 72 to the extent possible.

2. Cost impact - The retail price differential between a traditional smoke alarm (120vac powered with a 9vac battery backup) and 10-yr smoke alarms is about \$13 (\$35 for the former and \$22 for the latter based on retail prices at Home Depot October 2018).

Given the number of commercial occupancies involved (hotels, apartments, condominiums, dormitories, board and care facilities, assistive living facilities and time-shares) the number of smoke alarms to be replaced in the near-term (2019-2022), as the 2018 IFC is adopted state-by-state, is estimated at more than 200 million based on the ten-year age replacement obligation and in such occupancies' sleeping accommodations where only one smoke alarm is required. The cost savings to those owner/operators is thus estimated at \$2.6 billion, if 10-yr smoke alarms technology could replace traditional 120vac/9vac powered smoke alarms.

Bibliography: NFPA 72 -2019 and manufacturerers literature noted.

Cost Impact: The code change proposal will decrease the cost of construction

The proposed code change would decrease the cost of operations for occupanices utilizing single station smoke alarms.

Proposal # 5048

EB81-19

IEBC: 803.2.2, 803.2.2.2 (New)

Proponent: John Williams, representing Healthcare Committee (AHC@iccsafe.org)

2018 International Existing Building Code

Revise as follows:

803.2.2 Groups A, B, E, F-1, H, I-1, I-3, I-4, M, R-1, R-2, R-4, S-1 and S-2. In buildings with occupancies in Groups A, B, E, F-1, H, I-1, I-3, I-4, M, R-1, R-2, R-4, S-1 and S-2, *work areas* that have exits or corridors shared by more than one tenant or that have exits or corridors serving an occupant load greater than 30 shall be provided with automatic sprinkler protection where both of the following conditions occur:

1. The *work area* is required to be provided with automatic sprinkler protection in accordance with the International Building Code as applicable to new construction.
2. The *work area* exceeds 50 percent of the floor area.

Exception: If the building does not have sufficient municipal water supply for design of a fire sprinkler system available to the floor without installation of a new fire pump, *work areas* shall be protected by an automatic smoke detection system throughout all occupiable spaces other than sleeping units or individual dwelling units that activates the occupant notification system in accordance with Sections 907.4, 907.5 and 907.6 of the International Building Code.

803.2.2.1 Mixed uses. In *work areas* containing mixed uses, one or more of which requires automatic sprinkler protection in accordance with Section 803.2.2, such protection shall not be required throughout the *work area* provided that the uses requiring such protection are separated from those not requiring protection by fire-resistance-rated construction having a minimum 2-hour rating for Group H and a minimum 1-hour rating for all other occupancy groups.

Add new text as follows:

803.2.2.2 Group I-2. In Group I-2 occupancies, an automatic sprinkler system installed in accordance with Section 903.3.1.1 of the International Fire Code shall be provided in the following:

1. In Group I-2, Condition 1, throughout the work area .
2. In Group I-2, Condition 2, throughout the work area where the work area is 50 percent or less of the smoke compartment.
3. In Group I-2, Condition 2, throughout the smoke compartment in which the work occurs where the work area exceeds 50 percent of the smoke compartment.

Reason: This change provides a method for determining where sprinklers are required for group I-2 facilities undergoing at least a level 2 alteration. While the IFC already requires fire areas containing Group I-2 to be sprinklered, this change provides a mechanism and encouragement for those facilities coming up to this standard. This language is also consistent with the approach taken by the federal reimbursement agency. This proposal is submitted by the ICC Committee on Healthcare (CHC). The CHC was established by the ICC Board to evaluate and assess contemporary code issues relating to healthcare facilities. This is a joint effort between ICC and the American Society for Healthcare Engineering (ASHE), a subsidiary of the American Hospital Association, to eliminate duplication and conflicts in healthcare regulation. In 2017 and 2018 the CHC held 4 open meetings and numerous conference calls, *which included members of the committees as well as any interested parties, to discuss and debate the proposed changes*. Information on the CHC, including: meeting agendas; minutes; reports; resource documents; presentations; and all other materials developed in conjunction with the CHC effort can be downloaded from the CHC website at: <https://www.iccsafe.org/codes-tech-support/cs/icc-committee-on-healthcare/>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This allows for sprinklers to be added over time, instead of a complete building. This is already required by federal reimbursement requirements.

Proposal # 4247

EB81-19

EB82-19

IEBC@: 803.2.2

Proponent: Kevin Duerr-Clark, New York State Department of State, representing New York State Department of State (kevin.duerr-clark@dos.ny.gov); John Addario, New York State Department of State - Building Standards & Codes, representing New York State Department of State (john.addario@dos.ny.gov)

2018 International Existing Building Code

Revise as follows:

803.2.2 Groups A, B, E, F-1, H, I, M, R-1, R-2, R-4, S-1 and S-2. In buildings with occupancies in Groups A, B, E, F-1, H, I, M, R-1, R-2, R-4, S-1 and S-2, *work areas* that have exits or corridors shared by more than one tenant or that have exits or corridors serving an occupant load greater than 30 shall be provided with automatic sprinkler protection where both of the following conditions occur:

1. The *work area* is required to be provided with automatic sprinkler protection in accordance with the International Building Code as applicable to new construction.
2. The *work area* exceeds 50 percent of the floor area.

Exception: If the building does not ~~have sufficient municipal water supply for~~ have an existing municipal water supply present at the floor of the proposed work area, with sufficient pressure and flow for the design of a fire sprinkler system available to the floor without, and without installation of a new fire pump, work, service piping, or vertical piping, the *work areas* shall be protected by an automatic smoke detection system throughout all occupiable spaces other than sleeping units or individual dwelling units that activates the occupant notification system in accordance with Sections 907.4, 907.5 and 907.6 of the International Building Code.

Reason: There is some confusion surrounding the language of the exception to this section. Some interpret that "sufficient municipal supply available to the floor" means a water main is in the ROW with adequate pressures and flow, and available to tap into with new piping to the building and work area. As supported by the ICC IEBC Interpretation No. 12-04 (see attached), it was never intended for a new water service pipe or vertical/riser pipes to be installed as a requirement for "sufficient municipal supply" to satisfy this code section. The newly proposed language makes it clear that the existing sufficient municipal supply is to exist and be available to the floor where the work area is located without the installation of new service piping, fire pump, or vertical piping.

Commentary to this code section states *"One exception to these requirements states that if the building does not have a sufficient municipal water supply for a sprinkler system at the floor where the work area is located, then sprinklers are not required; however, that same exception does require an automatic smoke detection system throughout the work area. The smoke detection coverage is required throughout all occupiable spaces other than areas already required to install smoke alarms."* While useful in understanding this code section, in many cases the Commentary is not available or enforceable. This proposal brings the stated intent of in the Commentary into the actual Code language.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This is simply a clarification of the language as already interpreted by ICC and the commentary, so no change in the construction cost is anticipated.

Proposal # 4102

EB82-19

EB83-19

IEBC@: 803.2.4 (New), 904.1.4 (New), 904.1.5 (New), 904.1.4

Proponent: Jeffrey Hugo, representing National Fire Sprinkler Association (hugo@nfsa.org)

2018 International Existing Building Code

Add new text as follows:

803.2.4 Other required automatic sprinkler systems In buildings and areas listed in Table 903.2.11.6 of the *International Building Code*, work areas that have exits or corridors shared by more than one tenant or that have exits or corridors serving an occupant load greater than 30 shall be provided with an automatic sprinkler system under the following conditions:

1. The work area is required to be provided with an automatic sprinkler system in accordance with the *International Building Code* applicable to new construction; and
2. The building has sufficient municipal water supply for design of an automatic sprinkler system available to the floor without installation of a new fire pump.

904.1.4 Groups A, B, E, F-1, H, I, M, R-1, R-2, R-4, S-1 and S-2 In buildings with occupancies in Groups A, B, E, F-1, H, I, M, R-1, R-2, R-4, S-1 work areas shall be provided with automatic sprinkler protection where all of the following conditions occur:

1. The work area is required to be provided with automatic sprinkler protection in accordance with the *International Building Code* as applicable to new construction; and
2. The building site has sufficient municipal water supply for design and installation of an automatic sprinkler system.

904.1.5 Windowless stories Work located in a windowless story, as determined in accordance with the *International Building Code*, shall be sprinklered where the work area is required to be sprinklered under the provisions of the *International Building Code* for newly constructed buildings and the building site has a sufficient municipal water supply for the design and installation of an *automatic sprinkler system*.

Revise as follows:

~~904.1.4~~ **904.1.6 Other required automatic sprinkler systems.** In buildings and areas listed in Table 903.2.11.6 of the International Building Code, ~~work areas that have exits or corridors shared by more than one tenant or that have exits or corridors serving an occupant load greater than 30~~ shall be provided with an automatic sprinkler system under the following conditions:

1. The *work area* is required to be provided with an automatic sprinkler system in accordance with the International Building Code applicable to new construction.
2. The building site has sufficient municipal water supply for design and installation of an automatic sprinkler system.

Reason: This proposal backfills Section 803.2.4 to Chapter 8 to fill the void that was unintentionally created in the 2018 cycle (Proposal EB61). Without this change, other areas that require fire protection in the IBC will be missed in Level 2 Alterations.

The two new 904 sections (904.1.4 and 904.1.5) correlate with the new threshold of Level 3 alterations created by (Proposal EB61) 2018 IEBC Section 904.1.4 .

The changes to Section 904 fill a void for increased fire protection for Level 3 alterations. The IEBC committee considered three proposals EB59, EB 60 and EB61 during the 2018 development cycle. All three lowered the Level 2 threshold from a new fire pump to available water on the site. The membership and committee discussion favored these three proposals but to a Level 3, leaving Level 2 as is. The committee successfully made a modification to move EB61 to Level 3 but was unable to reconsider EB59 & EB60. During the PCH, public comments to correct EB 59 & EB60 failed to receive the 2/3 majority to complete the correlation.

Cost Impact: The code change proposal will increase the cost of construction

Level 3 alterations will have an increase of initial fire protection cost, however, there are other cost-neutral or cost-reducing measures fire protection systems provide in the model codes and community risk reduction.

Proposal # 5580

EB83-19

EB84-19

IEBC@: 803.4.1, 803.4.1.1 (New), 803.4.1.2 (New)

Proponent: Dan Finnegan, Siemens, representing Self (daniel.finnegan@siemens.com)

2018 International Existing Building Code

Revise as follows:

803.4.1 Occupancy requirements. A fire alarm system shall be installed in accordance with Sections 803.4.1.1 through 803.4.1.6. Existing alarm-notification appliances shall be automatically activated throughout the building. ~~Where the building is not equipped with a fire alarm system, alarm-notification appliances within the work area shall be provided and automatically activated.~~

Exceptions:

1. Occupancies with an existing, previously *approved* fire alarm system.
2. Where selective notification is permitted, alarm-notification appliances shall be automatically activated in the areas selected.

Add new text as follows:

803.4.1.1 Fire alarm control unit. ~~Where the building is not equipped with a fire alarm system, the following shall apply:~~

1. A building fire alarm control unit/system shall be provided with an annunciator installed at an approved location
2. All fire alarm system requirements in Work Areas in the building shall be connected into the building fire alarm control unit/system

803.4.1.2 Initiating and notification devices. ~~Where the building is equipped with a fire alarm system, all fire alarm system initiating, and notification devices required in the work area shall be connected into the existing fire alarm control unit/system.~~

Reason: An existing building without a fire alarm system, when following the existing language will have multiple fire alarm panels scattered throughout the building, based on the fire alarm system/panel being installed only for that Work Area. This code change will require a "building" fire alarm panel be installed with the first Work Area. From that point on all additional work will be tied into the building fire alarm panel. This will be more cost effective over time, and provide the minimum level of life safety for the building occupants and first responders

Cost Impact: The code change proposal will increase the cost of construction

The initial cost of the fire panel will be borne by the first tenant/work area/owner. This will depend on the size of the building. Could be a 5 to 10K cost

Proposal # 4807

EB84-19

EB85-19

IEBC@: 803.4.1.1 (New)

Proponent: Dan Finnegan, Siemens, representing Self (daniel.finnegan@siemens.com)

2018 International Existing Building Code

Add new text as follows:

803.4.1.1 Extent of installation. Audible/visual notification appliances shall be provided in accordance with this code for the work area and the entire common area of the floor or fire area, and shall be connected to the building fire alarm control unit/system

Reason: In addition for the need for a fire alarm control unit as addressed in the first IEBC alarm proposal this will require that the common areas of the entire floor or fire area be provided with notification appliances so when a fire is detected the occupants will receive a level of notification.

Cost Impact: The code change proposal will increase the cost of construction
Will depend on the number of notification devices and the size of the floor area. Estimate about 390.00 per device installed.

Proposal # 4808

EB85-19

EB86-19

IEBC@: 803.4.1.2 (New), 803.4.1.3 (New)

Proponent: John Williams, representing Healthcare Committee (AHC@iccsafe.org)

2018 International Existing Building Code

Revise as follows:

803.4.1.2 Group I-1. A An automatic fire alarm system shall be installed in *work areas* of Group I-1 ~~residential care/assisted living~~ facilities as required by Chapter 11 of the International Fire Code for existing Group I-1 occupancies.

803.4.1.3 Group I-2. ~~A~~ An automatic fire alarm system shall be installed throughout Group I-2 occupancies as required by Chapter 11 of the International Fire Code .

Reason: This is coordination with the requirements in the International Fire Code for existing buildings. The term 'residential care/assisted living' is no longer used in the code. Leaving it in this section is confusing.

This proposal is submitted by the ICC Committee on Healthcare (CHC). The CHC was established by the ICC Board to evaluate and assess contemporary code issues relating to healthcare facilities. This is a joint effort between ICC and the American Society for Healthcare Engineering (ASHE), a subsidiary of the American Hospital Association, to eliminate duplication and conflicts in healthcare regulation. In 2017 and 2018 the CHC held 4 open meetings and numerous conference calls, *which included members of the committees as well as any interested parties, to discuss and debate the proposed changes*. Information on the CHC, including: meeting agendas; minutes; reports; resource documents; presentations; and all other materials developed in conjunction with the CHC effort can be downloaded from the CHC website at: <https://www.iccsafe.org/codes-tech-support/cs/icc-committee-on-healthcare/>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is consistent with requirements already in IFC.

Proposal # 4277

EB86-19

EB87-19

IEBC@: 805.3.1.1, TABLE 805.3.1.1(1), 1301.6.17, 1301.6.17.1

Proponent: Jeffrey Hugo, National Fire Sprinkler Association, representing National Fire Sprinkler Association (hugo@nfsa.org)

2018 International Existing Building Code

Revise as follows:

805.3.1.1 Single-exit buildings. A single exit or access to a single exit shall be permitted from spaces, any story or any occupied roof where one of the following conditions exists:

1. The occupant load, number of dwelling units and exit access travel distance do not exceed the values in Table 805.3.1.1(1) or 805.3.1.1(2).
2. In Group R-1 or R-2, ~~nonsprinklered~~ buildings without an approved automatic sprinkler system, individual single-story or multiple-story dwelling or sleeping units shall be permitted to have a single exit or access to a single exit from the dwelling or sleeping unit provided one of the following criteria are met:
 - 2.1. The occupant load is not greater than 10 and the exit access travel distance within the unit does not exceed 75 feet (22 860 mm).
 - 2.2. The building is not more than three stories in height; all third-story space is part of dwelling with an exit access doorway on the second story; and the portion of the exit access travel distance from the door to any habitable room within any such unit to the unit entrance doors does not exceed 50 feet (15 240 mm).
3. In buildings of Group R-2 occupancy of any number of stories with not more than four dwelling units per floor served by an interior exit stairway; with a smokeproof enclosure in accordance with Sections 909.20 and 1023.11 of the International Building Code or an exterior stairway as an exit; and where the portion of the exit access travel distance from the dwelling unit entrance door to the exit is not greater than 20 feet (6096 mm).

TABLE 805.3.1.1(1)
STORIES WITH ONE EXIT OR ACCESS TO ONE EXIT FOR R-2 OCCUPANCIES

STORY	OCCUPANCY	MAXIMUM NUMBER OF DWELLING UNITS	MAXIMUM EXIT ACCESS TRAVEL DISTANCE (feet)
Basement, first or second story above grade plane	R-2 ^a	4 dwelling units	50
Third story above grade plane and higher	NP	NA	NA

For SI: 1 foot = 304.8 mm.

NP = Not Permitted.

NA = Not Applicable.

- a. Group R-2, ~~nonsprinklered~~ without an approved automatic sprinkler system and provided with emergency escape and rescue openings in accordance with Section 1030 of the International Building Code.

1301.6.17 Automatic sprinklers. Evaluate the ability to suppress or control a fire based on the installation of an automatic sprinkler system in accordance with Section ~~903.3.1.1-903.3.1~~ 903.3.1 of the International Building Code. "Required sprinklers" shall be based on the requirements of ~~this code-~~ the International Building Code. Under the categories and occupancies in Table 1301.6.17, determine the appropriate value and enter that value into Table 1301.7 under Safety Parameter 1301.6.17, Automatic Sprinklers, for fire safety, means of egress divided by 2, and general safety. High-rise buildings defined in Chapter 2 of the International Building Code that undergo a *change of occupancy* to Group R shall be equipped throughout with an automatic sprinkler system in accordance with Section 403 of the International Building Code and Chapter 9 of the International Building Code. Facilities in Group I-2 occupancies meeting Category a, b, c or f shall be considered to fail the evaluation.

1301.6.17.1 Categories. The categories for automatic sprinkler system protection are:

1. Category ~~a—Sprinklers are~~ a—An approved automatic sprinkler system is required throughout; an approved automatic sprinkler system is not provided.
 2. ~~Category b—An approved automatic sprinkler system is required in a fire area or compartment; an approved automatic sprinkler system sprinkler is not provided; sprinkler protection is not provided or the sprinkler system design is not adequate for the hazard protected in accordance with Section 903 of the International Building Code.~~ 2. Category b—Sprinklers are required in a portion of the building; sprinkler protection is not provided or the sprinkler system design is not adequate for the hazard protected in accordance with Section 903-Chapter 9 of the International Building Code.

3. Category ~~e~~—~~Sprinklers are c~~—An approved automatic sprinkler system is not required; none are provided.
4. Category ~~d~~—~~Sprinklers are d~~—An approved automatic sprinkler system is required in a ~~portion of the building; sprinklers are provided in such portion; the system is one that complied with the code at the time of installation and is maintained and supervised in accordance with Section 903~~ fire area or compartment; an approved automatic sprinkler system is provided in a fire area or compartment in accordance with Chapter 9 of the International Building Code.
5. Category ~~e~~—~~Sprinklers are e~~—An approved automatic sprinkler system is required throughout; ~~sprinklers are an approved automatic sprinkler system is~~ provided throughout in accordance with Chapter 9 of the International Building Code.
6. Category ~~f~~—~~Sprinklers are f~~—An approved automatic sprinkler system is not required throughout; ~~sprinklers are an approved automatic sprinkler system is~~ provided throughout in accordance with Chapter 9 of the International Building Code.

Reason: IEBC 805.3.1.1:

An "unsprinklered" building is not defined and is a subjective term. This proposal uses terms that are defined and correlate to the other ICC codes.

IEBC 1301.6.17:

These changes swap the term "sprinklers" with the defined terms of "approved" and "automatic sprinkler system" to correlate to the other ICC codes. Below are specific reasons for each text change:

"...or control..." This change correctly addresses automatic fire sprinkler systems for the majority of installations. Fire sprinkler systems designed according to NFPA 13, NFPA 13R and NFPA 13D are designed to control fires. There are a few instances where the fire sprinkler is designed to suppress fires, such as in storage occupancies. It is appropriate to have "control" more than suppression in the code text, but this proposal leaves suppression in to accommodate the suppression in storage occupancies. ..."

"...Section 903.3.1.1..." This change removes the limitation of the values to be used just on a NFPA 13 system. The values cannot be limited to just NFPA 13 systems. The intent of the proposal that expanded the values for 1996 BOCA did not prohibit NFPA 13R systems (B213-95), likewise, the values table has occupancies that are permitted to use NFPA 13R (R-1, R-2) and NFPA 13D (R-3, R-4) systems. When a building is sprinklered according to any of the sprinkler standards, they are considered fully sprinklered.

"...the International Building Code..." When this section was located in the IBC it also stated "this code". This section wasn't revised when it moved from the IBC to the IEBC. Every other section in Chapter 14 of the IEBC that has similar language refers to the IBC. For example, IEBC Section 1401.6.18 refers the requirements back to the IBC. this code..."

"Category a" This change updates and clarifies where sprinklers are throughout to make the user aware of the extent of sprinklers protection. The latter portion of the text is removed. The value assigned to this is extreme and is redundant with Category b. Having no sprinklers and an under-designed system is not equal. Both are detrimental, but one has no protection, the other has some form of protection. The penalty for an under-designed system should a Category b and keep the unsprinklered building as the highest penalty.

"Category b" This change provides a negative value when a fire area or compartment that is required to have sprinklers, but doesn't. Fire areas are defined in the IBC and "compartments" are used and qualified in Section 1301.6.3. These terms are concrete and have definite passive fire protection boundaries than the subjective term "portion". By using fire area and compartments, the code official and the user can be clear where sprinklers are supposed to be installed. There are some occupancies, such as A-1, A-2, A-3 and A-4, that are only required to have sprinklers in the fire area. Other fire areas may not need fire sprinklers. This change would provide buildings with sprinklered fire areas some credit. The value would not apply to a partial systems for incidental uses or other partial or limited-area system installation. The value would only be applied when the fire areas that are supposed to have sprinklers are installed according to the appropriate standard, or when the compartment is sprinklered.

"Category d" This change assigns the partial system for a fire area with a value. It also removes the undefined term "portion". Fire areas are defined in the IBC and "compartments" are used and qualified in Section 1301.6.3. These terms are concrete and have definite passive fire protection boundaries than the subjective term "portion" which will have differing boundaries by every user for every building that is evaluated. By using fire area and compartments, the code official and the user can be clear where sprinklers are supposed to be installed. This proposal also removes the value that is assigned for the maintenance of the system according to the edition of the standard when it was installed. The IBC and IFC along with NFPA 13 require the sprinkler system to be maintained according to NFPA 25. This may not have been clear when the proposal was drafted for the 1996 BOCA. NFPA 25 was a new standard in 1992 and while it was referenced by the BOCA Fire Prevention Code, the scope may not have been fully understood and enforcement was difficult if the BOCA Fire Prevention Code was not specifically adopted.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
No cost impact, correlative change.

EB88-19

IEBC@: 805.4.1.2 (New)

Proponent: John Williams, representing Healthcare Committee (AHC@iccsafe.org)

2018 International Existing Building Code

Revise as follows:

805.4.1.2 Group I-2. ~~In buildings of Group I-2 occupancy, any patient sleeping room or suite of patient rooms greater than 1,000 square feet (93 m²) within the work area shall have not fewer than two egress doorways.~~ Condition 2, work areas that include altered care suites shall comply with Sections 407.4.4 through 407.4.4.6.2 of the International Building Code.

Reason: The existing language of this paragraph only references patient sleeping rooms. It is important to define the limit of a suite requiring two exits beyond the sleeping rooms, because hospitals also utilize suites that do not sleep patients, but are used for treatment. This proposal captures the 2,500 square-foot limit already established by the federal standard. This change is limited to I-2, Condition 2 (hospitals) because suites are not widely used in the nursing home or post-acute care setting.

IFC 1105.8 Group I-2 care suites. Care suites in existing Group I-2, Condition 2 occupancies shall comply with Sections 407.4.4 through 407.4.4.6.2 of the *International Building Code*.

This proposal is submitted by the ICC Committee on Healthcare (CHC). The CHC was established by the ICC Board to evaluate and assess contemporary code issues relating to healthcare facilities. This is a joint effort between ICC and the American Society for Healthcare Engineering (ASHE), a subsidiary of the American Hospital Association, to eliminate duplication and conflicts in healthcare regulation. In 2017 and 2018 the CHC held 4 open meetings and numerous conference calls, *which included members of the committees as well as any interested parties, to discuss and debate the proposed changes*. Information on the CHC, including: meeting agendas; minutes; reports; resource documents; presentations; and all other materials developed in conjunction with the CHC effort can be downloaded from the CHC website at: <https://www.iccsafe.org/codes-tech-support/cs/icc-committee-on-healthcare/>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction Group I-2, Condition occupancies already conform to this requirement.

Proposal # 4244

EB88-19

EB89-19

IEBC@: 805.4.4

Proponent: Jonathan Roberts, UL LLC, representing UL LLC (jonathan.roberts@ul.com)

2018 International Existing Building Code

Revise as follows:

805.4.4 Panic and fire exit hardware. In any *work area*, and in the egress path from any *work area* to the exit discharge, in buildings or portions thereof of Group A assembly occupancies with an occupant load greater than 100, all required exit doors equipped with latching devices shall be equipped with *approved* panic hardware or fire exit hardware in accordance with Section 1010.1.10 of the International Building Code.

Reason: Fire exit hardware should be included as an approved option in these requirements for those installations where the hardware is used on a fire door. Both panic hardware and fire exit hardware are life safety devices, and should be installed in accordance with the requirements in Chapter 10 of the IBC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. There are numerous panic and fire exit hardware that already comply with Section 1010.1.10, so when these are used there will be no increase in costs.

Proposal # 4844

EB89-19

EB90-19

IEBC@: 805.5.3

Proponent: Allison Cook, representing VBCOA; Ronald Clements Jr, representing Chesterfield County (clementsro@chesterfield.gov); Kenney Payne, Moseley Architects, representing AIA Virginia (kpayne@moseleyarchitects.com); Charles Vernon, representing VBCOA (cvernon@arlingtonva.us); Debra McMahon (debra.mcmahon@fairfaxcounty.gov); Michael Williams (mike.williams@harrisonburgva.gov); Christina Jackson, representing City of Norfolk / WICED of VA (christina.reynolds@norfolk.gov)

2018 International Existing Building Code

Revise as follows:

805.5.3 Other corridor openings. In any *work area*, unless otherwise protected or fire-resistant rated in accordance with Section 716 of the IBC, any other sash, grille, or opening in a corridor and any window in a corridor not opening to the outside air shall be sealed with materials consistent with the corridor construction.

Reason: As currently written, the provision states that any other corridor opening shall be sealed. This is regardless of the level of protection that might already exist. So, an otherwise code-compliant opening or window would still need to be sealed. Sealing should only be required when such protection or rating is not already provided in accordance with the IBC.

Cost Impact: The code change proposal will decrease the cost of construction
This proposal could result in cost decrease by eliminating unnecessary sealing of otherwise compliant openings.

Proposal # 5554

EB90-19

EB91-19

IEBC@: 805.6 (New)

Proponent: John Williams, representing Healthcare Committee (AHC@iccsafe.org)

2018 International Existing Building Code

Revise as follows:

805.6 Dead-end corridors. Dead-end corridors in any *work area* shall not exceed 35 feet (10 670 mm) . In Group I-2 occupancies, dead-end corridors shall not exceed 30 feet (9144 mm).

Exceptions:

1. Where dead-end corridors of greater length are permitted by the International Building Code .
2. In other than Group A, I-2 and H occupancies, the maximum length of an existing dead-end corridor shall be 50 feet (15 240 mm) in buildings equipped throughout with an automatic fire alarm system installed in accordance with the International Building Code .
3. In other than Group A, I-2 and H occupancies, the maximum length of an existing dead-end corridor shall be 70 feet (21 356 mm) in buildings equipped throughout with an automatic sprinkler system installed in accordance with the International Building Code .
4. In other than Group A, I-2 and H occupancies, the maximum length of an existing, newly constructed, or extended dead-end corridor shall not exceed 50 feet (15 240 mm) on floors equipped with an automatic sprinkler system installed in accordance with the International Building Code .

Reason: For I-2 occupancies, a 30 foot corridor is required by the federal standard. If the subject corridor is within the work area of Level 2 construction, it is appropriate for work to be done to modify it to conform with that standard. This is consistent with what is currently permitted under IFC 1105.6.5.

IFC 1105.6.5 Dead-end corridors. In smoke compartments containing patient sleeping rooms and treatment rooms, dead-end *corridors* shall not exceed 30 feet (9144 mm) unless approved by the *fire code official*.

This proposal is submitted by the ICC Committee on Healthcare (CHC). The CHC was established by the ICC Board to evaluate and assess contemporary code issues relating to healthcare facilities. This is a joint effort between ICC and the American Society for Healthcare Engineering (ASHE), a subsidiary of the American Hospital Association, to eliminate duplication and conflicts in healthcare regulation. In 2017 and 2018 the CHC held 4 open meetings and numerous conference calls, *which included members of the committees as well as any interested parties, to discuss and debate the proposed changes*. Information on the CHC, including: meeting agendas; minutes; reports; resource documents; presentations; and all other materials developed in conjunction with the CHC effort can be downloaded from the CHC website at: <https://www.iccsafe.org/codes-tech-support/cs/icc-committee-on-healthcare/>.

Cost Impact: The code change proposal will increase the cost of construction

This code change will add construction cost, because additional modification to the corridor would be required to reduce the dead end from 35 to 30 feet.

Proposal # 4250

EB91-19

EB92-19

IEBC@: SECTION 809, 809.1, 1009.1

Proponent: Allison Cook, Arlington, VA, representing myself; Christina Jackson, representing City of Norfolk / WICED of VA (christina.reynolds@norfolk.gov)

2018 International Existing Building Code

Delete without substitution:

~~SECTION 809- PLUMBING~~

~~**809.1 Minimum fixtures.** Where the occupant load of the story is increased by more than 20 percent, plumbing fixtures for the story shall be provided in quantities specified in the International Plumbing Code based on the increased occupant load.~~

Revise as follows:

1009.1 Increased demand. Where the occupancy of an *existing building* or part of an *existing building* is changed such that the new occupancy is subject to increased or different plumbing fixture requirements or to increased water supply requirements in accordance with the International Plumbing Code, the new occupancy shall comply with the intent of the respective International Plumbing Code provisions.

Exception: Only where the occupant load of the story is increased by more than 20 percent, plumbing fixtures for the story shall be provided in quantities specified in the International Plumbing Code based on the increased occupant load.

Reason: The change of occupancy definition includes "Change of occupancy includes the language "any change in use within a group for which there is a change in the application of the requirements of this code" So, an increase in occupant load of 20% is a change of occupancy. This does not belong in a level 2 alteration. Relocating this code section as an exception under the change of occupancy reduces confusion about what is or is not a change of occupancy. It also eliminates the conflict between section 809.1 (which essentially says you can increase occupant load without adding fixtures) and section 1009.1 (which says requires tenants to add fixtures if the IPC requires a greater fixture quantity or different type)

Cost Impact: The code change proposal will decrease the cost of construction
Applying this section to all change of occupancy will reduce the requirement to add plumbing fixtures to existing tenant spaces.

Proposal # 5439

EB92-19

EB93-19

IEBC@: 904.2, 904.2.1, 904.2.2

Proponent: Dan Finnegan, Siemens, representing Self (daniel.finnegan@siemens.com)

2018 International Existing Building Code

Revise as follows:

904.2 Fire alarm and detection systems. Fire alarm and detection shall be provided in accordance with Section 907 of the International Building Code as required for new construction.

904.2.1 Manual fire alarm systems. Where required by the International Building Code , a manual fire alarm system shall be provided throughout the *work area*. Alarm notification appliances shall be provided on such floors and shall be automatically activated as required by the International Building Code .

Exceptions:

1. Alarm-initiating ~~and notification appliances~~ devices shall not be required to be installed in tenant spaces outside of the *work area*.
2. ~~Visual alarm notification appliances are not required, except where an existing alarm system is upgraded or replaced or where a new fire alarm system is installed.~~

904.2.2 Automatic fire detection. Where required by the International Building Code for new buildings, automatic fire detection systems shall be provided throughout the *work area*.

Reason: This proposal follows the life safety concept in the other IEBC alarm proposal that requires installation of audible and visual notification appliances beyond the work area for level 2 alterations. When a work area is on a floor, the exception will state only alarm initiating devices are not needed outside the space of the work area. It will require the notification appliances to be installed outside the work area to provide proper notification to occupants at risk when an alarm initiating device has been activated.

Cost Impact: The code change proposal will increase the cost of construction
Will depend on the number of notification devices and the size of the floor area. Estimate about 390.00 per device installed

Proposal # 4809

EB93-19

EB94-19

IEBC: 905.4 (New), 503.17 (New)

Proponent: Dawn Anderson, representing self (gonedawning@yahoo.com); Gene Boecker, representing Code Consultants, Inc. (geneb@codeconsultants.com); Dan Buuck, representing National Association of Home Builders (dbuuck@nahb.org); David Collins, representing the American Institute of Architects (dcollins@preview-group.com); Marsha Mazz, representing United Spinal Association (m.mazz@verizon.net)

2018 International Existing Building Code

SECTION 905 MEANS OF EGRESS

905.1 General. The means of egress shall comply with the requirements of Section 805 except as specifically required in Sections 905.2 and 905.3.

905.2 Means-of-egress lighting. Means of egress from the highest *work area* floor to the floor of exit discharge shall be provided with artificial lighting within the exit enclosure in accordance with the requirements of the International Building Code .

905.3 Exit signs. Means of egress from the highest *work area* floor to the floor of exit discharge shall be provided with exit signs in accordance with the requirements of the International Building Code .

Add new text as follows:

905.4 Two-way communications systems. In buildings with elevator service, a two way communication systems shall be provided in accordance with Section 1009.8 of the International Building Code.

SECTION 503 ALTERATIONS

503.17 Two-way communications systems. Where the work area for alterations exceeds 50 percent of the building area and the building has elevator service, a two way communication systems shall be provided in accordance with Section 1009.8 of the International Building Code.

Reason: The addition of Sections 503.7 and 905.4 would allow for a person who could not use the stairways for evacuation to at least have a way to contact emergency responders. Since this is only alteration of Level 3 or exceeds 50% of the building area, this would have minimal impact on the construction and would be a big boost for persons who needed assistance in evacuation and the fire department.

Cost Impact: The code change proposal will increase the cost of construction
A two way communication system may need to be added in older multi-story buildings that were undergoing Level 3 alterations.

Proposal # 4417

EB94-19

EB95-19

IEBC: SECTION 908 (New), 908.1 (New), 1010.2 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Existing Building Code

Add new text as follows:

SECTION 908 **EMERGENCY RESPONDER RADIO COVERAGE**

908.1 Emergency responder radio coverage in existing buildings. Where existing buildings do not have an approved emergency responder radio coverage in the building based on existing coverage levels of the public safety communication systems, an approved emergency responder radio coverage system shall be installed within the building in compliance with Section 510 of the International Fire Code.

SECTION 1010 **OTHER REQUIREMENTS**

1010.1 Light and ventilation. Light and ventilation shall comply with the requirements of the International Building Code for the new occupancy.

Add new text as follows:

1010.2 Emergency responder radio coverage in existing buildings. Where an existing building undergoes a complete change of occupancy, and the building does not have an approved emergency responder radio coverage based on existing coverage levels of the public safety communication systems, an approved emergency responder radio coverage system shall be installed within the building in compliance with Section 510 of the International Fire Code. The system shall be installed within the time frame established by the code official.

Reason: For jurisdictions that do not adopt the Chapter 11 (retroactive) requirements of the IFC for Emergency Responder Radio Coverage, this proposal would add triggers to the IEBC that would require all existing buildings that undergo a Level 3 alteration or Change of Occupancy to have approved radio coverage. Providing these two triggers for Emergency Responder Radio Coverage provides a reasonable opportunity to install equipment and systems that ensure the safety of emergency responders that depend on reliable communication for their safety. We are not asking for this in a building undergoing a partial change of occupancy with a Level 1 or 2 alteration because that could be only one tenant in a very large multi-tenant building. IFC Section 510 includes all the requirements for the design and installation. Allowing for a time frame for installation in a COO is consistent with IFC Section 1103.2.

This proposal will correlate consistency between the IFC and the IEBC as it relates to the requirements for emergency responder radio coverage in existing buildings.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will increase the cost of construction
For the safety of emergency responders, a system may need to be added in some of the larger buildings.

Proposal # 4232

EB95-19

EB96-19

IEBC@: 1002.1, 1002.2

Proponent: Allison Cook, representing VBCOA; Ronald Clements Jr, representing Chesterfield County (clementsro@chesterfield.gov); Kenney Payne, Moseley Architects, representing AIA Virginia (kpayne@moseleyarchitects.com); Charles Vernon, representing VBCOA (cvernon@arlingtonva.us); Debra McMahon (debra.mcmahon@fairfaxcounty.gov); Christina Jackson, representing City of Norfolk / WICED of VA (christina.reynolds@norfolk.gov)

2018 International Existing Building Code

Revise as follows:

1002.1 Compliance with the building code. ~~Where the character or use of an existing building or part of an existing building is changed~~ undergoes a *change of occupancy* to one of the following special use or occupancy categories as defined described in Chapter 4 in the International Building Code, the building shall comply with all of the applicable requirements of Chapter 4 of the International Building Code applicable to the special use or occupancy.:

1. ~~Covered and open mall buildings.~~
2. ~~Atriums.~~
3. ~~Motor vehicle related occupancies.~~
4. ~~Aircraft related occupancies.~~
5. ~~Motion picture projection rooms.~~
6. ~~Stages and platforms.~~
7. ~~Special amusement buildings.~~
8. ~~Incidental use areas.~~
9. ~~Hazardous materials.~~
10. ~~Ambulatory care facilities.~~
11. ~~Group I-2 occupancies.~~

1002.2 Underground buildings. Incidental uses. ~~An underground building in which there is a change of~~ Where a portion of a building undergoes a *change of occupancy* to one of the incidental uses listed in Table 509 of the International Building Code, the incidental use shall comply with the requirements Section 509 of the International Building Code applicable to underground structures. the incidental use.

Reason: 1002.1- The special use and occupancy section listed some of the special uses addressed in IBC chapter 4 but not all. The commentary suggest that the specific list is for special uses that would not constitute a change in classification and are necessary because a change in occupancy without a change in classification would not invoke the chapter 4 requirements. The current definition of change of occupancy includes a change in use where there is a change in application of code regardless of whether there is a classification change; therefore, the list is no longer necessary. As currently written, regardless of whether a change of classification is involved in a change of occupancy, special use provisions in IBC chapter 4 would not be applicable to any special uses that are not in the list in IEBC chapter 10. This change simplifies the requirement and brings in all of the potential special use hazards that should be mitigated in a change of occupancy involving one of the special uses.

1002.2- Underground structures are a special use per IBC chapter 4 so the change proposed for 1002.1 covers underground buildings. Incidental uses are not special uses addressed by IBC chapter 4 so listing incidental uses in 1002.1 was out of place and will be lost with the proposed amendment to 1002.1; therefore, 1002.2 is proposed to capture the incidental use requirement.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The code change proposal will not increase or decrease the cost of construction since the commentary suggested that all of IBC Chapter 4 was already applicable.

Proposal # 5556

EB96-19

EB97-19

IEBC@: 1002.1 (New), 1011.1.4 (New)

Proponent: John Williams, representing Healthcare Committee (AHC@iccsafe.org)

2018 International Existing Building Code

Revise as follows:

1002.1 Compliance with the building code. Where the character or use of an *existing building* or part of an *existing building* is changed to one of the following special use or occupancy categories as defined in the International Building Code, the building shall comply with all of the applicable requirements of the International Building Code:

1. Covered and open mall buildings.
2. Atriums.
3. Motor vehicle-related occupancies.
4. Aircraft-related occupancies.
5. Motion picture projection rooms.
6. Stages and platforms.
7. Special amusement buildings.
8. Incidental use areas.
9. Hazardous materials.
10. Ambulatory care facilities.
11. ~~Group I-2 occupancies.~~

Add new text as follows:

1011.1.4 Change of occupancy in Healthcare. Where a change of occupancy occurs to a Group I-2 or I-1 facility, the work area with the change of occupancy shall comply with the International Building Code.

Exception: A change in use or occupancy in the following cases shall not be required to meet the International Building Code:

1. Group I-2 Condition 2 to Group I-2 Condition 1
2. Group I-2 to ambulatory healthcare.
3. Group I-2 to Group I-1
4. Group I-1 Condition 2 to a Group I-1 Condition 1

Reason: The most obvious effect of this proposal is to move the discussion regarding Group I-2 occupancies to its own section. This is needed because we are proposing a few exceptions that would only apply to this occupancy class. This proposal also accomplishes two technical changes:

1. It identifies that building converting to a Group I-1 occupancies need careful consideration. There are some special requirements for that occupancy that should be applied during a change of occupancy. For example, group I-1 condition 2 facilities are required to have smoke compartments. Current language would not trigger this requirement. Specifically, the special requirements include Chapter 4 (smoke compartmentation, fire partitions), chapter 9 (sprinkler requirements), and chapter 10 (limitations on the means of egress systems). Due to the special character and risk in Group I-1, we believe these building code provisions should be applied at any change of occupancy.

2. This change also creates a few exceptions to the application of new building code requirements. The current federal requirements allow the "downgrade" of medical facilities from a more intensive to less intensive use. In effect, this encourages older hospitals to become nursing homes and ambulatory surgery facilities; older nursing homes to become assisted living facilities; etc.

This proposal is submitted by the ICC Committee on Healthcare (CHC). The CHC was established by the ICC Board to evaluate and assess contemporary code issues relating to healthcare facilities. This is a joint effort between ICC and the American Society for Healthcare Engineering (ASHE), a subsidiary of the American Hospital Association, to eliminate duplication and conflicts in healthcare regulation. In 2017 and 2018 the CHC held 4 open meetings and numerous conference calls, *which included members of the committees as well as any interested parties, to discuss and debate the proposed changes*. Information on the CHC, including: meeting agendas; minutes; reports; resource documents; presentations; and all other materials developed in conjunction with the CHC effort can be downloaded from the CHC website at: <https://www.iccsafe.org/codes-tech-support/cs/icc-committee-on-healthcare/>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The addition of Group I-1 would increase the cost of construction. The exceptions for Group I-2 would reduce the cost of construction.

Proposal # 4243

EB97-19

EB98-19

IEBC@: 1002.2 (New)

Proponent: John Williams, representing Healthcare Committee (AHC@iccsafe.org)

2018 International Existing Building Code

Add new text as follows:

1002.2 Storage. In Group I-2 occupancies, equipped throughout with an automatic sprinklered in accordance with Section 903.3.1.1, where a room 250 ft² (23.2 m²) or less undergoes a change in occupancy to a storage room, the room shall be separated from the remainder of the building by construction capable of resisting the passage of smoke in accordance with Section 509.4.2 of the International Building Code.

Reason: In buildings of Group I-2, the IBC requires 1 hr separation for such storage rooms for new construction, the IFC only requires construction capable of resisting the passage of smoke when the storage room is protected with an automatic sprinkler system. With the presence of automatic sprinkler protection, the disruption associated with replacing the walls with one-hour fire barriers is not necessary for an act that occurs quite frequently (converting spaces to/from storage spaces quite frequently).

Standard language about correlation with CMS requirements.

This proposal is submitted by the ICC Committee on Healthcare (CHC). The CHC was established by the ICC Board to evaluate and assess contemporary code issues relating to healthcare facilities. This is a joint effort between ICC and the American Society for Healthcare Engineering (ASHE), a subsidiary of the American Hospital Association, to eliminate duplication and conflicts in healthcare regulation. In 2017 and 2018 the CHC held 4 open meetings and numerous conference calls, *which included members of the committees as well as any interested parties, to discuss and debate the proposed changes*. Information on the CHC, including: meeting agendas; minutes; reports; resource documents; presentations; and all other materials developed in conjunction with the CHC effort can be downloaded from the CHC website at: <https://www.iccsafe.org/codes-tech-support/cs/icc-committee-on-healthcare/>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Permits operation change without having to comply with incidental use requirements.

Proposal # 4245

EB98-19

EB99-19

IEBC@: 1007.1 (New)

Proponent: John Williams, representing Healthcare Committee (AHC@iccsafe.org)

2018 International Existing Building Code

Revise as follows:

1007.1 Special occupancies. Where the occupancy of an *existing building* or part of an *existing building* is changed to one of the following special occupancies as described in NFPA 70, the electrical wiring and equipment of the building or portion thereof that contains the proposed occupancy shall comply with the applicable requirements of NFPA 70 ~~whether or not a change of occupancy group is involved~~. Health care facilities, including Group I-2, ambulatory healthcare facilities and outpatient clinics, shall also comply with the applicable requirements of NFPA 99.

1. Hazardous locations.
2. Commercial garages, repair and storage.
3. Aircraft hangars.
4. Gasoline dispensing and service stations.
5. Bulk storage plants.
6. Spray application, dipping and coating processes.
7. Health care facilities, including Group I-2, ambulatory healthcare facilities and outpatient clinics.
8. Places of assembly.
9. Theaters, audience areas of motion picture and television studios, and similar locations.
10. Motion picture and television studios and similar locations.
11. Motion picture projectors.
12. Agricultural buildings.

Reason: NFPA 99 specifies additional requirements for electrical systems in health care facilities than just NFPA 70. In order to meet federal conditions of participation health care facilities must comply with the electrical systems and equipment must be installed according to the requirements listed in NFPA 99, Health Care Facilities Code (K901, K911, and K916). This change will align the electrical systems installation requirements for Outpatient Clinics, Group B Ambulatory Care and Group I-2 facilities.

NFPA 99 uses a risk based approach to system design, installation and maintenance in healthcare facilities (Group I-2 facilities, ambulatory care facilities and outpatient clinics). Four levels of systems categories are defined in NFPA 99, based on the risks to patients and caregivers in the facilities. The categories are as follows:

(1) Category 1: Systems that are expected to be functional at all times. Failure of these systems is likely to cause major injury or death.

(2) Category 2: Systems are expected to have a high level of reliability. Failures of these systems are likely to cause minor injury to patients or caregivers, however, limited short durations of equipment downtime can be tolerated. Category 2 systems are not critical for life support.

(3) Category 3: Normal building system reliabilities are expected. Such systems support patient needs, but failure of such equipment or systems would not immediately affect patient care and are not critical for life support.

(4) Category 4: Such systems have no impact on patient care and would not be noticeable to patients in the event of failure.

The category definitions apply to equipment and systems operations.

A risk assessment should be conducted to evaluate the risk to the patients, staff, and visitors in all healthcare facilities. These categories are not always aligned to occupancy classification. Potential examples of areas/systems and their categories of risk;

(1) Ambulatory surgical center, where patients undergo general anesthesia, Category 1

(2) Reconstructive surgeon's office with general anesthesia, Category 1

(3) Procedural sedation site for outpatient services, Category 2

(4) Cooling systems in Houston, TX, Category 2

(5) Cooling systems in Seattle, WA, Category 3

(6) Heating systems in Chicago, IL Category 2

(7) Dental office, no general anesthesia, Category 3

(8) Typical doctor's office/exam room, Category 4

(9) Group I-2 Condition 2 facilities most systems would be Category 1

This approach more closely aligns system design, performance and maintenance to the safety risk to the public. It does not create significant additional costs.

This proposal is submitted by the ICC Committee on Healthcare (CHC). The CHC was established by the ICC Board to evaluate and assess contemporary code issues relating to healthcare facilities. This is a joint effort between ICC and the American Society for Healthcare Engineering (ASHE), a subsidiary of the American Hospital Association, to eliminate duplication and conflicts in healthcare regulation. In 2017 and 2018 the CHC held 4 open meetings and numerous conference calls, *which included members of the committees as well as any interested parties, to discuss and debate the proposed changes*. Information on the CHC, including: meeting agendas; minutes; reports; resource documents; presentations; and all other materials developed in conjunction with the CHC effort can be downloaded from the CHC website at: <https://www.iccsafe.org/codes-tech-support/cs/icc-committee-on-healthcare/>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This change aligns with existing federal requirements for the healthcare industry.

Proposal # 4242

EB99-19

EB100-19

IEBC@: 1009.5 (New)

Proponent: John Williams, representing Healthcare Committee (AHC@iccsafe.org)

2018 International Existing Building Code

Revise as follows:

1009.5 Group I-2. If the occupancy group is changed to Group I-2, the plumbing system and medical gas system shall comply with the applicable requirements of the International Plumbing Code.

Reason: The *International Plumbing Code* includes medical gas system requirements which are important to comply in many I-2 occupancies. The International Plumbing code provides guidance for medical gas systems to comply with federal guidelines (K903).

This proposal is submitted by the ICC Committee on Healthcare (CHC). The CHC was established by the ICC Board to evaluate and assess contemporary code issues relating to healthcare facilities. This is a joint effort between ICC and the American Society for Healthcare Engineering (ASHE), a subsidiary of the American Hospital Association, to eliminate duplication and conflicts in healthcare regulation. In 2017 and 2018 the CHC held 4 open meetings and numerous conference calls, *which included members of the committees as well as any interested parties, to discuss and debate the proposed changes*. Information on the CHC, including: meeting agendas; minutes; reports; resource documents; presentations; and all other materials developed in conjunction with the CHC effort can be downloaded from the CHC website at: <https://www.iccsafe.org/codes-tech-support/cs/icc-committee-on-healthcare/>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This change aligns with existing federal requirements for the healthcare industry.

Proposal # 4254

EB100-19

EB101-19 Part I

PART I — IEBC: 1011.4.1, 1011.4.6 (New), 506.4 (New); IRC: R310.5, R310.6, 310.9.1 (New)

PART II — IRC@: **SECTION R310 (New), R310.5 (New), R310.6 (New), R310.9.1 (New)**

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD THE IEBC COMMITTEE, PART II WILL BE HEARD BY THE IRC-BUILDING COMMITTEE. PLEASE SEE THE TENTATIVE HEARING ORDERS FOR THE RESPECTIVE COMMITTEES.

2018 International Existing Building Code

Revise as follows:

SECTION 1011 CHANGE OF OCCUPANCY CLASSIFICATION

1011.4 Means of egress, general. Hazard categories in regard to life safety and means of egress shall be in accordance with Table 1011.4.

**TABLE 1011.4
MEANS OF EGRESS HAZARD CATEGORIES**

RELATIVE HAZARD	OCCUPANCY CLASSIFICATIONS
1 (Highest Hazard)	H
2	I-2; I-3; I-4
3	A; E; I-1; M; R-1; R-2; R-4, Condition 2
4	B; F-1; R-3; R-4, Condition 1; S-1
5 (Lowest Hazard)	F-2; S-2; U

1011.4.1 Means of egress for change to a higher-hazard category. Where a change of occupancy classification is made to a higher-hazard category (lower number) as shown in Table 1011.4, the means of egress shall comply with the requirements of Chapter 10 of the International Building Code.

Exceptions:

1. Stairways shall be enclosed in compliance with the applicable provisions of Section 903.1.
2. Existing stairways including handrails and guards complying with the requirements of Chapter 9 shall be permitted for continued use subject to approval of the *code official*. 3. Any stairway replacing an existing stairway within a space where the pitch or slope cannot be reduced because of existing construction shall not be required to comply with the maximum riser height and minimum tread depth requirements.
4. Existing corridor walls constructed on both sides of wood lath and plaster in good condition or 1/2 inch-thick (12.7 mm) gypsum wallboard shall be permitted. Such walls shall either terminate at the underside of a ceiling of equivalent construction or extend to the underside of the floor or roof next above.
5. Existing corridor doorways, transoms and other corridor openings shall comply with the requirements in Sections 805.5.1, 805.5.2 and 805.5.3.
6. Existing dead-end corridors shall comply with the requirements in Section 805.6.
7. ~~An existing operable window with clear opening area not less than 4 square feet (0.38 m²) and minimum opening height and width of 22 inches (559 mm) and 20 inches (508 mm), respectively~~ operable window complying with Section 1011.4.6, shall be accepted as an emergency escape and rescue opening.

1011.4.2 Means of egress for change of use to an equal or lower-hazard category. Where a change of occupancy classification is made to an equal or lesser-hazard category (higher number) as shown in Table 1011.4, existing elements of the means of egress shall comply with the requirements of Section 905 for the new occupancy classification. Newly constructed or configured means of egress shall comply with the requirements of Chapter 10 of the International Building Code.

Exception: Any stairway replacing an existing stairway within a space where the pitch or slope cannot be reduced because of existing construction shall not be required to comply with the maximum riser height and minimum tread depth requirements.

1011.4.3 Egress capacity. Egress capacity shall meet or exceed the occupant load as specified in the International Building Code for the new occupancy.

1011.4.4 Handrails. Existing stairways shall comply with the handrail requirements of Section 805.9 in the area of the *change of occupancy*

classification.

1011.4.5 Guards. Existing guards shall comply with the requirements in Section 805.11 in the area of the *change of occupancy* classification.

Add new text as follows:

1011.4.6 Existing emergency escape and rescue openings. Where a change of occupancy would require emergency escape and rescue opening in accordance with Section 1030.1 of the International Building Code, operable windows serving as the emergency escape and rescue opening shall comply with the following:

1. An existing operable window shall provide a minimum net clear opening of 4 square feet (0.38 m²) with a minimum net clear opening height of 22 inches (559 mm) and a minimum net clear opening width of 20 inches (508 mm).
2. A replacement window where such window complies with both of the following:
 - 2.1. The replacement window meets the size requirements in Item 1.
 - 2.2. The replacement window is the manufacturer's largest standard size window that will fit within the existing frame or existing rough opening. The replacement window shall be permitted to be of the same operating style as the existing window or a style that provides for an equal or greater window opening area than the existing window.

Revise as follows:

SECTION 506 CHANGE OF OCCUPANCY

506.3 Stairways. An existing stairway shall not be required to comply with the requirements of Section 1011 of the International Building Code where the existing space and construction does not allow a reduction in pitch or slope.

Add new text as follows:

506.4 Existing Emergency escape and rescue openings. Where a change of occupancy would require emergency escape and rescue opening in accordance with Section 1030.1 of the International Building Code, operable windows serving as the emergency escape and rescue opening shall comply with the following:

1. An existing operable window shall provide a minimum net clear opening of 4 square feet (0.38 m²) with a minimum net clear opening height of 22 inches (559 mm) and a minimum net clear opening width of 20 inches (508 mm).
2. A replacement window where such window complies with both of the following:
 - 2.1. The replacement window meets the size requirements in Item 1.
 - 2.2. The replacement window is the manufacturer's largest standard size window that will fit within the existing frame or existing rough opening. The replacement window shall be permitted to be of the same operating style as the existing window or a style that provides for an equal or greater window opening area than the existing window.

Proposal # 4167

EB101-19 Part I

EB101-19 Part II

IRC®: SECTION R310 (New), R310.5 (New), R310.6 (New), R310.9.1 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

SECTION R310 EMERGENCY ESCAPE AND RESCUE OPENINGS

~~R310.5~~ **R310.8 Dwelling additions.** Where *dwelling additions* contain sleeping rooms, an emergency escape and rescue opening shall be provided in each new sleeping room. Where *dwelling additions* have *basements*, an emergency escape and rescue opening shall be provided in the new *basement*.

Exceptions:

1. An emergency escape and rescue opening is not required in a new *basement* that contains a sleeping room with an emergency escape and rescue opening.
2. An emergency escape and rescue opening is not required in a new *basement* where there is an emergency escape and rescue opening in an existing *basement* that is *accessed* from the new *basement*.
3. An operable window complying with Section 310.9.1 shall be acceptable as an emergency escape and rescue opening.

~~R310.6~~ **R310.9 Alterations or repairs of existing basements.** ~~An emergency escape and rescue opening is not required where existing basements undergo alterations or repairs.~~

~~Exception:~~ New sleeping rooms created in an existing basement shall be provided with emergency escape and rescue openings in accordance with Section R310.1. Other than new sleeping rooms, where existing basements undergo alterations or repairs an emergency escape and rescue opening is not required.

Exception: An operable window complying with Section 310.9.1 shall be acceptable as an emergency escape and rescue opening.

Add new text as follows:

R310.9.1 Existing Emergency escape and rescue openings. Where a change of occupancy would require emergency escape and rescue opening in accordance with Section 310.1, operable windows serving as the emergency escape and rescue opening shall comply with the following:

1. An existing operable window shall provide a minimum net clear opening of 4 square feet (0.38 m²) with a minimum net clear opening height of 22 inches (559 mm) and a minimum net clear opening width of 20 inches (508 mm).
2. A replacement window where such window complies with both of the following:
 - 2.1. The replacement window meets the size requirements in Item 1.
 - 2.2. The replacement window is the manufacturer's largest standard size window that will fit within the existing frame or existing rough opening. The replacement window shall be permitted to be of the same operating style as the existing window or a style that provides for an equal or greater window opening area than the existing window.

Reason: The intent of this proposal is to allow for some existing or replacement windows to be used for emergency escape and rescue openings (EEROs) while still maintaining the level of safety for occupants and emergency responders.

EEROs are required in IBC Section 1030 only in R-3 and R-4 dwellings and for R-2 apartments in single exit buildings (4 units per floor, 3 stories maximum). So looking at something converting to a single family home per Table 1011.1, Section 1104.1 would only apply if a house was made out of an F-2, S-2 or U – such as a barn to a house. Any other use being converted to a house would be under Section 1011.4.2 – which has no language for EEROs. There does not appear to be any justification for a moving to the same or lesser hazard to be more restrictive than what is allowed for an increased hazard.

The provisions in Section 505 and 702 say they are not applicable to COO, so it should be addressed here for any occupancy that converts to R-3, R-4 and single exit R-2. The size currently permitted under Section 1104.1 Exception 7 for existing window is maintained. The requirements for replacement windows is from current language in 505 and 702.

The same language is proposed for COO under the prescriptive method – which currently does not address EEROs at all.

The IRC requires EEROs in Section R310.1. Current Section R310.5 and R310.6 state when a EERO needs to be added. The exceptions say an existing EERO can be used instead of one added, but it does not have the same allowances for existing windows currently found in the IEBC. It is proposed to allow for this by the new exceptions in R310.5 and 310.6 and a new R301.9.1 which mirrors the current language in the IEBC.

The order of R310.6 of the current allowances has been revised because the exception was more restrictive than the main text.

This is one of a series of proposals to coordinate the requirements for emergency escape and rescue openings in the IBC and IRC. While independent issues, if all the proposals are approved, the IRC section would appear as indicated in the reason for the proposal to revise the definition – emergency escape and rescue openings.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will decrease the cost of construction

The proposed allowance would allow for existing or replacement windows to be used instead of having to install new in some cases.

Proposal # 5755

EB101-19 Part II

EB102-19

IEBC: 1011.1, 1011.1.1, 1011.1.1.1, 1011.1.1.2, 1011.1.2, 1011.1.3, 1011.2.1

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Existing Building Code

Revise as follows:

SECTION 1011 CHANGE OF OCCUPANCY CLASSIFICATION

1011.1 General. The provisions of this section shall apply to buildings or portions thereof undergoing a change of occupancy classification. This includes a *change of occupancy* classification within a group as well as a change of occupancy classification from one group to a different group or where there is a *change of occupancy* within a space where there is a different fire protection system threshold requirement in Chapter 9 of the International Building Code. Such buildings shall also comply with Sections 1002 through 1010 of this code. ~~The application of requirements for the *change of occupancy* shall be as set forth in Sections 1011.1.1 through 1011.1.4. A *change of occupancy*, as defined in Section 202, without a corresponding change of occupancy classification shall comply with Section 1001.2. code.~~

Delete without substitution:

~~**1011.1.1 Compliance with Chapter 9.** The requirements of Chapter 9 shall be applicable throughout the building for the new occupancy classification based on the separation conditions set forth in Sections 1011.1.1.1 and 1011.1.1.2.~~

~~**1011.1.1.1 Change of occupancy classification without separation.** Where a portion of an *existing building* is changed to a new occupancy classification or where there is a *change of occupancy* within a space where there is a different fire protection system threshold requirement in Chapter 9 of the International Building Code, and that portion is not separated from the remainder of the building with fire barriers having a fire-resistance rating as required in the International Building Code for the separate occupancy, the entire building shall comply with all of the requirements of Chapter 9 of this code applied throughout the building for the most restrictive occupancy classification in the building and with the requirements of this chapter.~~

~~**1011.1.1.2 Change of occupancy classification with separation.** Where a portion of an *existing building* is changed to a new occupancy classification or where there is a *change of occupancy* within a space where there is a different fire protection system threshold requirement in Chapter 9 of the International Building Code, and that portion is separated from the remainder of the building with fire barriers having a fire-resistance rating as required in the International Building Code for the separate occupancy, that portion shall comply with all of the requirements of Chapter 9 of this code for the new occupancy classification and with the requirements of this chapter.~~

~~**1011.1.2 Fire protection and interior finish.** The provisions of Sections 1011.2 and 1011.3 for fire protection and interior finish, respectively, shall apply to all buildings undergoing a change of occupancy classification.~~

~~**1011.1.3 Change of occupancy classification based on hazard category.** The relative degree of hazard between different occupancy classifications shall be determined in accordance with the categories specified in Tables 1011.4, 1011.5 and 1011.6. Such a determination shall be the basis for the application of Sections 1011.4 through 1011.7.~~

Revise as follows:

1011.2 Fire protection systems. Fire protection systems shall be provided in accordance with Sections 1011.2.1 and 1011.2.2.

1011.2.1 Fire sprinkler system. Where a change in occupancy classification occurs or where there is a *change of occupancy* within a space where there is a different fire protection system threshold requirement in Chapter 9 of the International Building Code that requires an automatic fire sprinkler system to be provided based on the new occupancy in accordance with Chapter 9 of the International Building Code; ~~such~~ The installation of the automatic sprinkler system shall be provided throughout the area where the *change of occupancy* occurs. required within the area of the change of occupancy and areas of the building not separated horizontally and vertically from the change of occupancy by one of the following:

1. Non rated permanent partition
2. Fire Partition
3. Smoke Partition
4. Smoke Barrier
5. Fire Barrier
6. Fire wall

Exceptions:

1. An automatic sprinkler system shall not be required in a one or two family dwelling constructed in accordance with the IRC.
2. Automatic sprinkler system shall not be required in a townhouse constructed in accordance with the IRC.

3. The townhouse shall be separated from adjoining units in accordance with Section R302.2 of the International Residential Code.

1011.2.2 Fire alarm and detection system. Where a change in occupancy classification occurs or where there is a *change of occupancy* within a space where there is a different fire protection system threshold requirement in Chapter 9 of the International Building Code that requires a fire alarm and detection system to be provided based on the new occupancy in accordance with Chapter 9 of the International Building Code, such system shall be provided throughout the area where the *change of occupancy* occurs. Existing alarm notification appliances shall be automatically activated throughout the building. Where the building is not equipped with a fire alarm system, alarm notification appliances shall be provided throughout the area where the *change of occupancy* occurs in accordance with Section 907 of the International Building Code as required for new construction.

Reason: The point of the revisions to 1011.2.1 is to allow for existing buildings that wish to add a sprinkler system to do so in such a manner that the partial sprinkler system will be within walls so that it will activate appropriately. So, regardless of a work area, the sprinkler system is within a space confined by walls that will allow for the heat to activate the sprinkler system. The end result, while not confined to separated occupancies or fire areas, should get existing buildings sprinklered over time. This would be required even if the area was of a lesser hazard, unlike some of the breaks offered in Sections 1011.4 through 1011.6.

The current language could be read to require the entire fire area or building to be sprinklered, even where only a single tenant is undergoing a change of occupancy. In looking to make the general reference to Chapter 9 in Section 1011.1.1, 1011.1.1.1 and 1011.1.1.2 consistent with the allowances in 1022.2 through 1011.2.2, it seemed more appropriate to delete the language since this will be specifically addressed.

The exceptions to Section 1011.2.1 was for consistency with the allowances for existing building in the IRC. Note that townhouses would be required to be separated.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This would allow sprinkler systems to be added in a building over time rather than throughout where a COO occurs.

Proposal # 4193

EB102-19

EB103-19

IEBC@: 1011.2.1.1 (New), 1011.2.1.1.1 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Existing Building Code

Add new text as follows:

1011.2.1.1 Nonrequired automatic sprinkler systems. The code official is authorized to permit the removal of existing automatic sprinkler system where all of the following conditions exist:

1. The system is not required for new construction.
2. The system is removed in its entirety throughout the building.
3. The system was not installed as part of any special construction features, including fire-resistance-rated assemblies and smoke-resistive assemblies, conditions of occupancy, means of egress conditions, fire code deficiencies, approved modifications or approved alternative materials, design and methods of construction, and equipment applying to the building.

1011.2.1.1.1 Approval. Plans, investigation and evaluation reports, and other data shall be submitted documenting compliance with Items 1 and 2 of Section 1011.2.1.1 for review and approval in support of a determination authorizing the removal of the automatic sprinkler system by the code official.

Reason: A change of occupancy could be to an occupancy that did not require a sprinkler system. If the system was old, outdated or needed extensive reconfiguration, costs could be high. The new Section 1011.2.1.1 allows for non required systems to be removed. To be removed the designer/building owner would have to demonstrate to the code official that the building did not need the sprinklers for occupancy, fire areas or type of construction limitations, and that none of the trade off's for items such as travel distance or corridor rating were in effect in the building. The system would have to be removed totally – including the system in the ceiling, standpipes and the connections for the fire department outside of the building.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. There will be the cost of removal, but this may be less than the cost of repairing or replacing an older system.

Proposal # 4194

EB103-19

EB104-19

IEBC@: 1011.7.2 (New), 1011.7.4 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Existing Building Code

Revise as follows:

1011.7.2 Stairways. Where a change of occupancy classification is made to a higher-hazard category as shown in Table 1011.4, interior stairways shall be enclosed as required by the International Building Code .

Exceptions:

1. In other than Group I occupancies, an enclosure shall not be required for openings serving only one adjacent floor and that are not connected with corridors or stairways serving other floors.
2. Unenclosed existing stairways need not be enclosed in a continuous vertical shaft if each story is separated from other stories by 1-hour fire-resistance-rated construction or *approved* wired glass set in steel frames and all exit corridors are sprinklered. The openings between the corridor and the occupant space shall have not fewer than one sprinkler head above the openings on the tenant side. The sprinkler system shall be permitted to be supplied from the domestic water-supply systems, provided that the system is of adequate pressure, capacity, and sizing for the combined domestic and sprinkler requirements.
3. ~~Existing penetrations of stairway enclosures shall be accepted if they are protected in accordance with the International Building Code Stairways enclosed in compliance with the applicable provisions of Section 903.1.~~

1011.7.4 Openings. Openings into existing vertical shaft enclosures shall be protected by fire assemblies having a fire protection rating of not less than 1 hour and shall be maintained self-closing or shall be automatic-closing by actuation of a smoke detector. Other openings shall be fire protected in an *approved* manner. Existing fusible linktype automatic door-closing devices shall be permitted in all shafts except stairways if the fusible link rating does not exceed 135° F (57° C).

Exception: Existing penetrations of stairway enclosures shall be accepted if they are protected in accordance with the International Building Code.

Reason: This is an editorial correction. Without this exception, the means of egress allowance to use the provisions of Section 903.1 (and 802.2) would not be applicable in change of occupancy classification with alterations projects. This will make the requirements consistent and provide a pointer to 903.1. The exception related to openings (1011.7.2 Exception 3) is moved to Section 1011.7.4 since that deals with openings into exiting vertical shafts.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal is an editorial correction and may reduce potential costs by providing design options.

Proposal # 4223

EB104-19

EB105-19

IEBC@: 1012 (New), 1012.1 (New), 1012.1.1 (New)

Proponent: Benchmark Harris, self, representing self

2018 International Existing Building Code

Add new text as follows:

1012 STORM SHELTER

1012.1 Group E occupancy. In areas where the shelter design wind speed for tornados is 250 mph in accordance with Figure 1304.2(1) of ICC 500, all buildings undergoing a change a occupancy to Group E where the occupant load is 50 or more, shall have a storm shelter constructed in accordance with ICC 500.

Exceptions:

1. Group E day care facilities.
2. Group E occupancies accessory to places of religious worship.
3. Buildings meeting the requirements for storm shelter design in ICC 500.

1012.1.1 Required occupant capacity. The required occupant capacity of the storm shelter shall include all buildings on the site, and shall be the total occupant load of the classrooms, vocational rooms and offices in the Group E occupancy.

Exceptions:

1. Where the change of occupancy to Group E is on an existing Group E site, and where the area of the change of occupancy to Group E is not of sufficient size to accommodate the required occupant capacity of the storm shelter for all of the buildings on-site, the storm shelter shall at a minimum accommodate the required capacity for the area undergoing the change of occupancy to Group E.
2. Where approved by the code official, the required occupant capacity of the shelter shall be permitted to be reduced by the occupant capacity of any existing storm shelters on the site.

Reason: The IEBC currently requires tornado shelters for additions in Section 502.8, 1106, 1301.2.3.1. However, Chapter 10, related to change of occupancy, has no provisions requiring tornado shelters for areas changed to Group E occupancy. It is common in many areas of the country for schools to purchase existing buildings that were designed for commercial or public use other than a Group E occupancy so that the school can convert the facilities into a Group E occupancy. This is especially common for smaller private schools however it can also occur in public-private partnerships. If a storm shelter is required for new buildings and for additions, building officials have indicated that this should be required for changes of use to Group E occupancy and have requested this code change to clarify the code intent.

Cost Impact: The code change proposal will increase the cost of construction

This would increase the cost of construction by requiring tornado shelters in existing buildings that do not have any Group E occupancies where they are being changed to a Group E occupancy.

Proposal # 5625

EB105-19

EB106-19

EBC: 1104.1, 1105.1

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Existing Building Code

Revise as follows:

SECTION 1104 SMOKE ALARMS IN OCCUPANCY GROUPS R AND I-1

1104.1 Smoke alarms in existing portions of a building. Where an *addition* is made to a building or structure of a Group R or I-1 occupancy, the *existing building* shall be provided with smoke alarms as required by Section ~~1103.8~~ 907.2.10 of the International Fire Code ~~or Section R314 of the International Residential Code as applicable.~~

SECTION 1105 CARBON MONOXIDE ALARMS IN GROUPS I-1, I-2, I-4 AND R

1105.1 Carbon monoxide alarms in existing portions of a building. Where an *addition* is made to a building or structure of a Group I-1, I-2, I-4 or R occupancy, the *existing building* shall be equipped with carbon monoxide alarms in accordance with Section ~~1103.9~~ 915 of the International Fire Code ~~or Section R315 of the International Residential Code, as applicable.~~

Reason: The reference to the IRC for requirements in the existing building, where there is no work (addition) occurring is incorrect and not applicable as there are no IRC requirements for an area that is not undergoing repair, alteration or addition.

The change in the IFC reference section is simply to simplify the pointer; IFC Section 1103.9 basically refers to Section 915 with the only technical difference being Exception 1 which states "Carbon monoxide alarms are permitted to be solely battery operated where the code that was in effect at the time of construction did not require carbon monoxide detectors to be provided"; which is an appropriate exception for the retroactive requirements in IFC Chapter 11. If an Addition is being conducted, the carbon monoxide alarm requirements for new construction are appropriate.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is providing a more appropriate reference, not a change in requirements.

Proposal # 4308

EB106-19

EB107-19

IEBC: 1106.1.1, 110.1.3 (New)

Proponent: Ek Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Marc Levitan, representing the ICC 500 Storm Shelter Development Committee

2018 International Existing Building Code

SECTION 1106 STORM SHELTERS

1106.1 Addition to a Group E occupancy. Where an *addition* is added to an existing Group E occupancy located in an area where the shelter design wind speed for tornados is 250 mph in accordance with Figure 304.2(1) of ICC 500 and the occupant load in the *addition* is 50 or more, the *addition* shall have a storm shelter constructed in accordance with ICC 500.

Exceptions:

1. Group E day care facilities.
2. Group E occupancies accessory to places of religious worship.
3. Additions meeting the requirements for shelter design in ICC 500.

Revise as follows:

1106.1.1 Required occupant capacity. The required occupant capacity of the storm shelter shall include all buildings on the site, and shall be the greater of the following:

1. The total occupant load of the classrooms, vocational rooms and offices in the Group E occupancy.
2. The occupant load of ~~any the largest~~ indoor assembly space that is associated with the Group E occupancy.

Exceptions:

1. Where an *addition* is being added on an existing Group E site, and where the *addition* is not of sufficient size to accommodate the required occupant capacity of the storm shelter for all of the buildings on-site, the storm shelter shall at a minimum accommodate the required capacity for the addition.
2. Where *approved* by the *code official*, the required occupant capacity of the shelter shall be permitted to be reduced by the occupant capacity of any existing storm shelters on the site.

1106.1.2 Location. Storm shelters shall be located within the buildings they serve, or shall be located where the maximum distance of travel from not fewer than one exterior door of each building to a door of the shelter serving that building does not exceed 1,000 feet (305 m).

Add new text as follows:

1106.1.3 Occupancy classification. The occupancy classification for storm shelters shall be determined in accordance with Section 423.3 of the International Building Code.

Reason: Occupancy classification was added in the IBC Section 423 by G59-18. Since the IEBC uses the IBC for occupancy classifications, it seems appropriate to make this a reference. G65-18 made the clarification in Section 1106.1.1 Item 2 for assembly spaces in Section 423.4.1 Item 2.

This proposal is submitted by the ICC Building Code Action Committee (BCAC) and the ICC 500 Code Development committee.

BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

The ICC 500 Standards Development committee is responsible for the development of the ICC/NSSA Standard for the Design and Construction of Storm Shelters. The committee is currently working on the development of the 2020 edition. In 2017 the ICC 500 committee held 7 open conference calls. In addition, there were numerous Working Group meetings and conference calls, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/standards-development/is-stm>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This is a coordination with clarifications added to 2021 IBC.

Proposal # 4326

EB107-19

EB108-19

IEBC@: SECTION 1106, 1106.1, 1106.1.1

Proponent: Marc Levitan, representing the ICC 500 Storm Shelter Development Committee; Benchmark Harris representing the National Storm Shelter Association (NSSA) (bharris@huckabee-inc.com)

2018 International Existing Building Code

SECTION 1106 STORM SHELTERS

Revise as follows:

1106.1 Addition to a Group E occupancy. Where an *addition* is added to an existing Group E occupancy located in an area where the shelter design wind speed for tornados is 250 mph in accordance with Figure 304.2(1) of ICC 500 and the occupant load in the *addition* is 50 or more, the *addition* shall have a storm shelter constructed in accordance with ICC 500.

Exceptions:

1. Group E day care facilities.
2. Group E occupancies accessory to places of religious worship.
3. Additions meeting the requirements for shelter design in ICC 500.

1106.1.1 Required occupant capacity. The required occupant capacity of the storm shelter shall include all buildings on the site, and shall be the greater of the following:

1. The total occupant load of the classrooms, vocational rooms and offices in the Group E occupancy.
2. ~~The occupant load of any indoor assembly space that is associated with the Group E occupancy.~~

Exceptions:

1. Where an *addition* is being added on an existing Group E site, and where the *addition* is not of sufficient size to accommodate the required occupant capacity of the storm shelter for all of the buildings on-site, the storm shelter shall at a minimum accommodate the required capacity for the addition.
2. Where *approved* by the *code official*, the required occupant capacity of the shelter shall be permitted to be reduced by the occupant capacity of any existing storm shelters on the site.

Reason: This proposal is submitted by the National Storm Shelter Association (NSSA) and the ICC 500 Storm Shelter Standard Development committee.

The ICC 500 Standards Development committee is responsible for the development of the ICC/NSSA Standard for the Design and Construction of Storm Shelters. The committee is currently working on the development of the 2020 edition. In 2017 the ICC 500 committee held 7 open conference calls. In addition, there were numerous Working Group meetings and conference calls, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/standards-development/is-stm>.

NSSA was responsible for the development of the original standard for storm shelters in 2001, which ICC 500 replaced through an agreement between ICC and NSSA. Representing General, User and Producer interest categories, NSSA is a technical organization that is committed to promoting consistent quality in both residential and community storm shelters.

For the same reason that the code does not require shelters for the entire population that outdoor venues can accommodate, such as outdoor football fields, it should not be necessary for schools to increase the size of the shelters for criteria 2. It is common for schools to share sites with other buildings that have indoor assembly areas that many building officials conservatively consider to be associated with a Group E occupancy. These assembly areas are often on the same site as the school and are sometimes even used by students during the school day, but these assembly areas do not add to the normal population of students in school and the staff that are associated with those students. Many school communities can understand and support the unfunded mandate in tornado prone areas that schools bear the cost of providing tornado shelters for minors that are required by law to be in the care of a school and those adult individuals taking care of them, out of an elevated obligation that comes with having school be mandatory for minors in our country. However, it is inappropriate to require that school systems bear the cost of sheltering possible occupants from the public at these areas. The population for criteria 2 can be significantly larger than criteria 1 when there are large assembly spaces on the site such as a public library (e.g. when a public library operates on a school campus and also functions as the school library), indoor football field, performing arts center, equestrian arena, natatorium, competition basketball arena, and/or professional development center.

The additional people in question (above and beyond criteria 1) elect to be in those assembly areas (as adults, or as minors before or after normal school hours at the permission of their parents/guardians), just like they do in any commercial or other public assembly area. If ICC believed that the public in all assembly areas needed to be sheltered because the tornado hazards are that significant in those areas, then those types of businesses should be required to build tornado shelters too. The current code places an inequitable financial burden on school districts. More importantly, though, the additional area of shelter will most likely never be used.

Yes, if a tornado with windspeeds greater than the main building was designed to withstand happens to occur at the exact moment that there is an assembly with more people than the criteria 1 population, the additional area of the shelter could be used. However, there is a very low probability of this occurring and, other than this occurrence, the additional area of shelter would typically never be used because school districts that are constructing code-required shelters (not FEMA funded safe rooms) typically have no intention of ever opening their tornado shelters up to the general public because of the many operational challenges (e.g. concern with overcrowding above the shelter capacity) and increased liability.

This issue is further complicated by the fact that Section 1106.1.2 requires storm shelters be within 1,000 feet of the buildings they serve. Many high school campuses have buildings with Assembly functions (that building officials conservatively consider to be associated with an E occupancy) greater than 1,000 feet from the school building. The code is not clear whether these assembly areas require their own tornado shelter. Removing criteria 2 would resolve this dilemma by clearly identifying that the occupant load of the classrooms, vocational areas and offices are the areas that need to be served with tornado shelters.

The rationale to remove criteria 2 applies to new campuses as well as existing construction; however, it is especially applicable for additions to existing campuses where options to provide a tornado shelter are much more limited because the existing buildings were not designed with a future tornado shelter in mind.

The following is an example based on a real case provided by a school district in Texas, with some modifications made to simplify the example:

There is an existing academy and an existing performing arts center on a 100 Acre site, with the two buildings more than 1,000 feet apart, and the 2018 IEBC is in effect. The school system proposed an addition to the existing academy to double the criteria 1 population from 1,000 to 2,000. The criteria 1 population of the performing arts center is 0. The Building Official considers the performing arts center to be an A that is associated with an E occupancy. There are moveable partitions in the performing arts center that allow all of the rooms (except for the lobby) to open up into one large performing arena for 5,000 people in seats and up to 500 people on stage, making the criteria 2 population (the largest indoor assembly area associated with the E occupancy on the site) 5,500 people. The school system is required to build a shelter for at least 5,500 people because the floor plan area of the proposed addition to the academy could accommodate 5,500 people if the entire addition was one large tornado shelter. If the two buildings were closer than 1,000 feet, the 2018 IEBC would require \$10 Million of sheltering (\$5.6 Million for the 2,000 people in a multi-purpose shelter and \$4.4 Million for 3,500 people in a dedicated, single-use shelter). This means that even in the 1,000 feet proximity rule was not in effect, this school system would need to spend \$4.4 Million on sheltering the additional population that could be in a performing arts center. However, because the buildings are more than 1,000 feet apart, the actual cost impact of criteria 2 is much greater at this campus because 2 separate shelters are required to accommodate the travel distance requirement. 2018 IEBC section 1106.1.2 requires that the shelters be located within 1,000 feet of the "population they serve" and these two buildings are more than 1,000 feet apart. Therefore, the code requires that a 5,500 person shelter be constructed as a new addition to the performing arts center to accommodate that population and a 2,000 person shelter be constructed as part of the proposed addition to the academy. The combined cost of these two shelters would be \$12.5 Million (\$5.6 Million for the 2,000 people in the multi-purpose shelter by the academy and \$6.9 Million for 5,500 people in a dedicated, single-use shelter by the performing arts center). The school system was prepared to construct a \$5.6 Million shelter for the 2,000 people in the multi-purpose shelter by the academy but could not fund the additional \$6.9 Million (associated with the criteria 2 requirement) to shelter the performing arts center population, which is a special events center. Therefore, the school system was not able to double the population of their academy as they had hoped.

Cost Impact: The code change proposal will decrease the cost of construction

There will be a decrease in the cost for storm shelters for existing schools that have associated assembly spaces larger than the student population.

Proposal # 4523

EB108-19

EB109-19

IEBC@: 1106.1.2

Proponent: Benchmark Harris, representing self

2018 International Existing Building Code

Delete without substitution:

~~**1106.1.2 Location.** Storm shelters shall be located within the buildings they serve, or shall be located where the maximum distance of travel from not fewer than one exterior door of each building to a door of the shelter serving that building does not exceed 1,000 feet (305 m).~~

Reason: While 1,000 feet maximum travel may be appropriate for new schools, this can be an undue hardship for existing buildings. Where an addition is located may be limited by a variety of building and site constraints.

Good disaster management practices will typically give schools a response time long enough to be able to move students to on-site shelters.

And, good management of a storm shelter is often better when there is 1 location instead of many smaller tornado shelters. For example, it's possible to overcrowd a tornado shelter when there are multiple shelters onsite and it is not clear which shelter has room available, unless all tornado shelters are designed to accommodate the entire population of the campus which would be a significant, redundant cost. Furthermore, emergency rescue is greatly assisted when there are a fewer number of tornado shelters for people to be rescued from.

An example of how the current provision can create a significant and unnecessary financial impact at a campus: A large, existing community college in Texas with 25 buildings throughout an approximately 200 Acre campus. 1 building in the middle of the campus is for high school students that want to earn early college credit, making this existing building a Group E building. The other 24 buildings have assembly spaces that are considered an accessory to the Group E occupancy because they can be used by the high school students. The campus wants to build a large addition to the early college learning building for high school students, one that is large enough to accommodate the population required by Section 1106.1.1. However, there are indoor assembly spaces that are spread throughout the entire campus, much greater than 1,000 feet, requiring that multiple new tornado shelters be constructed for the assembly spaces that are accessory to a Group E occupancy. Tornado Shelters are not required for college campus classrooms, which are Group B. It is an unnecessary burden to require a community college campus construct multiple tornado shelters throughout their campuses when there are emergency planning alternatives. The community college can manage the high school student population by directing those students to their designated shelters at early signs of an approaching storm, even though some students may be in a building farther than 1,000 feet from the shelter when a tornado approaches.

Cost Impact: The code change proposal will decrease the cost of construction

Decrease. Removing the requirement for a maximum 1,000 foot travel distance avoids constructing multiple tornado shelters at large campuses, instead of one.

Proposal # 5628

EB109-19

EB110-19

IEBC@: 1201.3 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Existing Building Code

Revise as follows:

1201.3 Special occupancy exceptions—museums. Where a building in Group R-3 is used for Group A, B or M purposes such as museum tours, exhibits, and other public assembly activities, or for museums less than 3,000 square feet (279 m²), the ~~code official may be authorized to~~ determine that the occupancy is Group B where life safety conditions can be demonstrated in accordance with Section 1201.2. Adequate means of egress in such buildings, which ~~may include~~ includes, but are not limited to a means of maintaining doors in an open position to permit egress, a limit on building occupancy to an occupant load permitted by the means of egress capacity, a limit on occupancy of certain areas or floors, or supervision by a person knowledgeable in the emergency exiting procedures, shall be provided.

Reason: This addresses non mandatory language.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction Editorial.

Proposal # 4222

EB110-19

EB111-19

IEBC@: 1203.3 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Existing Building Code

Revise as follows:

1203.3 Means of egress. ~~Existing door openings and corridor and stairway widths less than those specified elsewhere in this code may be approved, provided that, Where,~~ in the opinion of the code official, there is sufficient width and height for a person to pass through the opening or traverse the means of egress. egress, existing door openings and corridor and stairway widths not required to meet the widths required by the International Building Code or this code. Where *approved* by the *code official*, the front or main exit doors need not swing in the direction of the path of exit travel, provided that other *approved* means of egress having sufficient capacity to serve the total occupant load are provided.

Reason: This addresses non mandatory language and also addresses the fact that this is likely intending to refer also to the IBC. This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is editorial.

Proposal # 4224

EB111-19

EB112-19

IEBC@: 1204.9

Proponent: Marcelo Hirschler, representing GBH International (mmh@gbhint.com)

2018 International Existing Building Code

Revise as follows:

1204.9 Finishes- Interior finish Where interior finish materials are required to ~~have a flame spread index of Class C or better, when tested in accordance with ASTM E84 or UL 723~~ comply with the fire test requirements of Section 803.1 of the *International Building Code*, existing nonconforming materials shall be permitted to be surfaced with an *approved* fire-retardant ~~paint or finish~~ coating to achieve the required fire performance.

Exception: Existing nonconforming materials need not be surfaced with an *approved* fire-retardant ~~paint or finish coating~~ where the building is equipped throughout with an automatic sprinkler system installed in accordance with the *International Building Code* and the nonconforming materials can be substantiated as being historic in character.

Reason: This code proposal makes two changes:

1. Neither the IBC nor the IFC allow all interior finish materials to be tested to ASTM E84 or UL 723. In fact, although all materials are allowed to be classified by NFPA 286 (a room corner test), some materials are not allowed to be classified by using ASTM E84 or UL 723. Any material that meets the requirements of the IBC code (or IFC code) based on testing to NFPA 286 is considered to comply with a Class A, Class B or Class C requirement, in accordance with ASTM E84 or UL 723. The requirements are contained in Section 803.1 of the IBC (with 803.1.1 dealing with NFPA 286, 803.1.2 dealing with ASTM E84 or UL 723 and 803.1.3 dealing with materials with special requirements). Therefore it is possible that interior finish materials have been shown to meet NFPA 286 requirements and they are (in accordance with the IBC) acceptable as materials with a "Class C or better" in accordance with ASTM E84 or UL 723 and don't need retesting (or may not even be allowed by the IBC to be tested to ASTM E84 or UL 723). The use of a reference exclusively to a Class C, without a reference to the IBC or IFC, prevents the use of materials tested to (or needing testing to) NFPA 286.

2. The typical nomenclature used in the IBC and IFC is fire-retardant coating.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The revision simply permits materials already tested to NFPA 286 to be covered.

Proposal # 4491

EB112-19

EB113-19

IEBC@: 1204.9

Proponent: Tim Earl, representing GBH International (tearl@gbhinternational.com)

2018 International Existing Building Code

Revise as follows:

1204.9 Finishes. Where interior finish materials are required to have a flame spread index of Class C or better, when tested in accordance with ASTM E84 or UL 723, existing nonconforming materials shall be surfaced with ~~an approved fire-retardant paint or finish~~ fire-retardant coating. Compliance with this section shall be demonstrated by testing the fire-retardant coating on the same material and achieving the required performance. If the same material is not available, it shall be permitted to test on a similar material.

Exception: Existing nonconforming materials need not be surfaced with an ~~approved fire-retardant paint or finish coating~~ where the building is equipped throughout with an automatic sprinkler system installed in accordance with the International Building Code and the nonconforming materials can be substantiated as being historic in character.

Reason: It is important to clarify that, if fire retardant coatings are to be used to achieve improved fire performance, they must have been tested on the actual product (substrate) to which they will be applied. There have been instances of manufacturers applying coatings to a noncombustible surface and running an ASTM E84 test in an attempt to demonstrate compliance. (See figures below). This obviously does not reflect real world performance and is not the intent of the code. This proposal would make the requirement more explicit.

This proposal also replaces "paint or finish" with the more generic term "coating" which is used throughout the I-codes.

RESULTS:

INTRODUCTION:

This report presents test results of Flame Spread and Smoke Developed Values per ASTM E-84-04. The report also includes Material Identification, Method of Preparation, Mounting and Conditioning of the specimens.

The tests were performed in accordance with the specifications set forth in ASTM E-84-04, Standard Test Method for Surface Burning Characteristics of Building Materials, both as to equipment and test procedure. This test procedure is similar to UL-723, ANSI No. 2.5, NFPA No. 255 and UBC 42-1.

The test results cover two parameters: Flame Spread and Smoke Developed Values during a 10-minute fire exposure. Inorganic cement board and red oak flooring are used as comparative standards and their responses are assigned arbitrary values of 0 and 100, respectively.

PREPARATION AND CONDITIONING:

Three pieces of Hardy Backer Board 21 inches X 8 feet were coated using a flat brush with the clients ~~Paint Additive Flame Retardant~~ and allowed to cure.

The sample was conditioned at 73° ± 5° Fahrenheit and 50 ± 5% relative humidity.

TEST PROCEDURE:

The tunnel was thoroughly pre-heated by burning natural gas. When the brick temperature, sensed by a floor thermocouple, had reached the prescribed 105° Fahrenheit ± 5° Fahrenheit level, the sample was inserted in the tunnel and test conducted in accordance with the standard ASTM E-84-04 procedures.

The operation of the tunnel was checked by performing a 10-minute test with inorganic board on the day of the test.

RESULTS:

TEST RESULTS:

The test results, calculated in accordance with ASTM E-84-04 for Flame Spread and Smoke Developed Values are as follows:

Test Specimen : Paint Additive Flame Retardant
Flame Spread Index* : 0
Smoke Developed Value* : 10

*Rounded off to the nearest 5 units. Graphs of the Flame Spread, Smoke Developed and Time-Temperature are shown on the attached charts at the end of this report.

OBSERVATIONS:

Ignition was not noted there was charring of the sample during the test.

RATING:

The National Fire Protection Association Life Safety Code 101, Section 6-5.3, "Interior Wall and Ceiling Finish Classification", has a means of classifying materials with respect to Flame Spread and Smoke Developed when tested in accordance with NFPA 255, "Method of Test of Surface Burning Characteristics of Building Materials", (ASTM E-84).

The classifications are as follows:

Class A Interior Wall & Ceiling Finish:	Flame Spread -	0-25
	Smoke Developed -	0-450
Class B Interior Wall & Ceiling Finish:	Flame Spread -	26-75
	Smoke Developed -	0-450
Class C Interior Wall & Ceiling Finish:	Flame Spread -	76-200
	Smoke Developed -	0-450

Since the sample received a Flame Spread of 0 and a Smoke Developed Value of 10, it would fall into the Class A Interior Wall & Ceiling Finish Category.

Cost Impact: The code change proposal will increase the cost of construction
This may increase the cost of construction by requiring tests to be run on the surface intended to be used.

EB114-19

IEBC@: 1301.2

Proponent: Kevin Duerr-Clark, representing NYS Department of State (kevin.duerr-clark@dos.ny.gov)

2018 International Existing Building Code

Revise as follows:

1301.2 Applicability. *Existing buildings* in which there is work involving *additions, alterations or changes of occupancy* shall be made to conform to the requirements of this chapter or the provisions of Chapters 6 through 10. The provisions of Sections 1301.2.1 through 1301.2.5 shall apply to existing occupancies that will continue to be, or are proposed to be, in Groups A, B, E, F, I-2, M, R and S. These provisions shall apply to Group U occupancies only where such occupancies are undergoing a change of occupancy or a partial change in occupancy with separations in accordance with Section 1301.2.2. ~~These provisions shall~~ not apply to buildings with occupancies in Group H ~~or~~ I-1, I-3 ~~or~~ I-4.

Reason: Currently, the applicability section is silent on the use of this section on Group U buildings. Although Section 1301.6 *Evaluation process*, clearly allows it for Group U buildings, the intent is the allows the use of this compliance method for changing from one Group U to another Group. Group U buildings undergoing alterations or additions with no change in occupancy cannot be evaluated using this method. The tables, charts, and point system do not accommodate this.

This proposal simply clarifies the proper use of this method for Group U buildings.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is a clarification of how the code is already used.

Proposal # 4239

EB114-19

EB115-19

IEBC@: 1301.1 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Existing Building Code

Revise as follows:

1301.1 Scope. The provisions of this chapter shall apply to the *alteration, addition and change of occupancy of existing structures*, including historic structures, as referenced in Section 301.3.3. The provisions of this chapter are intended to maintain or increase the current degree of public safety, health and general welfare in *existing buildings* while permitting, *alteration, addition and change of occupancy* without requiring full compliance with the prescriptive method of Chapter 5 or the work area method of Chapters 6 through 12, except where compliance with other provisions of this code is specifically required in this chapter.

Reason: This compliance method should not require compliance with both the prescriptive and work area methods. As currently written, because only Chapters 6 through 12 are listed, it could be construed that compliance with Chapter 5, Prescriptive Compliance Method is required. By adding the Chapter 5 reference, it clarifies the intent to absolve projects that are properly design in accordance with Chapter 13 from compliance with both the Prescriptive and Work Area methods.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This is merely further clarification that this method would not require further compliance with the prescriptive method, if compliance with the performance method is established.

Proposal # 4231

EB115-19

EB116-19

IEBC@: 1301.2, 1301.2.6 (New)

Proponent: Kevin Duerr-Clark, representing NYS Department of State (kevin.duerr-clark@dos.ny.gov); Erika Krieger, representing NYS Department of State (codeczar@optonline.net)

2018 International Existing Building Code

Revise as follows:

1301.2 Applicability. *Existing buildings* in which there is work involving *additions, alterations* or *changes of occupancy* shall be made to conform to the requirements of this chapter or the provisions of Chapters 6 through 10. The provisions of Sections 1301.2.1 through ~~1301.2.5~~ 1301.2.6 shall apply to existing occupancies that will continue to be, or are proposed to be, in Groups A, B, E, F, I-2, M, R and S. These provisions shall not apply to buildings with occupancies in Group H or I-1, I-3 or I-4.

Add new text as follows:

1301.2.6 Plumbing Fixtures. Plumbing fixtures shall be provided in accordance with Section 1009 for a *Change of Occupancy* and Section 809 for *Alterations*. Plumbing fixtures for *additions* shall be in accordance with the *International Plumbing Code*.

Reason: Currently there does not appear to be a code path₂ within the performance compliance method, to require additional plumbing facilities or fixtures for buildings undergoing alterations, additions, and changes in occupancy, where the occupant load is increased. The performance compliance method focuses primarily on fire and life safety. Historically, applicants have argued that due to the lacking code path, they can increase the occupant load of a building and achieve compliance using the performance method, without increasing the number of plumbing fixtures or facilities to account for the increased occupant load. This new language would provide a code path to specifically require fixtures and facilities yet provides the same level of leniency as the other compliance paths available in the Existing Building Code.

Cost Impact: The code change proposal will increase the cost of construction
This may increase the cost of construction because today, the code path to require the additional facilities does not exist.

Proposal # 4236

EB116-19

EB117-19

IEBC@: 1301.2.2

Proponent: Gregory Nicholls, representing American Institute of Architects (gnicholls@preview-group.com)

2018 International Existing Building Code

Revise as follows:

1301.2.2 Partial change in occupancy. Where a portion of the building is changed to a new occupancy classification and that portion is separated from the remainder of the building with fire barrier or horizontal assemblies having a fire-resistance rating as required by Table 508.4 of the International Building Code or Section R302 of the International Residential Code for the separate occupancies, or with *approved* compliance alternatives, the portion changed shall be made to conform to the provisions of this section. Only the portion separated shall be required to be evaluated for compliance.

Where a portion of the building is changed to a new occupancy classification and that portion is not separated from the remainder of the building with fire barriers or horizontal assemblies having a fire-resistance rating as required by Table 508.4 of the International Building Code or Section R302 of the International Residential Code for the separate occupancies, or with *approved* compliance alternatives, the provisions of this section which apply to each occupancy shall apply to the entire building. Where there are conflicting provisions, those requirements which secure the greater public safety shall apply to the entire building or structure.

Reason: The code text does not explain how to evaluate a separated partial change of occupancy. The current ICC code commentary is not at all consistent with how a partial change of occupancy is treated in Section 1011.1.1.2 IEBC, even though the wording is almost the same. The code text and commentary for Section 1011.1.1.2 IEBC specifically only require compliance with Chapter 9 IEBC for that portion within the fire-resistance rated separations. When using the Performance Compliance Method in Section 1301 IEBC, once again the code text only dictates that the portion changed and separated has to comply. But that leaves some confusion as to how the evaluation needs to be done, and this is apparent with the over-reaching interpretation in the IEBC commentary, which reads,

“Where a portion of the building is changed to a new occupancy classification and that portion is separated from the remainder of the building by a fire barrier that complies with the requirements for new construction, the new occupancy portion must be evaluated with the existing or proposed building design to be in full compliance with the provisions of Chapter 13. The remainder of the existing building must also be evaluated in accordance with Chapter 13. The mandatory safety scores for the new occupancy portion of the building and the existing occupancy are obtained from those listed in Table 1401.8 and are incorporated in the building’s final evaluation score (see Table 1401.7).”

The requirement stated in the commentary to evaluate the remainder of the building is in contrast to the code text, and opposite of the code text and intent for partial change of occupancy without the performance compliance method. Why should a fully separated partial change of occupancy on the first floor of a 20-story building need the other stories to comply with the mandatory safety scores when no change of occupancy or alterations are proposed? So if the existing floors above are over the allowable height in current code, then what? This interpretation, which has no support in code text, will make it unfeasible for small changes in occupancy in existing non-compliant buildings.

By adding the text shown, it is then clear that only the portion separated needs to comply and that this is the only portion that needs to be evaluated. This is also making application of the evaluation clear and consistent with Section 1301.2.2 IEBC.

Cost Impact: The code change proposal will decrease the cost of construction

By clarifying the code text to meet the intent of how a partial change in occupancy is limited in scope, the cost of construction to the remainder of the building is reduced.

Proposal # 5290

EB117-19

EB118-19

IEBC@: 1301.3

Proponent: Jeffrey Harper, JENSEN HUGHES, representing JENSEN HUGHES (jharper@jensenhughes.com); Sean Donohue, representing JENSEN HUGHES (sdonohue@jensenhughes.com)

2018 International Existing Building Code

Revise as follows:

1301.3 Acceptance. For *repairs, alterations, additions, and changes of occupancy to existing buildings* that are evaluated in accordance with this section, compliance with this section shall be accepted by the *code official*. Existing buildings without repairs, alterations, additions or a change of occupancy that are evaluated and receive a passing score in accordance with Table 1301.8 shall be deemed to comply with Chapter 11 of the International Fire Code.

Reason: Chapter 11 of the IFC provides no alternate to compliance for existing buildings in the same manner that NFPA 101A provides for existing buildings regulated by NFPA 101.

The IEBC only applies to buildings undergoing repair, alteration, change of occupancy, addition and relocation of existing buildings. However, Chapter 13 of IEBC allows the performance compliance method to be used for existing occupancies. Per 1301.2: "The provisions of Sections 1301.2 through 1301.5 shall apply to existing occupancies that will continue to be, or are proposed to be in Groups A, B, E, F, I-2, M, R and S." Therefore, no change is needed to allow the use of this Chapter to existing buildings.

By adding an applicability section to the administrative provisions of the fire code (included in a separate Proposal), the user is given a code path to use the evaluation methods prescribed in Chapter 13 of the IEBC for existing buildings.

Therefore, the change to Section 1301.3 of the IEBC is necessary to add authority for acceptance of the performance compliance method on existing buildings wherein no work is planned. Currently this acceptance section only applies to buildings undergoing construction.

For example: An existing office building's highest story is 55 feet above the lowest level of fire department access and has been cited for not having any standpipes. Per IFC Section 1103.6, standpipes are required. The building is fully sprinkler protected per NFPA 13 and provided with a fire alarm system throughout. All shafts are 2-hour rated and corridors are 1-hour rated. Egress capacity, travel distances and common paths all exceed that required by the IBC for new construction and elevators have been recently replaced with fully compliant Stage 2 recall capability. The fire code would require standpipes regardless of these other systems. The Performance Compliance Method permits an accepted method of evaluating all components of a building and providing a score to account for deficiencies

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This code provision will not increase cost and has a high likelihood of reducing cost by providing flexibility that does not currently exist in the code.

Proposal # 5494

EB118-19

EB119-19

IEBC: 1301.6.2, 1301.6.2.2

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Existing Building Code

Revise as follows:

1301.6.2 Building area. The value for building area shall be determined by the formula in Section 1301.6.2.2. Section 506 of the International Building Code and the formula in Section 1301.6.2.1 shall be used to determine the allowable area of the building. ~~Subtract the actual building area from the allowable area and divide by 1,200 square feet (112 m²).~~ Enter the area value and its sign (positive or negative) in Table 1301.7 under Safety Parameter 1301.6.2, Building Area, for fire safety, means of egress and general safety. In determining the area value, the maximum permitted positive value for area is 50 percent of the fire safety score as listed in Table 1301.8, Mandatory Safety Scores. Group I-2 occupancies shall be scored zero.

1301.6.2.1 Allowable area formula. The following formula shall be used in computing allowable area:

$$A_a = A_t + (NS \times I_f) \tag{Equation 13-3}$$

where:

A_a = Allowable building area per story (square feet).

A_t = Tabular allowable area factor (NS, S1, S13R, or SM value, as applicable) in accordance with Table 506.2 of the International Building Code.

NS = Tabular allowable area factor in accordance with Table 506.2 of the International Building Code for a nonsprinklered building (regardless of whether the building is sprinklered).

I_f = Area factor increase due to frontage as calculated in accordance with Section 506.3 of the International Building Code.

1301.6.2.2 Area formula. The following ~~formula-formulas~~ shall be used in computing the area value. ~~Determine Equation 13-4 shall be used for a single occupancy buildings and Equation 13-5 shall be used for multiple occupancy buildings.~~ Determine the area value for each occupancy floor area on a floor-by-floor basis. For ~~each multiple occupancy, choose buildings~~ the minimum area value of the set of values obtained for the particular occupancy shall be used as the area value for that occupancy.

For single occupancy buildings:

Area value_i = (Allowable area-Actual area)/1200 square feet (Equation 13-4)

For multiple occupancy buildings:

$$\text{Area value}_i = \frac{\text{Allowable area}_i}{1200 \text{ square feet}} \left[1 - \left(\frac{\text{Actual area}_i}{\text{Allowable area}_i} + \dots + \frac{\text{Actual area}_n}{\text{Allowable area}_n} \right) \right]$$

(Equation

~~13-4~~

13-5)

where:

i = Value for an individual separated occupancy on a floor.

n = Number of separated occupancies on a floor.

Reason: This section as written is confusing and does not differentiate well between single occupancy buildings and multiple occupancy buildings. This proposal creates two equations to address this.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposed code change is clarification of existing code language and neither adds to or decreases cost of construction.

EB120-19

IEBC@: 1301.6.3 (New), TABLE 1301.6.3 (New), 1301.6.3.1, 1301.6.3.1 (New), 1301.6.3.2 (New)

Proponent: Kevin Scott, representing KH Scott & Associates LLC (khscottassoc@gmail.com)

2018 International Existing Building Code

Revise as follows:

1301.6.3 Compartmentation. Evaluate the compartments created by fire barriers or horizontal assemblies which comply with Sections ~~1301.6.3.1~~ and 1301.6.3.2 and 1301.6.3.3 and which are exclusive of the wall elements considered under Sections 1301.6.4 and 1301.6.5. Conforming compartments shall be figured as the net area and do not include shafts, chases, stairways, walls, or columns. Using Table 1301.6.3, determine the appropriate compartmentation value (CV) and enter that value into Table 1301.7 under Safety Parameter 1301.6.3, Compartmentation, for fire safety, means of egress, and general safety.

**TABLE 1301.6.3
COMPARTMENTATION VALUES**

OCCUPANCY	CATEGORIES ^a				
	a Compartment size equal to or greater than 15,000 square feet	b Compartment size of 10,000 square feet	c Compartment size of 7,500 square feet	d Compartment size of 5,000 square feet	e Compartment size of 2,500 square feet or less
A-1, A-3	0	6	10	14	18
A-2	0	4	10	14	18
A-4, B, E, S-2	0	5	10	15	20
F, M, R, S-1	0	4	10	16	22

For SI: 1 square foot = 0.0929 m².

a. For compartment sizes between categories, the compartmentation value shall be obtained by linear interpolation.

Add new text as follows:

1301.6.3.1 Categories. The categories for compartment separations are:

1. Category a-compartment size of 15,000 square feet or more.
2. Category b-maximum compartment size of 10,000 square feet.
3. Category c-maximum compartment size of 7,500 square feet.
4. Category d-maximum compartment size of 5,000 square feet.
5. Category e-maximum compartment size of 2,500 square feet.

Revise as follows:

~~1301.6.3.1~~ **1301.6.3.2 Wall construction.** A wall used to create separate compartments shall be a fire barrier conforming to Section 707 of the International Building Code with a fire-resistance rating of not less than 2 hours. Where the building is not divided into more than one compartment, the compartment size shall be taken as the total floor area on all floors. Where there is more than one compartment within a story, each compartmented area on such story shall be provided with a horizontal exit conforming to Section 1026 of the International Building Code. The fire door serving as the horizontal exit between compartments shall be so installed, fitted, and gasketed that such fire door will provide a substantial barrier to the passage of smoke.

~~1301.6.3.2~~ **1301.6.3.3 Floor/ceiling construction.** A floor/ceiling assembly used to create compartments shall conform to Section 711 of the International Building Code and shall have a fire-resistance rating of not less than 2 hours.

Reason: This proposal is designed to correct an inconsistency in Table 1301.6.3. Currently, there is a hole in the size values for compartment size. There is no recognition of a fire compartment that is between 10,000 and 15,000 square feet.

1. Category a applies to 15,000 sq. ft. or larger
2. Category b applies to 10,000 sq. ft. or less

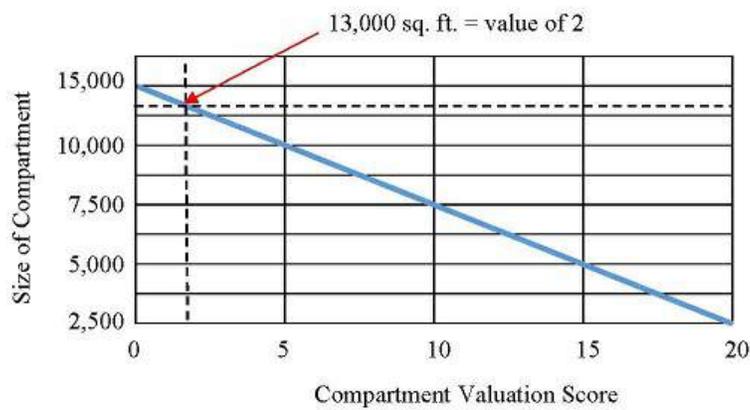
So what value is applied when the fire compartment is 12,000 square feet. It is not listed on the table and there is no guidance as to the value associated to this size. Obviously, it is better than 15,000 square feet, but is it the same value as 10,000 square feet.

Therefore, this proposal makes two revisions:

1. Moves the criteria out of the table header
2. Corrects the gap in compartment sizes

Moving the criteria out of the table header is an editorial change. But it is consistent with the format used in all the other tables in Chapter 13. It also allows for easier application and use of the table.

The gap between 10,000 and 15,000 square feet is resolved by adding Footnote a. Footnote a allows interpolation between categories. For example, consider a Group B occupancy with the largest compartment of 13,000 square feet. It does not fit into a category, it is between Category a – 15,000 square feet or more, and Category b – 10,000 square feet or less. The score for Category a is “0” and the score for Category b is “5”. By interpolation, the Group B compartment at 13,000 square feet receives a score of “2”. See the table below.



Cost Impact: The code change proposal will decrease the cost of construction. This revision allows credit for compartment size between 10,000 and 15,000 square feet where no credit was giving previously.

Proposal # 1486

EB120-19

EB121-19

IEBC: TABLE 1301.6.3

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Existing Building Code

1301.6.3 Compartmentation. Evaluate the compartments created by fire barriers or horizontal assemblies which comply with Sections 1301.6.3.1 and 1301.6.3.2 and which are exclusive of the wall elements considered under Sections 1301.6.4 and 1301.6.5. Conforming compartments shall be figured as the net area and do not include shafts, chases, stairways, walls, or columns. Using Table 1301.6.3, determine the appropriate compartmentation value (CV) and enter that value into Table 1301.7 under Safety Parameter 1301.6.3, Compartmentation, for fire safety, means of egress, and general safety.

Revise as follows:

**TABLE 1301.6.3
COMPARTMENTATION VALUES**

OCCUPANCY	CATEGORIES ^a				
	a Compartment size equal to or greater than 15,000 square feet	b Compartment size of 10,000 square feet	c Compartment size of 7,500 square feet	d Compartment size of 5,000 square feet	e Compartment size of 2,500 square feet or less
A-1, A-3	0	6	10	14	18
A-2	0	4	10	14	18
A-4, B, E, S-2	0	5	10	15	20
F, M, R, S-1	0	4	10	16	22

For SI: 1 square foot = 0.0929 m².

a. For areas between categories, the determination of the compartmentation value obtained by linear interpolation shall be permitted.

Reason: This table when placed in the IEBC never carried over the footnote a that was found in the same table in the IBC Chapter 34. This question arises and this appears within the intent to allow interpolation.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposed change is a coordination item between the IEBC and the IBC and neither adds to or decreases cost of construction.

Proposal # 4226

EB121-19

EB122-19

IEBC@: TABLE 1301.6.3

Proponent: Jeffrey Harper, JENSEN HUGHES, representing JENSEN HUGHES (jharper@jensenhughes.com); Sean Donohue, representing JENSEN HUGHES (sdonohue@jensenhughes.com)

2018 International Existing Building Code

Revise as follows:

TABLE 1301.6.3
COMPARTMENTATION VALUES

OCCUPANCY	CATEGORIES				
	aCompartment size equal to or greater than 15,000square feet	bCompartment size of 10,000 square feet	cCompartment size of 7,500 square feet	dCompartment size of 5,000 square feet	eCompartment size of 2,500 square feet or less
A-1, A-3	0	6	10	14	18
A-2	0	4	10	14	18
A-4, B, E, S-2	0	5	10	15	20
F, M, R, S-1	0	4	10	16	22
I-2	<u>0</u>	<u>2</u>	<u>8</u>	<u>10</u>	<u>14</u>

For SI: 1 square foot = 0.0929 m².

Reason: This table does not provide Group I-2 occupancies with any benefit of fire compartmentation. This should not be confused with 1301.6.20 which provides for smoke zones because 1301.6.3.1 clearly indicates the compartmentation is to be defined based on the use or presence of fire barriers having a fire rating of 2-hours or more. I-2 occupancy should be included on this table to remain consistent with the rest of the Performance Compliance Methods sections. Just as in 1301.6.20, I-2 occupancies on this table should be scored at zero for compartments that comply with 22,500 square feet. Although the code has gone to 40,000 SF compartment sizes for hospitals, this recognizes that nursing homes (I-2 Condition 1) are still at 22,500. There should not be a negative value for being larger than 22,500 SF because this is fire compartmentation, not smoke compartmentation.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This code provision will not increase cost and has a high likelihood of reducing cost by providing flexibility that does not currently exist in the code.

Proposal # 5472

EB122-19

EB123-19

IEBC@: TABLE 1301.6.3

Proponent: Kevin Duerr-Clark, NYS Department of State, representing NYS Department of State (kevin.duerr-clark@dos.ny.gov); Ronald Stark, NYS Department of State, representing NYS Department of State (ronald.stark@dos.ny.gov)

2018 International Existing Building Code

Revise as follows:

**TABLE 1301.6.3
COMPARTMENTATION VALUES^a**

OCCUPANCY	CATEGORIES				
	aCompartment size equal to or greater than 15,000 square feet	bCompartment size of 10,000 square feet	cCompartment size of 7,500 square feet	dCompartment size of 5,000 square feet	eCompartment size of 2,500 square feet or less
A-1, A-3	0	6	10	14	18
A-2	0	4	10	14	18
A-4, B, E, S-2	0	5	10	15	20
F, M, R, S-1	0	4	10	16	22

For SI: 1 square foot = 0.0929 m².

a. For compartment sizes between categories, values shall be obtained by linear interpolation.

Reason: The compartment sizes given in Table 1301.6.3 are neither consecutive, not all inclusive. The table does not provide guidance for compartment sizes outside of the values given. This leads some applicants to advocate for the higher value and some code officials to argue in favor of the more restrictive lower values. In some instances, the value increase is as high as 6 points, which could make a considerable difference in the Summary Sheet results of Table 1301.7.

To resolve this discrepancy and ensure uniform enforcement, Table 1301.6.3 should include a footnote similar to those found in Tables 1301.6.12 and 1301.6.16, indicating that values between categories shall be obtained by linear interpolation.

The IEBC Commentary states that *"the evaluation of the compartments contained in an existing building is a linear function allowing interpolation between the various categories. This approach allows the compartmentation value to increase or decrease consistent with the actual changes in compartment sizes."* However, the language of neither Section 1301.6.3, nor Table 1301.6.3 reflects this intent and therefore, a footnote is needed to remove the ambiguity and facilitate enforcement.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal is to provide clarification consistent with the IEBC Commentary and does not have a cost implication.

Proposal # 4337

EB123-19

EB124-19

IEBC@: 1301.6.4

Proponent: Gregory Nicholls, representing American Institute of Architects (gnicholls@preview-group.com)

2018 International Existing Building Code

Revise as follows:

1301.6.4 Tenant and dwelling unit separations. Evaluate the fire-resistance rating of floors and walls separating tenants, including dwelling units, and not evaluated under Sections 1301.6.3 and 1301.6.5. Group I-2 occupancies shall evaluate the rating of the separations between patient sleeping rooms.

Under the categories and occupancies in Table 1301.6.4, determine the appropriate value and enter that value in Table 1301.7 under Safety Parameter 1301.6.4, Tenant and Dwelling Unit Separation, for fire safety, means of egress, and general safety. The value shall be zero for single tenant buildings, and buildings without dwelling units.

Reason: The current code text gives no direction on what the appropriate scoring category is for non-residential, single tenant buildings. Since the categories only have partition ratings, the default would penalize the building scores without any justification that having a single tenant is less safe. The added text gives an appropriate score of zero, which does not penalize the building but also does not give points to achieve a passing score.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The code change clarifies the disposition of buildings without dwelling units or multiple tenants. There is no current cost to modify.

Proposal # 5292

EB124-19

EB125-19

IEBC@: 1301.6.5.1

Proponent: Gregory Nicholls, representing American Institute of Architects (gnicholls@preview-group.com)

2018 International Existing Building Code

Revise as follows:

1301.6.5.1 Categories. The categories for corridor walls are:

1. Category a—No fire partitions; incomplete fire partitions; no doors; or doors not self-closing.
2. Category b—Less than 1-hour fire-resistance rating or not constructed in accordance with Section 708.4 of the International Building Code.
3. Category c—1-hour to less than 2-hour fire-resistance rating, with doors conforming to Section 716 of the International Building Code or ~~without corridors as permitted by Section 1020 of the International Building Code.~~ Code to be without a fire-resistance rating.
4. Category d—2-hour or greater fire-resistance rating, with doors conforming to Section 716 of the International Building Code.

Reason: The IBC does not require corridors for any project, it only has criteria for corridors when they are proposed. As written, the current code text makes no sense, and nowhere in Section 1020 IBC does it say where corridors are permitted. Further, the current text does not say what to do when a corridor does not have to have a rating, leading to some interpretations that ALL projects using the Performance Compliance method have to have corridors, no matter the occupancy or occupant load.

This appears to be the result of a historical error in editing, one that occurred without a code change, done by ICC staff. Back in the 1995 Basic Building Code (BOCA), the code section for corridors, category c used to read :

Fire partitions having a fireresistance rating from 1 hour to less than 2 hours, with doors conforming to Section 1011.4.2 or without corridors as required by Section 1011.4. Section 1011.4 OBC (1995) was entitled "Enclosure" and only addressed corridors if they were provided (and that was when section titles sort of meant something). When this was transferred to the IBC, the code section on enclosure was no longer worded the same, and was changed to "Construction". Along with this change in section title the reference from Chapter 34 was to the entire Section on corridors, so the distinction between corridors permitted without a fire-resistance rating went to without corridors.

Compliance Alternatives are not meant to do either of two things:

1. To require corridors in order to comply with one of the categories, even when none are proposed;
2. To require corridors allowed to be non-fire-resistance rated by Section 1020 to have to be 1 hour rated to keep from being severely punished by negative points.

It should be noted that the scoring for all occupancies in category c is zero except for I-2, which is typical in the 3412 scoring system for meeting code for non-3412 projects but not exceeding standard code. In other words, a score of zero does not mean the level of performance is penalized, but without a positive score will not provide any points to pass.

Cost Impact: The code change proposal will decrease the cost of construction

By allowing buildings to not have corridors, and allowing the option to comply without negative points will decrease the cost of compliance.

Proposal # 5293

EB125-19

EB126-19

IEBC@: 1301.6.7.1

Proponent: Kevin Duerr-Clark, representing NYS Department of State (kevin.duerr-clark@dos.ny.gov); Erika Krieger, NYS Department of State, representing NYS Department of State (codeczar@optonline.net)

2018 International Existing Building Code

Revise as follows:

1301.6.7.1 Categories. The categories for HVAC systems are:

1. Category a—Plenums not in accordance with Section 602 of the International Mechanical Code. -10 points.
2. Category b—Air movement in egress elements not in accordance with Section 1020.5 of the International Building Code. -5 points.
3. Category c—Both Categories a and b are applicable. -15 points.
4. Category d—Compliance of the HVAC system with Section 1020.5 of the International Building Code and Section 602 of the International Mechanical Code; or where HVAC systems do not contain ductwork. 0 points.
5. Category e—Systems serving one story; or a central boiler/chiller system without ductwork connecting two or more stories. +5 points.

Reason: The stated intent of Section 1301.6.7 is to “evaluate the ability of the HVAC system to resist the movement of smoke and fire.” Points are awarded to systems with a limited ability to spread smoke and fire, such as systems serving only one story. However, the code is silent regarding instances where heating and air conditioning systems utilizing ductwork are not proposed, thus eliminating the risk of spreading smoke and fire. The silence leads to confusion and disagreement among code users on whether to interpret that those instances constitute a category “d” or a category “e”.

Without heating and air conditioning ductwork, the degree of code compliance and fire safety is equal to or greater than category “e” and points should be gained. That change in code language is proposed under the title “HVAC System Categories I.” However, should that previous proposal not be approved, the code language should at least mention the lack of ductwork as a condition in category “d” and eliminate the ambiguity.

Cost Impact: The code change proposal will increase the cost of construction

This change addresses a silent provision in the code. There is no change if the provision was previously interpreted to constitute category “d”. There is a small likelihood that it could increase the cost of construction if code users had interpreted the silent provision to constitute category “e”.

Proposal # 4211

EB126-19

EB127-19

IEBC@: 1301.6.7.1

Proponent: Kevin Duerr-Clark, NYS Department of State, representing NYS Department of State (kevin.duerr-clark@dos.ny.gov); Erika Krieger, NYS Department of State, representing NYS Department of State (codeczar@optonline.net)

2018 International Existing Building Code

Revise as follows:

1301.6.7.1 Categories. The categories for HVAC systems are:

1. Category a—Plenums not in accordance with Section 602 of the International Mechanical Code. -10 points.
2. Category b—Air movement in egress elements not in accordance with Section 1020.5 of the International Building Code. -5 points.
3. Category c—Both Categories a and b are applicable. -15 points.
4. Category d—Compliance of the HVAC system with Section 1020.5 of the International Building Code and Section 602 of the International Mechanical Code. 0 points.
5. Category e—Systems serving one story; or a central boiler/chiller system without ductwork connecting two or more stories—or where systems have no ductwork. +5 points.

Reason: The stated intent of Section 1301.6.7 is to “evaluate the ability of the HVAC system to resist the movement of smoke and fire.” Points are awarded to systems with a limited ability to spread smoke and fire, such as systems serving only one story. The code is silent regarding instances where the heating and air conditioning systems do not utilize ductwork, thus eliminating the risk of spreading smoke and fire. Without heating and air conditioning ductwork, the degree of code compliance and fire safety is equal or greater than category “e” and points should be gained.

Cost Impact: The code change proposal will decrease the cost of construction

There is a small likelihood that points potentially gained by this code change would result in a decrease in cost. This is dependent on the total building score on Table 1301.7 and other decisions made by the applicant.

Proposal # 4174

EB127-19

EB128-19

IEBC®: 1301.6.12 (New), TABLE 1301.6.12 (New), 1301.6.12.1 (New)

Proponent: Kevin Scott, representing KH Scott & Associates LLC (khscoassoc@gmail.com)

2018 International Existing Building Code

Revise as follows:

1301.6.12 Dead ends. In spaces required to be served by more than one means of egress, evaluate the length of the exit access travel path in which the building occupants are confined to a single path of travel. Under the categories and occupancies in Table 1301.6.12, determine the appropriate value and enter that value into Table 1301.7 under Safety Parameter 1301.6.12, Dead Ends, for means of egress and general safety.

**TABLE 1301.6.12
DEAD-END VALUES**

OCCUPANCY	CATEGORIES ^a			
	a	b	c	d
A-1, A-2, A-3, A-4, B, E, F, M, R, S	-2 -4	0 -2	2 0	-4 2
A-2, E	-2	0	2	-4
I-2	-2 -6	0 -2	2 0	-6 2

- a. For dead-end distances between categories, the dead-end value shall be obtained by linear interpolation based on the longest dead-end corridor.

1301.6.12.1 Categories. The categories for dead ends are:

1. ~~Category a-Dead end of ends exceeding Category b.~~
2. Category b-Dead end not greater than 35 feet (10 670 mm) in nonsprinklered buildings or 70 feet (21 340 mm) in sprinklered buildings.
3. Category c-Dead end of not greater than 20 feet (6096 mm); or 50 feet (15 240 mm) in Group Groups B, E, F, M, R-1, R-2, R-4 and S in accordance with Section 1020.4, Exception 2, of the International Building Code.
4. ~~Category c-No d-No dead ends; or ratio of length to width (l/w) is less than 2.5:1. Category d-Dead ends exceeding Category a.~~

Reason: This code change accomplishes several things:

1. Table 1301.6.12 currently has failure modes at both ends of the table (Categories a and d). This is completely contrary to all of the other tables in Chapter 134. This revision places both failure modes as Categories a and b. This is consistent with the other tables in Chapter 13 and will reduce confusion in application of the table. As a result of revising the category order, Section 1301.6.12.1 is reorganized to match the table format.
2. The values for Group A-2 and E are identical to the scores for Groups A-1, A-3, A-4, B, F, M, R, and S. Therefore, the separate row for A-2 and E is deleted and these occupancies are moved into the row with the other occupancies.
3. Correlation of the new Category c with the current provisions in the IBC for new construction, otherwise the building will receive a deficit even though the building complies with the code. The current requirement states that only dead-end corridors in Group B occupancies can be up to 50 feet in length. However, the 2018 IBC allows dead-end corridors up to 50 feet in length in Group B, E, F, M, R-1, R-2, R-4, and S occupancies.

There is no change in the values applied from this table.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is editorial for clarity and correlation.

EB129-19

IEBC@: 1301.6.16.1 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Existing Building Code

Revise as follows:

1301.6.16.1 Categories. The categories for mixed occupancies are:

1. Category a—Occupancies separated by minimum 1-hour fire barriers or minimum 1-hour horizontal assemblies, or both.
2. Category b—Separations between occupancies in accordance with Section 508.4 of the International Building Code.
3. Category c— Separations between occupancies having a fire-resistance rating of not less than twice the 1-hour, 2-hour, 3-hour or 4-hour fire-resistance ratings that are specified in Table 508.4 where that required by Section 508.4 of the International Building Code.

Reason: The original intent was to provide a benefit where a wall provided double the hourly rating required for some type of separation. The rewording is simply to not allow for a project to get points for a wall with a zero rating.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is a rating system and design alternative, not a requirement.

Proposal # 4200

EB129-19

EB130-19

IEBC@: 1301.9.1

Proponent: Gregory Nicholls, representing American Institute of Architects (gnicholls@preview-group.com)

2018 International Existing Building Code

Revise as follows:

1301.9.1 Mixed occupancies. For mixed occupancies, the following provisions shall apply:

1. Where the separation between mixed occupancies does not qualify for any category indicated in Section 1301.6.16, the mandatory safety scores for the occupancy with the lowest general safety score in Table 1301.8 shall be utilized (see Section 1301.6).
2. Where the separation between mixed occupancies qualifies for any category indicated in Section 1301.6.16, the mandatory safety scores for each occupancy shall be placed against the evaluation scores for the appropriate occupancy. An evaluation is not required for areas of the building with separated occupancies in accordance with Table 508.4 of the International Building Code in which there are no alterations or change of occupancy.

Reason: The code text is intended to address a condition with multiple occupancies that are being altered or changed in occupancy classification. It does not address the situation where only portions of the building within the building are being changed. This added text is make it clear that while the portions altered or changed can have multiple separated occupancies, this does not have any bearing for the separated areas outside the work areas being addressed by the performance method.

Cost Impact: The code change proposal will decrease the cost of construction

By clarifying what happens with partial change in occupancy and conditions of mixed occupancies within the separated areas that are proposed to change in occupancy, the cost to the remainder of the building is decreased.

Proposal # 5295

EB130-19

EB131-19

IEBC@: TABLE 1301.6.20, 1301.6.20.1

Proponent: Jeffrey Harper, JENSEN HUGHES, representing JENSEN HUGHES (jharper@jensenhughes.com); Sean Donohue, representing JENSEN HUGHES (sdonohue@jensenhughes.com)

2018 International Existing Building Code

Revise as follows:

**TABLE 1301.6.20
SMOKE COMPARTMENTATION VALUES**

OCCUPANCY	CATEGORIES ^a			
	a	b	c	d
A, B, E, F, M, R and S	0	0	0	0
I-2	0	NP -10	NP -10	NP

For SI: 1 square foot = 0.093 m².

NP = Not Permitted.

- a. For areas between categories, the smoke compartmentation value shall be obtained by linear interpolation.

1301.6.20.1 Categories. Categories for smoke compartment size are:

1. Category a-Smoke compartment size is equal to or less than 22,500 square feet (2092 m²) - in a Group I-2, Condition 1 occupancy; or less than 40,000 square feet (3716 m²) in a Group I-2, Condition 2 occupancy as prescribed by IBC 407.5.1.
2. Category b-Smoke compartment size is greater than 22,500 square feet (2092 m²) - in a Group I-2, Condition 1 occupancy.
3. Category c-Smoke compartment size is greater than 40,000 square feet (3716 m²) in a Group I-2, Condition 2 occupancy.
4. Category d-Smoke compartments are not provided.

Reason: The effect of this table as currently written is to either allow or disallow the use of the performance compliance method for Group I-2 occupancies. There is no middle ground to account for a deficient smoke compartment. I-2 occupancies that fall under category 'b' should not create an automatic fail (NP), but rather should be assigned a certain negative value. Being over the maximum smoke compartment size does not cause the NFPA 101-A FSES to fail automatically; and if the intent is to echo the process, then it should cause a similar scoring condition. Currently, FSES allows smoke compartments that are greater than that required by the applicable governing section of NFPA 101. Having category 'b' as automatic fail contradicts this intent. A value of -10 has been chosen to show that the importance of smoke compartmentation is on par with the inclusion of sprinkler protection.

Lastly, the table has been adjusted to reflect the difference between I-2 conditions 1 and 2 having different allowable smoke compartment sizes.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This code provision will not increase cost and has a high likelihood of reducing cost by providing flexibility that does not currently exist in the code.

Proposal # 5477

EB131-19

EB132-19

IEBC@: TABLE 1301.6.21.1, TABLE 1301.6.21.2, TABLE 1301.6.21.3

Proponent: Jeffrey Harper, representing JENSEN HUGHES (jharper@jensenhughes.com); Sean Donohue, representing JENSEN HUGHES (sdonohue@jensenhughes.com)

2018 International Existing Building Code

Revise as follows:

TABLE 1301.6.21.1
PATIENT ABILITY VALUES

OCCUPANCY	CATEGORIES		
	a	b	c
I-2	1 ₃	2	3 ₁

TABLE 1301.6.21.2
PATIENT CONCENTRATION VALUES

OCCUPANCY	CATEGORIES		
	a	b	c
I-2	1 ₃	2	3 ₁

TABLE 1301.6.21.3
ATTENDANT-TO-PATIENT RATIO VALUES

OCCUPANCY	CATEGORIES		
	a	b	c
I-2	1 ₃	2	3 ₁

Reason: The point values for categories 'a' and 'c' in these three tables were incorrectly arranged during the original code change process and are not providing the higher score for what is the better situation and should be reversed in each of the three tables. In Table 1301.6.21.1, Category 'a' states "patients are capable of self-preservation without assistance." On the other hand, category 'c' states that "patients cannot be evacuated or relocated." Regarding means of egress and general safety, patient's ability to be mobile should be awarded more points. In Table 1301.6.21.2, Category 'a' states "smoke compartment has 1 to 10 patients." Category 'c', on the other hand, states "smoke compartment has more than 40 patients." The more patients there are in a single compartment, the worse it is in regard to means of egress and general safety. Thus, category 'c' should be awarded less points, having a higher concentration of patients. And finally in Table 1301.6.21.3, Category 'a' states "attendant-to-patient concentration is 1:5." Category 'c' states "attendant-to-patient concentration is greater than 1:10 or no patients." When it comes to means of egress and general safety, having a smaller attendant-to-patient ratio is more beneficial when compared to a larger ratio. Thus, category 'a' should be awarded more points as it has the smallest ratio.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This code provision will not increase cost and has a high likelihood of reducing cost by providing flexibility that does not currently exist in the code.

Proposal # 5488

EB132-19

EB133-19

IEBC@: (New), 1402.8 (New)

Proponent: Ali Fattah, City of San Diego, representing City of San Diego (afattah@sandiego.gov)

2018 International Existing Building Code

Add new definition as follows:

WILDLAND-URBAN INTERFACE AREA. That geographical area where structures and other human development meets or intermingles with wildland or vegetative fuels.

Add new text as follows:

1402.8 Wildland-Urban Interface Areas. If moved into a *wildland-urban interface area*, buildings shall comply with the *International Wildland-Urban Interface Code* as applicable.

Exception: Buildings previously located in a *wildland-urban interface area* or moved within a *wildland-urban interface area*.

Reason: The wildland-urban interface code provides additional building standards for buildings subjected to fire hazards within a *wildland-urban interface area* and as a result are subject the increased fire risk when relocated into such an area. The Scope of Section 101.2 of the IWUIC includes moved buildings. This code change merely correlates the two codes. The alterations Sections are not proposed to be amended nor is an exception being added for historical buildings to allow local jurisdictions to determine whether to exempt their historical resources or exterior building alterations from from compliance. It makes no sense that if a building is moved to a vacant lot that a site built adjacent building is required to satisfy WUI regulations but not the relocated building.

Cost Impact: The code change proposal will increase the cost of construction

By moving a building into a wui area the exterior roof, walls and openings may require upgrading. However the cost of the enhanced protection will provide a community benefit since in the WUI it is not unusual for conflagration hazards to occur when non compliant buildings burn and expose compliant buildings to hazards that they were not quite designed for since exterior fire fighting suppression may not be available to control the non-compliant building.

Proposal # 4840

EB133-19

EB134-19

IEBC@: [A] 101.4.2, CHAPTER 16 (New), 1601.1 (New), 1601.2 (New), 1601.3 (New), 1601.4 (New), 1601.4.1 (New), 1601.4.2 (New), 1601.4.3 (New)

Proponent: Anthony Apfelbeck, City of Altamonte Springs, representing City of Altamonte Springs (ACApfelbeck@altamonte.org)

2018 International Existing Building Code

Revise as follows:

[A] 101.4.2 Buildings previously occupied. The legal occupancy of any building existing on the date of adoption of this code shall be permitted to continue without change, except as is specifically covered in Chapter 16 of this code, the International Fire Code, or the International Property Maintenance Code, or as is deemed necessary by the *code official* for the general safety and welfare of the occupants and the public.

Add new text as follows:

CHAPTER 16 CONSTRUCTION REQUIREMENTS FOR EXISTING BUILDINGS

1601.1 Scope The provisions of this chapter shall apply to existing buildings constructed prior to the adoption of this code.

1601.2 Intent. The intent of this chapter is to provide a minimum degree of fire and life safety to persons occupying existing buildings by providing minimum construction requirements where such existing buildings do not comply with the minimum requirements of the International Building Code.

1601.3 Compliance. Existing buildings shall comply with not less than the minimum provisions specified in Chapter 11 of the International Fire Code and the International Property Maintenance Code prior to the application of the requirements in the International Existing Building Code.

1601.4 Owner notification. When a building is found to be in noncompliance with Section 1601.3, the code official shall duly notify the owner of the building or owner's authorized agent. Upon receipt of such notice, the owner or owner's authorized agent shall, subject to the following time limits, take necessary actions to comply with the provisions of this chapter.

1601.4.1 Construction documents. Construction documents necessary to comply with Section 1601.3 shall be completed and submitted within a time schedule approved by the code official.

1601.4.2 Completion of work. Work necessary to comply with this chapter shall be completed within a time schedule approved by the code official.

1601.4.3 Extension of time. The code official is authorized to grant necessary extensions of time where it can be shown that the specified time periods are not physically practical or pose an undue hardship. The granting of an extension of time for compliance shall be based on the showing of good cause and subject to the filing of an acceptable systematic plan of correction with the code official.

Reason: The IEBC, as expressly stated in the scope (Section 101.2) only applies when work is being done. It does not establish the minimum requirements for existing buildings. The International Fire Code, Chapter 11, establishes the minimum threshold of existing buildings.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal just clarifies the intent of how the code should be enforced. There is no impact to cost.

Proposal # 5541

EB134-19

EB135-19

IEBC@: 301.1, 301.3, SECTION 1601 (New), [BS] 1601.1 (New), [BS] 507.3, SECTION 1602 (New), [BS] 1602.1 (New), [BS] 1602.2 (New), [BS] 302.5.1, SECTION 303, [BS] 303.1, [BS] 303.2, [BS] 303.3, [BS] 303.3.1, [BS] TABLE 303.3.1, [BS] 303.3.2, [BS] TABLE 303.3.2, SECTION 304, [BS] 304.1, SECTION 405, [BS] 405.1, [BS] 405.2, [BS] 405.2.1, [BS] 405.2.1.1, [BS] 405.2.2, [BS] 405.2.3, [BS] 405.2.3.1, [BS] 405.2.3.2, [BS] 405.2.3.3, [BS] 405.2.4, [BS] 405.2.4.1, [BS] 405.2.5, 1606 (New), 1606.1 (New), [BS] 1103.3, [BS] 502.2, [BS] 502.4, [BS] 502.5, 1606.6 (New), 1607 (New), 1607.1 (New), [BS] 503.3, [BS] 705.2, [BS] 503.4, [BS] 503.11, [BS] 503.13, [BS] 503.12, [BS] 503.5, [BS] 503.6, [BS] 503.7, [BS] 503.8, [BS] 503.9, [BS] 503.10, 1608 (New), 1608.1 (New), 506.4.1, 506.4.2, 506.4.3, 506.4.4, 1609 (New), 1609.1 (New), [BS] 507.4, [BS] 1205.2, 1609.4 (New), 1610 (New), 1610.1 (New), [BS] 1402.2, [BS] 1402.2.1, [BS] 1402.3, [BS] 1402.4, [BS] 1402.5, [BS] 1402.6, [BS] 1402.7, [BS] 401.3, [BS] 502.3, [BS] 503.2, [BS] 701.3, SECTION 706, [BS] 706.1, [BS] 706.2, [BS] 706.3, [BS] 706.3.1, [BS] 706.3.2, SECTION 806, [BS] 806.1, [BS] 806.2, [BS] 806.3, [BS] 806.4, SECTION 906, [BS] 906.1, [BS] 906.2, [BS] 906.3, [BS] 906.4., [BS] 906.5, [BS] 906.6, [BS] 906.7, SECTION 1006, [BS] 1006.1, [BS] 1006.2, [BS]1006.3, [BS]1006.4, SECTION 1103, [BS] 1103.1, [BS] 1103.2, [BS] 1201.4, SECTION 1205, [BS] 1205.1, [BS] 1301.3.3, [BS] 1301.4.1

Proponent: Michael Fillion, representing National Council of Structural Engineers Associations (mrf.structure@verizon.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Revise as follows:

301.1 General. The *repair, alteration, change of occupancy, addition* or relocation of all *existing buildings* shall comply with Section 301.2, 301.3, or 301.4. Structural work shall comply with Chapter 16.

301.3 Alteration, addition or change of occupancy. The *alteration, addition or change of occupancy* of all *existing buildings* shall comply with one of the methods listed in Section 301.3.1, 301.3.2 or 301.3.3 as selected by the applicant. Sections 301.3.1 through 301.3.3 shall not be applied in combination with each other.

Exception: Subject to the approval of the *code official, alterations* complying with the laws in existence at the time the building or the affected portion of the building was built shall be considered in compliance with the provisions of this code. New structural members added as part of the *alteration* shall comply with the International Building Code. This exception shall not apply to alterations that constitute substantial improvement in *flood hazard areas*, which shall comply with Section 1601.2 503.2, 701.3 or 1301.3.3. This exception shall not apply to the structural provisions of Chapter 16, 5 or to the structural provisions of Sections 706, 806 and 906.

Add new text as follows:

SECTION 1601 ADMINISTRATION

[BS] 1601.1 Scope The provisions of this chapter shall govern the structural design of *repairs, alterations, changes of occupancy, additions or relocations* of all *existing buildings, structures and portions thereof* regulated by this code

Revise as follows:

[BS] ~~507.3~~ 1601.2 Flood hazard areas. Within flood *hazard areas* established in accordance with Section 1612.3 of the International Building Code, or Section R322 of the International Residential Code, as applicable, where the work proposed constitutes *substantial improvement*, the building shall be brought into compliance with Section 1612 of the International Building Code, or Section R322 of the International Residential Code, as applicable.

Exception: *Historic buildings* meeting any of the following criteria need not be brought into compliance:

1. Listed or preliminarily determined to be eligible for listing in the National Register of Historic Places.
2. Determined by the Secretary of the U.S. Department of Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined to qualify as an historic district.
3. Designated as historic under a state or local historic preservation program that is *approved* by the Department of Interior.

Add new text as follows:

SECTION 1602 GENERAL PROVISIONS

[BS] 1602.1 Existing Materials Use of existing materials shall comply with section 302.4.

[BS] 1602.2 New and replacement materials. New and replacement materials shall comply with section 302.5.

Revise as follows:

[BS] ~~302.5.1~~ 1602.2.1 New structural members and connections. New structural members and connections shall comply with the detailing provisions of the International Building Code for new buildings of similar structure, purpose and location.

Exception: Where alternative design criteria are specifically permitted.

SECTION ~~303~~ 1603

STRUCTURAL DESIGN LOADS ~~ANDEVALUATION AND EVALUATION AND DESIGN PROCEDURES~~

[BS] ~~303.1~~ 1603.1 Live loads. Where an *addition* or *alteration* does not result in increased design live load, existing gravity load-carrying structural elements shall be permitted to be evaluated and designed for live loads *approved* prior to the *addition* or *alteration*. If the *approved* live load is less than that required by Section 1607 of the International Building Code, the area designated for the nonconforming live load shall be posted with placards of *approved* design indicating the *approved* live load. Where the *addition* or *alteration* results in increased design live load, the live load required by Section 1607 of the International Building Code shall be used.

[BS] ~~303.2~~ 1603.2 Snow loads on adjacent buildings. Where an *alteration* or *addition* changes the potential snow drift effects on an adjacent building, the *code official* is authorized to enforce Section 7.12 of ASCE 7.

[BS] ~~303.3~~ 1603.3 Seismic evaluation and design procedures. Where required, seismic evaluation or design shall be based on the procedures and criteria in this section, regardless of which compliance method is used.

[BS] ~~303.3.1~~ 1603.3.1 Compliance with full seismic forces. Where compliance requires the use of full seismic forces, the criteria shall be in accordance with one of the following:

1. One-hundred percent of the values in the International Building Code. Where the existing seismic force-resisting system is a type that can be designated as "Ordinary," values of R , ϕ_e , Ω_0 and C_d used for analysis in accordance with Chapter 16 of the International Building Code shall be those specified for structural systems classified as "Ordinary" in accordance with Table 12.2-1 of ASCE 7, unless it can be demonstrated that the structural system will provide performance equivalent to that of a "Detailed," "Intermediate" or "Special" system.
2. ASCE 41, using a Tier 3 procedure and the two-level performance objective in Table ~~303.3.1~~ 1603.3.1 for the applicable *risk category*.

[BS] TABLE ~~303.3.1~~ 1603.3.1

PERFORMANCE OBJECTIVES FOR USE IN ASCE 41 FOR COMPLIANCE WITH FULL SEISMIC FORCES

RISK CATEGORY (Based on IBC Table 1604.5)	STRUCTURAL PERFORMANCE LEVEL FOR USE WITH BSE-1N EARTHQUAKE HAZARD LEVEL	STRUCTURAL PERFORMANCE LEVEL FOR USE WITH BSE-2N EARTHQUAKE HAZARD LEVEL
I	Life Safety (S-3)	Collapse Prevention (S-5)
II	Life Safety (S-3)	Collapse Prevention (S-5)
III	Damage Control (S-2)	Limited Safety (S-4)
IV	Immediate Occupancy (S-1)	Life Safety (S-3)

[BS] ~~303.3.2~~ 1603.3.2 Compliance with reduced seismic forces. Where seismic evaluation and design is permitted to use reduced seismic forces, the criteria used shall be in accordance with one of the following:

1. The International Building Code using 75 percent of the prescribed forces. Values of R , ϕ_e , Ω_0 and C_d used for analysis shall be as specified in Section ~~303.3.1~~ 1603.3.1 of this code.
2. Structures or portions of structures that comply with the requirements of the applicable chapter in Appendix A as specified in Items 2.1 through 2.4 and subject to the limitations of the respective Appendix A chapters shall be deemed to comply with this section.
 - 2.1. The seismic evaluation and design of unreinforced masonry bearing wall buildings in *Risk Category* I or II are permitted to be based on the procedures specified in Appendix Chapter A1.
 - 2.2. Seismic evaluation and design of the wall anchorage system in reinforced concrete and reinforced masonry wall buildings with flexible diaphragms in *Risk Category* I or II are permitted to be based on the procedures specified in Chapter A2.
 - 2.3. Seismic evaluation and design of cripple walls and sill plate anchorage in residential buildings of light-frame wood construction in *Risk Category* I or II are permitted to be based on the procedures specified in Chapter A3.
 - 2.4. Seismic evaluation and design of soft, weak, or open-front wall conditions in multiple-unit residential buildings of wood construction in *Risk Category* I or II are permitted to be based on the procedures specified in Chapter A4.
3. ASCE 41, using the performance objective in Table ~~303.3.2~~ 1603.3.2 for the applicable *risk category*.

[BS] TABLE ~~303.3.2~~ 1603.3.2

PERFORMANCE OBJECTIVES FOR USE IN ASCE 41 FOR COMPLIANCE WITH REDUCED SEISMIC FORCES

RISK CATEGORY(Based on IBC Table 1604.5)	STRUCTURAL PERFORMANCE LEVEL FOR USE WITH BSE-1E EARTHQUAKE HAZARD LEVEL	STRUCTURAL PERFORMANCE LEVEL FOR USE WITH BSE-2E EARTHQUAKE HAZARD LEVEL
I	Life Safety (S-3). See Note a	Collapse Prevention (S-5)
II	Life Safety (S-3). See Note a	Collapse Prevention (S-5)
III	Damage Control (S-2). See Note a	Limited Safety (S-4). See Note b
IV	Immediate Occupancy (S-1)	Life Safety (S-3). See Note c

- a. For Risk Categories I, II and III, the Tier 1 and Tier 2 procedures need not be considered for the BSE-1E earthquake hazard level.
- b. For Risk Category III, the Tier 1 screening checklists shall be based on the Collapse Prevention, except that checklist statements using the Quick Check provisions shall be based on *MS*-factors that are the average of the values for Collapse Prevention and Life Safety.
- c. For Risk Category IV, the Tier 1 screening checklists shall be based on Collapse Prevention, except that checklist statements using the Quick Check provisions shall be based on *MS*-factors for Life Safety.

SECTION 304 1604 IN-SITU LOAD TESTS

[BS] ~~304.1 1604.1~~ General. Where used, in-situ load tests shall be conducted in accordance with Section 1708 of the International Building Code.

SECTION 405 1605 STRUCTURAL REPAIRS

[BS] ~~405.1 1605.1~~ General. Structural *repairs* shall be in compliance with this section and Section 401.2.

[BS] ~~405.2 1605.2~~ Repairs to damaged buildings. *Repairs* to damaged buildings shall comply with this section.

[BS] ~~405.2.1 1605.2.1~~ Repairs for less than substantial structural damage. Unless otherwise required by this section, for damage less than *substantial structural damage*, the damaged elements shall be permitted to be restored to their predamage condition.

[BS] ~~405.2.1.1 1605.2.1.1~~ Snow damage. Structural components whose damage was caused by or related to snow load effects shall be repaired, replaced or altered to satisfy the requirements of Section 1608 of the International Building Code.

[BS] ~~405.2.2 1605.2.2~~ Disproportionate earthquake damage. A building assigned to Seismic Design Category D, E or F that has sustained *disproportionate earthquake damage* shall be subject to the requirements for buildings with substantial structural damage to vertical elements of the lateral force-resisting system.

[BS] ~~405.2.3 1605.2.3~~ Substantial structural damage to vertical elements of the lateral force-resisting system. A building that has sustained *substantial structural damage* to the vertical elements of its lateral force-resisting system shall be evaluated in accordance with Section ~~405.2.3.1~~ 1605.2.3.1, and either repaired in accordance with Section ~~405.2.3.2~~ 1605.2.3.2 or repaired and retrofitted in accordance with Section ~~405.2.3.3~~ 1605.2.3.3, depending on the results of the evaluation.

Exceptions:

1. Buildings assigned to Seismic Design Category A, B or C whose *substantial structural damage* was not caused by earthquake need not be evaluated or retrofitted for load combinations that include earthquake effects.
2. One- and two-family dwellings need not be evaluated or retrofitted for load combinations that include earthquake effects.

[BS] ~~405.2.3.1 1605.2.3.1~~ Evaluation. The building shall be evaluated by a registered design professional, and the evaluation findings shall be submitted to the *code official*. The evaluation shall establish whether the damaged building, if repaired to its predamage state, would comply with the provisions of the International Building Code for load combinations that include wind or earthquake effects, except that the seismic forces shall be the reduced seismic forces.

[BS] ~~405.2.3.2 1605.2.3.2~~ Extent of repair for compliant buildings. If the evaluation establishes that the building in its predamage condition complies with the provisions of Section ~~405.2.3.1~~ 1605.2.3.1, then the damaged elements shall be permitted to be restored to their predamage condition.

[BS] ~~405.2.3.3 1605.2.3.3~~ Extent of repair for noncompliant buildings. If the evaluation does not establish that the building in its predamage condition complies with the provisions of Section ~~405.2.3.1~~ 1605.2.3.1, then the building shall be retrofitted to comply with the provisions of this section. The wind loads for the *repair* and *retrofit* shall be those required by the building code in effect at the time of original construction, unless the damage was caused by wind, in which case the wind loads shall be in accordance with the International Building Code. The seismic loads for this *retrofit* design shall be those required by the building code in effect at the time of original construction, but not less than the reduced seismic forces.

[BS] ~~405.2.4~~ 1605.2.4 Substantial structural damage to gravity load-carrying components. Gravity load-carrying components that have sustained *substantial structural damage* shall be rehabilitated to comply with the applicable provisions for dead and live loads in the International Building Code. Snow loads shall be considered if the *substantial structural damage* was caused by or related to snow load effects. Undamaged gravity load-carrying components that receive dead, live or snow loads from rehabilitated components shall also be rehabilitated if required to comply with the design loads of the *rehabilitation* design.

[BS] ~~405.2.4.1~~ 1605.2.4.1 Lateral force-resisting elements. Regardless of the level of damage to vertical elements of the lateral force-resisting system, if *substantial structural damage* to gravity load-carrying components was caused primarily by wind or seismic effects, then the building shall be evaluated in accordance with Section ~~405.2.3.1~~ 1605.2.3.1 and, if noncompliant, retrofitted in accordance with Section ~~405.2.3.3~~ 1605.2.3.3.

Exceptions:

1. Buildings assigned to Seismic Design Category A, B, or C whose substantial structural damage was not caused by earthquake need not be evaluated or retrofitted for load combinations that include earthquake effects.
2. One- and two-family dwellings need not be evaluated or retrofitted for load combinations that include earthquake effects.

[BS] ~~405.2.5~~ 1605.2.5 Flood hazard areas. In *flood hazard* areas, buildings that have sustained *substantial damage* shall be brought into compliance with Section 1612 of the International Building Code, or Section R322 of the International Residential Code, as applicable.

Add new text as follows:

1606 ADDITIONS

1606.1 General Additions shall comply with section 502.1 and this section.

Revise as follows:

[BS] ~~1103.3~~ 1606.2 Flood hazard areas. Additions and foundations in flood hazard areas shall comply with the following requirements:

1. For horizontal additions that are structurally interconnected to the *existing building*:
 - 1.1. If the *addition* and all other proposed work, when combined, constitute substantial improvement, the *existing building* and the *addition* shall comply with Section 1612 of the International Building Code, or Section R322 of the International Residential Code, as applicable.
 - 1.2. If the *addition* constitutes substantial improvement, the *existing building* and the *addition* shall comply with Section 1612 of the International Building Code, or Section R322 of the International Residential Code, as applicable.
2. For horizontal additions that are not structurally interconnected to the *existing building*:
 - 2.1. The *addition* shall comply with Section 1612 of the International Building Code, or Section R322 of the International Residential Code, as applicable.
 - 2.2. If the *addition* and all other proposed work, when combined, constitute substantial improvement, the *existing building* and the *addition* shall comply with Section 1612 of the International Building Code, or Section R322 of the International Residential Code, as applicable.
3. For vertical additions and all other proposed work that, when combined, constitute substantial improvement, the *existing building* shall comply with Section 1612 of the International Building Code, or Section R322 of the International Residential Code, as applicable.
4. For a raised or extended foundation, if the foundation work and all other proposed work, when combined, constitute substantial improvement, the *existing building* shall comply with Section 1612 of the International Building Code, or Section R322 of the International Residential Code, as applicable.
5. For a new foundation or replacement foundation, the foundation shall comply with Section 1612 of the International Building Code or Section R322 of the International Residential Code, as applicable.

[BS] ~~502.2~~ 1606.3 Disproportionate earthquake damage. A building assigned to Seismic Design Category D, E or F that has sustained *disproportionate earthquake damage* shall be subject to the requirements for buildings with substantial structural damage to vertical elements of the lateral force-resisting system.

[BS] ~~502.4~~ 1606.4 Existing structural elements carrying gravity load. Any existing gravity load-carrying structural element for which an *addition* and its related *alterations* cause an increase in design dead, live or snow load, including snow drift effects, of more than 5 percent shall be replaced or altered as needed to carry the gravity loads required by the International Building Code for new structures. Any existing gravity load-carrying structural element whose vertical load-carrying capacity is decreased as part of the *addition* and its related *alterations* shall be considered to be an altered element subject to the requirements of Section ~~503.3~~ 1607.2. Any existing element that will form part of the lateral load path for any part of the *addition* shall be considered to be an existing lateral load-carrying structural element subject to the requirements of Section ~~502.5~~ 1606.5.

Exception: Buildings of Group R occupancy with not more than five dwelling or sleeping units used solely for residential purposes where the *existing building* and the *addition* together comply with the conventional light-frame construction methods of the International Building Code or the provisions of the International Residential Code.

[BS] 502-5 1606.5 Existing structural elements carrying lateral load. Where the *addition* is structurally independent of the *existing structure*, existing lateral load-carrying structural elements shall be permitted to remain unaltered. Where the *addition* is not structurally independent of the *existing structure*, the *existing structure* and its *addition* acting together as a single structure shall be shown to meet the requirements of Sections 1609 and 1613 of the International Building Code using full seismic forces.

Exceptions:

1. Any existing lateral load-carrying structural element whose demand-capacity ratio with the *addition* considered is not more than 10 percent greater than its demand-capacity ratio with the *addition* ignored shall be permitted to remain unaltered. For purposes of calculating demand-capacity ratios, the demand shall consider applicable load combinations with design lateral loads or forces in accordance with Sections 1609 and 1613 of the International Building Code. For purposes of this exception, comparisons of demand-capacity ratios and calculation of design lateral loads, forces and capacities shall account for the cumulative effects of *additions* and *alterations* since original construction.
2. Buildings of Group R occupancy with not more than five dwelling or sleeping units used solely for residential purposes where the *existing building* and the addition together comply with the conventional light-frame construction methods of the International Building Code or the provisions of the International Residential Code.

Add new text as follows:

1606.6 Storm shelters. Storm shelters shall comply with section 1106.

1607 ALTERATIONS

1607.1 General Alterations shall comply with section 503.1 and this section.

Revise as follows:

[BS] 503-3 1607.2 Existing structural elements carrying gravity load. Any existing gravity load-carrying structural element for which an *alteration* causes an increase in design dead, live or snow load, including snow drift effects, of more than 5 percent shall be replaced or altered as needed to carry the gravity loads required by the International Building Code for new structures. Any existing gravity load-carrying structural element whose gravity load-carrying capacity is decreased as part of the *alteration* shall be shown to have the capacity to resist the applicable design dead, live and snow loads including snow drift effects required by the International Building Code for new structures.

Exceptions:

1. Buildings of Group R occupancy with not more than five dwelling or sleeping units used solely for residential purposes where the altered building complies with the conventional light-frame construction methods of the International Building Code or the provisions of the International Residential Code.
2. Buildings in which the increased dead load is due entirely to the addition of a second layer of roof covering weighing 3 pounds per square foot (0.1437 kN/m²) or less over an existing single layer of roof covering.

[BS] 705-2 1607.2.1 Structural and construction loads. Structural roof components shall be capable of supporting the roof-covering system and the material and equipment loads that will be encountered during installation of the system.

[BS] 503-4 1607.3 Existing structural elements carrying lateral load. Except as permitted by Section ~~503-13~~ 1607.5, where the *alteration* increases design lateral loads, results in a prohibited structural irregularity as defined in ASCE 7, or decreases the capacity of any existing lateral load-carrying structural element, the structure of the altered building or structure shall meet the requirements of Sections 1609 and 1613 of the International Building Code. Reduced seismic forces shall be permitted.

Exception: Any existing lateral load-carrying structural element whose demand-capacity ratio with the *alteration* considered is not more than 10 percent greater than its demand-capacity ratio with the *alteration* ignored shall be permitted to remain unaltered. For purposes of calculating demand-capacity ratios, the demand shall consider applicable load combinations with design lateral loads or forces in accordance with Sections 1609 and 1613 of the International Building Code. Reduced seismic forces shall be permitted. For purposes of this exception, comparisons of demand-capacity ratios and calculation of design lateral loads, forces and capacities shall account for the cumulative effects of *additions* and *alterations* since original construction.

[BS] 503-11 1607.4 Substantial structural alteration. Where the *work area* exceeds 50 percent of the building area and where work involves a *substantial structural alteration*, the lateral load-resisting system of the altered building shall satisfy the requirements of Sections 1609 and 1613 of the International Building Code. Reduced seismic forces shall be permitted.

Exceptions:

1. Buildings of Group R occupancy with not more than five dwelling or sleeping units used solely for residential purposes that are

altered based on the conventional light-frame construction methods of the International Building Code or in compliance with the provisions of the International Residential Code.

2. Where the intended *alteration* involves only the lowest story of a building, only the lateral load-resisting components in and below that story need comply with this section.

[BS] ~~503-13~~ 1607.5 Voluntary lateral force-resisting system alterations. Structural *alterations* that are intended exclusively to improve the lateral force-resisting system and are not required by other sections of this code shall not be required to meet the requirements of Section 1609 or Section 1613 of the International Building Code, provided that all of the following apply:

1. The capacity of existing structural systems to resist forces is not reduced.
2. New structural elements are detailed and connected to existing or new structural elements as required by the International Building Code for new construction.
3. New or relocated nonstructural elements are detailed and connected to existing or new structural elements as required by the International Building Code for new construction.
4. The *alterations* do not create a structural irregularity as defined in ASCE 7 or make an existing structural irregularity more severe.

[BS] ~~503-12~~ 1607.6 Roof diaphragms resisting wind loads in high-wind regions. Where the intended *alteration* requires a permit for reroofing and involves removal of roofing materials from more than 50 percent of the roof diaphragm of a building or section of a building located where the ultimate design wind speed is greater than 115 mph (51 m/s) in accordance with Figure 1609.3(1) of the International Building Code or in a special wind region as defined in Section 1609 of the International Building Code, roof diaphragms, connections of the roof diaphragm to roof framing members, and roof-to-wall connections shall be evaluated for the wind loads specified in Section 1609 of the International Building Code, including wind uplift. If the diaphragms and connections in their current condition are not capable of resisting 75 percent of those wind loads, they shall be replaced or strengthened in accordance with the loads specified in Section 1609 of the International Building Code.

[BS] ~~503-5~~ 1607.7 Seismic Design Category F. Where the *work area* exceeds 50 percent of the building area, and where the building is assigned to Seismic Design Category F, the structure of the altered building shall meet the requirements of Sections 1609 and 1613 of the International Building Code. Reduced seismic forces shall be permitted.

[BS] ~~503-6~~ 1607.8 Bracing for unreinforced masonry parapets on reroofing. Where the intended *alteration* requires a permit for reroofing and involves removal of roofing materials from more than 25 percent of the roof area of a building assigned to Seismic Design Category D, E or F that has parapets constructed of unreinforced masonry, the work shall include installation of parapet bracing to resist out-of-plane seismic forces, unless an evaluation demonstrates compliance of such items. Reduced seismic forces shall be permitted.

[BS] ~~503-7~~ 1607.9 Anchorage for concrete and reinforced masonry walls. Where the *work area* exceeds 50 percent of the building area, the building is assigned to Seismic Design Category C, D, E or F and the building's structural system includes concrete or reinforced masonry walls with a flexible roof diaphragm, the *alteration* work shall include installation of wall anchors at the roof line, unless an evaluation demonstrates compliance of existing wall anchorage. Use of reduced seismic forces shall be permitted.

[BS] ~~503-8~~ 1607.10 Anchorage for unreinforced masonry walls in major alterations. Where the *work area* exceeds 50 percent of the building area, the building is assigned to Seismic Design Category C, D, E or F and the building's structural system includes unreinforced masonry bearing walls, the *alteration* work shall include installation of wall anchors at the floor and roof lines, unless an evaluation demonstrates compliance of existing wall anchorage. Reduced seismic forces shall be permitted.

[BS] ~~503-9~~ 1607.11 Bracing for unreinforced masonry parapets in major alterations. Where the *work area* exceeds 50 percent of the building area, and where the building is assigned to Seismic Design Category C, D, E or F, parapets constructed of unreinforced masonry shall have bracing installed as needed to resist out-of-plane seismic forces, unless an evaluation demonstrates compliance of such items. Reduced seismic forces shall be permitted.

[BS] ~~503-10~~ 1607.12 Anchorage of unreinforced masonry partitions in major alterations. Where the *work area* exceeds 50 percent of the building area, and where the building is assigned to Seismic Design Category C, D, E or F, unreinforced masonry partitions and nonstructural walls within the *work area* and adjacent to egress paths from the *work area* shall be anchored, removed or altered to resist out-of-plane seismic forces, unless an evaluation demonstrates compliance of such items. Use of reduced seismic forces shall be permitted.

[BS] ~~503-11~~ 1607.13 Substantial structural alteration. Where the *work area* exceeds 50 percent of the building area and where work involves a *substantial structural alteration*, the lateral load-resisting system of the altered building shall satisfy the requirements of Sections 1609 and 1613 of the International Building Code. Reduced seismic forces shall be permitted.

Exceptions:

1. Buildings of Group R occupancy with not more than five dwelling or sleeping units used solely for residential purposes that are altered based on the conventional light-frame construction methods of the International Building Code or in compliance with the provisions of the International Residential Code .
2. Where the intended *alteration* involves only the lowest story of a building, only the lateral load-resisting components in and below that story need comply with this section.

Add new text as follows:

1608 **CHANGE OF OCCUPANCY**

1608.1 General. Change of occupancy shall comply with section 506.1 and this section.

Revise as follows:

~~506.4.1~~ **1608.2 Live loads.** Structural elements carrying tributary live loads from an area with a *change of occupancy* shall satisfy the requirements of Section 1607 of the International Building Code. Design live loads for areas of new occupancy shall be based on Section 1607 of the International Building Code. Design live loads for other areas shall be permitted to use previously *approved* design live loads.

Exception: Structural elements whose demand-capacity ratio considering the *change of occupancy* is not more than 5 percent greater than the demand-capacity ratio based on previously *approved* live loads need not comply with this section.

~~506.4.2~~ **1608.3 Snow and wind loads.** Where a change of occupancy results in a structure being assigned to a higher *risk category*, the structure shall satisfy the requirements of Sections 1608 and 1609 of the International Building Code for the new *risk category*.

Exception: Where the area of the new occupancy is less than 10 percent of the building area, compliance with this section is not required. The cumulative effect of occupancy changes over time shall be considered.

~~506.4.3~~ **1608.4 Seismic loads (seismic force-resisting system).** Where a *change of occupancy* results in a building being assigned to a higher *risk category*, the building shall satisfy the requirements of Section 1613 of the International Building Code for the new *risk category* using full seismic forces.

Exceptions:

1. Where the area of the new occupancy is less than 10 percent of the building area and the new occupancy is not assigned to *Risk Category IV*, compliance with this section is not required. The cumulative effect of occupancy changes over time shall be considered.
2. Where a change of use results in a building being reclassified from *Risk Category I* or *II* to *Risk Category III* and the seismic coefficient, SDS, is less than 0.33, compliance with this section is not required.
3. Unreinforced masonry bearing wall buildings assigned to *Risk Category III* and to Seismic Design Category A or B, shall be permitted to use Appendix Chapter A1 of this code.

~~506.4.4~~ **1608.5 Access to Risk Category IV.** Any structure that provides operational access to an adjacent structure assigned to *Risk Category IV* as the result of a *change of occupancy* shall itself satisfy the requirements of Sections 1608, 1609 and 1613 of the International Building Code. For compliance with Section 1613, International Building Code-level seismic forces shall be used. Where operational access to the *Risk Category IV* structure is less than 10 feet (3048 mm) from either an interior lot line or from another structure, access protection from potential falling debris shall be provided.

Add new text as follows:

1609 **HISTORIC BUILDINGS**

1609.1 Report A historic building undergoing alteration or *change of occupancy* shall be investigated and evaluated, and a report prepared and filed in accordance with section 1201.2.

Revise as follows:

[BS] ~~507.4~~ **1609.2 Structural: General.** Historic buildings shall comply with the applicable structural provisions in this chapter.

Exceptions:

1. The *code official* shall be authorized to accept existing floors and existing live loads and to approve operational controls that limit the live load on any floor.
2. Repair of *substantial structural damage* is not required to comply with Sections ~~405.2.3~~ 1605.2.3, and ~~405.2.4~~ 1605.2.4. *Substantial structural damage* shall be repaired in accordance with Section ~~405.2.1~~ 1605.2.1.

[BS] ~~1205.2~~ **1609.3 Dangerous conditions.** Conditions determined by the *code official* to be dangerous shall be remedied. Work shall not be required beyond what is required to remedy the dangerous condition.

Add new text as follows:

1609.4 Relocated historic buildings. Relocated historic buildings shall comply with section 1206 and this section.

1610 RELOCATED BUILDINGS

1610.1 General. Relocated buildings shall comply with section 1401.2 and this section.

Revise as follows:

[BS] ~~1402.2~~ 1610.2 Foundation. The foundation system of relocated buildings shall comply with the International Building Code or the International Residential Code as applicable.

[BS] ~~1402.2.1~~ 1610.2.1 Connection to the foundation. The connection of the relocated building to the foundation shall comply with the International Building Code or the International Residential Code as applicable.

[BS] ~~1402.3~~ 1610.3 Wind loads. Buildings shall comply with International Building Code or International Residential Code wind provisions as applicable.

Exceptions:

1. Detached one- and two-family dwellings and Group U occupancies where wind loads at the new location are not higher than those at the previous location.
2. Structural elements whose stress is not increased by more than 10 percent.

[BS] ~~1402.4~~ 1610.4 Seismic loads. Buildings shall comply with International Building Code or International Residential Code seismic provisions at the new location as applicable.

Exceptions:

1. Structures in Seismic Design Categories A and B and detached one- and two-family dwellings in Seismic Design Categories A, B and C where the seismic loads at the new location are not higher than those at the previous location.
2. Structural elements whose stress is not increased by more than 10 percent.

[BS] ~~1402.5~~ 1610.5 Snow loads. Structures shall comply with International Building Code or International Residential Code snow loads as applicable where snow loads at the new location are higher than those at the previous location.

Exception: Structural elements whose stress is not increased by more than 5 percent.

[BS] ~~1402.6~~ 1610.6 Flood hazard areas. If relocated or moved into a *flood hazard area*, structures shall comply with Section 1612 of the International Building Code, or Section R322 of the International Residential Code, as applicable.

[BS] ~~1402.7~~ 1610.7 Required inspection and repairs. The *code official* shall be authorized to inspect, or to require *approved* professionals to inspect at the expense of the owner, the various structural parts of a relocated building to verify that structural components and connections have not sustained structural damage. Any *repairs* required by the *code official* as a result of such inspection shall be made prior to the final approval.

Delete without substitution:

~~[BS] 401.3 Flood hazard areas.~~ In flood hazard areas, *repairs* that constitute *substantial improvement* shall require that the building comply with Section 1612 of the International Building Code, or Section R322 of the International Residential Code, as applicable.

~~[BS] 502.3 Flood hazard areas.~~ For buildings and structures in *flood hazard areas* established in Section 1612.3 of the International Building Code, or Section R322 of the International Residential Code, as applicable, any *addition* that constitutes *substantial improvement* of the *existing structure* shall comply with the flood design requirements for new construction, and all aspects of the *existing structure* shall be brought into compliance with the requirements for new construction for flood design.

~~For buildings and structures in *flood hazard areas* established in Section 1612.3 of the International Building Code, or Section R322 of the International Residential Code, as applicable, any *additions* that do not constitute *substantial improvement* of the *existing structure* are not required to comply with the flood design requirements for new construction.~~

~~[BS] 503.2 Flood hazard areas.~~ For buildings and structures in *flood hazard areas* established in Section 1612.3 of the International Building Code, or Section R322 of the International Residential Code, as applicable, any *alteration* that constitutes *substantial improvement* of the *existing structure* shall comply with the flood design requirements for new construction, and all aspects of the *existing structure* shall be brought into compliance with the requirements for new construction for flood design.

~~For buildings and structures in *flood hazard areas* established in Section 1612.3 of the International Building Code, or Section R322 of the International Residential Code, as applicable, any *alterations* that do not constitute *substantial improvement* of the *existing structure* are not required to comply with the flood design requirements for new construction.~~

~~[BS] 701.3 Flood hazard areas. In flood hazard areas, alterations that constitute substantial improvement shall require that the building comply with Section 1612 of the International Building Code, or Section R322 of the International Residential Code, as applicable.~~

~~SECTION 706- STRUCTURAL~~

~~[BS] 706.1 General. Where alteration work includes replacement of equipment that is supported by the building or where a reroofing permit is required, the provisions of this section shall apply.~~

~~[BS] 706.2 Addition or replacement of roofing or replacement of equipment. Any existing gravity load-carrying structural element for which an alteration causes an increase in design dead, live or snow load, including snow drift effects, of more than 5 percent shall be replaced or altered as needed to carry the gravity loads required by the International Building Code for new structures.~~

~~Exceptions:~~

- ~~1. Buildings of Group R occupancy with not more than five dwelling or sleeping units used solely for residential purposes where the altered building complies with the conventional light frame construction methods of the International Building Code or the provisions of the International Residential Code.~~
- ~~2. Buildings in which the increased dead load is due entirely to the addition of a second layer of roof covering weighing 3 pounds per square foot (0.1437 kN/m²) or less over an existing single layer of roof covering.~~

~~[BS] 706.3 Additional requirements for reroof permits. The requirements of this section shall apply to alteration work requiring reroof permits.~~

~~[BS] 706.3.1 Bracing for unreinforced masonry bearing wall parapets. Where a permit is issued for reroofing for more than 25 percent of the roof area of a building assigned to Seismic Design Category D, E or F that has parapets constructed of unreinforced masonry, the work shall include installation of parapet bracing unless an evaluation demonstrates compliance of such items. Reduced seismic forces shall be permitted.~~

~~[BS] 706.3.2 Roof diaphragms resisting wind loads in high-wind regions. Where roofing materials are removed from more than 50 percent of the roof diaphragm or section of a building located where the ultimate design wind speed, *Vult*, determined in accordance with Figure 1609.3(1) of the International Building Code, is greater than 115 mph (51 m/s) or in a special wind region, as defined in Section 1609 of the International Building Code, roof diaphragms, connections of the roof diaphragm to roof framing members, and roof to wall connections shall be evaluated for the wind loads specified in the International Building Code, including wind uplift. If the diaphragms and connections in their current condition are not capable of resisting 75 percent of those wind loads, they shall be replaced or strengthened in accordance with the loads specified in the International Building Code.~~

~~SECTION 806- STRUCTURAL~~

~~[BS] 806.1 General. Structural elements and systems within buildings undergoing Level 2 alterations shall comply with this section.~~

~~[BS] 806.2 Existing structural elements carrying gravity loads. Any existing gravity load-carrying structural element for which an alteration causes an increase in design dead, live or snow load, including snow drift effects, of more than 5 percent shall be replaced or altered as needed to carry the gravity loads required by the International Building Code for new structures. Any existing gravity load-carrying structural element whose gravity load-carrying capacity is decreased as part of the alteration shall be shown to have the capacity to resist the applicable design dead, live and snow loads, including snow drift effects, required by the International Building Code for new structures.~~

~~Exceptions:~~

- ~~1. Buildings of Group R occupancy with not more than five dwelling or sleeping units used solely for residential purposes where the altered building complies with the conventional light frame construction methods of the International Building Code or the provisions of the International Residential Code.~~
- ~~2. Buildings in which the increased dead load is attributable to the addition of a second layer of roof covering weighing 3 pounds per square foot (0.1437 kN/m²) or less over an existing single layer of roof covering.~~

~~[BS] 806.3 Existing structural elements resisting lateral loads. Except as permitted by Section 806.4, where the alteration increases design lateral loads, or where the alteration results in prohibited structural irregularity as defined in ASCE 7, or where the alteration decreases the capacity of any existing lateral load-carrying structural element, the structure of the altered building or structure shall meet the requirements of Sections 1609 and 1613 of the International Building Code. Reduced seismic forces shall be permitted.~~

~~**Exception:** Any existing lateral load-carrying structural element whose demand-capacity ratio with the alteration considered is not more than 10 percent greater than its demand-capacity ratio with the alteration ignored shall be permitted to remain unaltered. For purposes of calculating demand-capacity ratios, the demand shall consider applicable load combinations with design lateral loads or forces in accordance with Sections 1609 and 1613 of the International Building Code. Reduced seismic forces shall be permitted. For purposes of this exception, comparisons of~~

demand-capacity ratios and calculation of design lateral loads, forces and capacities shall account for the cumulative effects of *additions* and *alterations* since original construction:

[BS] 906.4 Voluntary lateral force-resisting system alterations. Structural *alterations* that are intended exclusively to improve the lateral force-resisting system and are not required by other sections of this code shall not be required to meet the requirements of Section 1609 or Section 1613 of the International Building Code, provided that the following conditions are met:

1. The capacity of existing structural systems to resist forces is not reduced.
2. New structural elements are detailed and connected to existing or new structural elements as required by the International Building Code for new construction.
3. New or relocated nonstructural elements are detailed and connected to existing or new structural elements as required by the International Building Code for new construction.
4. The *alterations* do not create a structural irregularity as defined in ASCE 7 or make an existing structural irregularity more severe.

SECTION 906- STRUCTURAL

[BS] 906.1 General. Where buildings are undergoing Level 3 *alterations*, the provisions of this section shall apply:

[BS] 906.2 Existing structural elements resisting lateral loads. Where work involves a *substantial structural alteration*, the lateral load-resisting system of the altered building shall be shown to satisfy the requirements of Sections 1609 and 1613 of the International Building Code. Reduced seismic forces shall be permitted:

Exceptions:

1. Buildings of Group R occupancy with not more than five dwelling or sleeping units used solely for residential purposes that are altered based on the conventional light-frame construction methods of the International Building Code or in compliance with the provisions of the International Residential Code.
2. Where the intended alteration involves only the lowest story of a building, only the lateral load-resisting components in and below that story need comply with this section.

[BS] 906.3 Seismic Design Category F. Where the building is assigned to Seismic Design Category F, the structure of the altered building shall meet the requirements of Sections 1609 and 1613 of the International Building Code. Reduced seismic forces shall be permitted:

[BS] 906.4 Anchorage for concrete and masonry buildings. For any building assigned to Seismic Design Category D, E or F with a structural system that includes concrete or reinforced masonry walls with a flexible roof diaphragm, the alteration work shall include installation of wall anchors at the roof line of all subject buildings and at the floor lines of unreinforced masonry buildings unless an evaluation demonstrates compliance of existing wall anchorage. Reduced seismic forces shall be permitted:

[BS] 906.5 Anchorage for unreinforced masonry walls. For any building assigned to Seismic Design Category C, D, E or F with a structural system that includes unreinforced masonry bearing walls, the alteration work shall include installation of wall anchors at the roof line, unless an evaluation demonstrates compliance of existing wall anchorage. Reduced seismic forces shall be permitted:

[BS] 906.6 Bracing for unreinforced masonry parapets. Parapets constructed of unreinforced masonry in buildings assigned to Seismic Design Category C, D, E or F shall have bracing installed as needed to resist the reduced International Building Code level seismic forces in accordance with Section 303.3, unless an evaluation demonstrates compliance of such items. Use of reduced seismic forces shall be permitted:

[BS] 906.7 Anchorage of unreinforced masonry partitions. Where the building is assigned to Seismic Design Category C, D, E or F, unreinforced masonry partitions and nonstructural walls within the *work area* and adjacent to egress paths from the *work area* shall be anchored, removed, or altered to resist out-of-plane seismic forces, unless an evaluation demonstrates compliance of such items. Use of reduced seismic forces shall be permitted:

SECTION 1006- STRUCTURAL

[BS] 1006.1 Live loads. Structural elements carrying tributary live loads from an area with a *change of occupancy* shall satisfy the requirements of Section 1607 of the International Building Code. Design live loads for areas of new occupancy shall be based on Section 1607 of the International Building Code. Design live loads for other areas shall be permitted to use previously *approved* design live loads:

Exception: Structural elements whose demand-capacity ratio considering the *change of occupancy* is not more than 5 percent greater than the demand-capacity ratio based on previously *approved* live loads:

[BS] 1006.2 Snow and wind loads. Where a *change of occupancy* results in a structure being assigned to a higher risk category, the structure shall satisfy the requirements of Sections 1608 and 1609 of the International Building Code for the new risk category:

Exception: Where the area of the new occupancy is less than 10 percent of the building area. The cumulative effect of occupancy changes over time shall be considered.

[BS]1006.3 Seismic loads. Where a *change of occupancy* results in a building being assigned to a higher risk category, the building shall satisfy the requirements of Section 1613 of the International Building Code for the new risk category using full seismic forces.

Exceptions:

1. ~~Where a change of use results in a building being reclassified from Risk Category I or II to Risk Category III and the seismic coefficient, SDS, is less than 0.33.~~
2. ~~Where the area of the new occupancy is less than 10 percent of the building area and the new occupancy is not assigned to Risk Category IV. The cumulative effect of occupancy changes over time shall be considered.~~
3. ~~Unreinforced masonry bearing wall buildings assigned to Risk Category III and to Seismic Design Category A or B shall be permitted to use Appendix Chapter A1 of this code.~~

[BS]1006.4 Access to Risk Category IV. Any structure that provides operational access to an adjacent structure assigned to Risk Category IV as the result of a change of occupancy shall itself satisfy the requirements of Sections 1608, 1609 and 1613 of the International Building Code. For compliance with Section 1613, the full seismic forces shall be used. Where operational access to Risk Category IV is less than 10 feet (3048 mm) from either an interior lot line or from another structure, access protection from potential falling debris shall be provided.

SECTION 1103 STRUCTURAL

[BS] 1103.1 Additional gravity loads. Any existing gravity load-carrying structural element for which an *addition* and its related *alterations* cause an increase in design dead, live or snow load, including snow drift effects, of more than 5 percent shall be replaced or altered as needed to carry the gravity loads required by the International Building Code for new structures. Any existing gravity load-carrying structural element whose gravity load-carrying capacity is decreased as part of the *addition* and its related *alterations* shall be considered to be an altered element subject to the requirements of Section 806.2. Any existing element that will form part of the lateral load path for any part of the *addition* shall be considered to be an existing lateral load-carrying structural element subject to the requirements of Section 1103.3.

Exception: Buildings of Group R occupancy with not more than five dwelling units or sleeping units used solely for residential purposes where the *existing building* and the *addition* together comply with the conventional light frame construction methods of the International Building Code or the provisions of the International Residential Code.

[BS] 1103.2 Lateral force-resisting system. Where the *addition* is structurally independent of the existing structure, existing lateral load-carrying structural elements shall be permitted to remain unaltered. Where the *addition* is not structurally independent of the existing structure, the existing structure and its *addition* acting together as a single structure shall meet the requirements of Sections 1609 and 1613 of the International Building Code using full seismic forces.

Exceptions:

1. ~~Buildings of Group R occupancy with not more than five dwelling or sleeping units used solely for residential purposes where the *existing building* and the *addition* comply with the conventional light frame construction methods of the International Building Code or the provisions of the International Residential Code.~~
2. ~~Any existing lateral load-carrying structural element whose demand-capacity ratio with the *addition* considered is not more than 10 percent greater than its demand-capacity ratio with the *addition* ignored shall be permitted to remain unaltered. For purposes of calculating demand-capacity ratios, the demand shall consider applicable load combinations with design lateral loads or forces in accordance with Sections 1609 and 1613 of the International Building Code. For purposes of this exception, comparisons of demand-capacity ratios and calculation of design lateral loads, forces and capacities shall account for the cumulative effects of additions and *alterations* since original construction.~~

[BS] 1201.4 Flood hazard areas. In flood hazard areas, if all proposed work, including *repairs*, work required because of a *change of occupancy*, and *alterations*, constitutes substantial improvement, then the *existing building* shall comply with Section 1612 of the International Building Code, or Section R322 of the International Residential Code, as applicable.

Exception: If a *historic building* will continue to be a *historic building* after the proposed work is completed, then the proposed work is not considered a substantial improvement. For the purposes of this exception, a *historic building* is any of the following:

1. Listed or preliminarily determined to be eligible for listing in the National Register of Historic Places.
2. Determined by the Secretary of the U.S. Department of Interior to contribute to the historical significance of a registered historic district or a district preliminarily determined to qualify as a historic district.
3. Designated as historic under a state or local historic preservation program that is *approved* by the Department of Interior.

SECTION 1205

STRUCTURAL

[BS] 1205.1 General. ~~Historic buildings shall comply with the applicable structural provisions for the work as classified in Chapter 4 or 5.~~

Exceptions:

1. ~~The code official shall be authorized to accept existing floors and existing live loads and to approve operational controls that limit the live load on any floor.~~
2. ~~Repair of substantial structural damage is not required to comply with Sections 405.2.3 and 405.2.4. Substantial structural damage shall be repaired in accordance with Section 405.2.1.~~

[BS] 1301.3.3 Compliance with flood hazard provisions. ~~In flood hazard areas, buildings that are evaluated in accordance with this section shall comply with Section 1612 of the International Building Code, or Section R322 of the International Residential Code, as applicable if the work covered by this section constitutes substantial improvement.~~

[BS] 1301.4.1 Structural analysis. ~~The owner shall have a structural analysis of the existing building made to determine adequacy of structural systems for the proposed alteration, addition or change of occupancy. The analysis shall demonstrate that the building with the work completed is capable of resisting the loads specified in Chapter 16 of the International Building Code.~~

Reason: Proposal is to collect all of the structural provisions into one chapter, chapter 16. Reasons as follows:

1. Current IEBC has structural provisions in triplicate - once for prescriptive method, once for work area method, and once for performance method (albeit structural provisions for performance method are short, but have also been source of unnecessary confusion in the past). This represents unnecessary text, and for each code cycle, unnecessary work to maintain the same provisions across methods - structural work should be independant of the methodology used to determine architectural compliance.
2. Collection of structural provisions in one chapter will lead to better understanding of the code provisions by practicing engineers, and hence improved compliance with the intent of the code.
3. Trend towards differentiation by trade is already started in past code cycle - accessibility requirements have been consolidated in one location in chapter 3 applicable to all methods of compliance.
4. Disconnection of structural work from other trades in the code may release other trades to find the most beneficial compliance methodology, independant of structural constraints.

This proposal is almost entirely a re-numbering and relocation of existing provisions, only substantive change is that the the same structural provisions from the current prescriptive and work area methods will apply to the performance method.

Current Chapter 16 - Reference Standards - should be revised to Chapter 17.

Cost Impact: The code change proposal will decrease the cost of construction

Proposal will generally have no effect on hard construction costs. Should have some beneficial effect on soft costs due to collection of structural design information in one chapter. For performance based designs, may decrease cost of construction since full compliance with IBC structural provisions would no longer be required.

Proposal # 5648

EB135-19

EB136-19

IEBC@: [BS] A106.2.2.2, ASTM Chapter A0 (New)

Proponent: Michael Fillion, representing National Council of Structural Engineers Associations (mrf.structure@verizon.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Revise as follows:

[BS] A106.2.2.2 **Concrete masonry units and structural clay load-bearing tile.** Grouted or ungrouted hollow concrete masonry units shall be tested in accordance with ASTM C140. Grouted or ungrouted structural clay load-bearing tile shall be tested in accordance with ASTM ~~C34~~, C67.

Add new text as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken PA 19428-2959

C67-14: Test Methods of Sampling and Testing Brick and Structural Clay Tile

Reason: What the proposal does: Eliminates an inappropriate ASTM Standard reference to ASTM C34, and replaces with a more appropriate ASTM Standard reference ASTM C67.

Summary of the current problem and why it's unacceptable: The current version of the Code (in Section A106.2.2.2) requires testing on clay tile to be conducted in accordance with ASTM C34, but this standard does not include any testing information.

How the proposal solves it, in concept: The proposed language removes an inappropriate reference to ASTM C34, and replaces it with ASTM C67.

Point by point explanation and rationale for each change: Section A106.2.2.2 currently states the following: "Grouted or ungrouted structural clay load-bearing tile shall be tested in accordance with ASTM C34." However, ASTM C34 is a material specification (*Standard Specification for Structural Clay Loadbearing Wall Tile*), not a test specification.

C34 states that tests on hollow clay tile shall be in conformance with ASTM C67 *Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile*, which is the same test standard for modern clay brick. The C34 material specification standard is intended for new units that are not already installed into an assembly.

However, a significant percentage of clay brick masonry and hollow clay tile masonry buildings are historic structures. Since the manufacturing processes and typical firing temperatures used in the production of clay masonry units has changed dramatically over the past 100 years, it is unlikely that historic clay masonry materials will meet modern material specifications. Therefore, mandating testing of historic units for comparison with modern standards such as ASTM C67 can be problematic in some circumstances.

Nonetheless, testing of clay tile masonry units installed in old/historic masonry structures in accordance with this standard may be the best approach available at this time.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Proposal provides corrected ASTM reference, no change to design or construction.

Staff Analysis: The referenced standard, ASTM C67, is currently referenced in other 2018 I-codes.

Proposal # 5557

EB136-19

EB137-19

IEBC@: [BS] A106.2.2.2

Proponent: Michael Fillion, representing National Council of Structural Engineers Associations (mrf.structure@verizon.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Revise as follows:

[BS] ~~A106.2.2.2~~ A106.2.3.1 Concrete masonry units and structural clay load-bearing tile. Grouted or ungrouted hollow concrete masonry units shall be tested in accordance with ASTM C140. Grouted or ungrouted structural clay load-bearing tile shall be tested in accordance with ASTM C34.

Reason: Note that cdpAccess system did not let us modify existing section, so we have submitted under the "new section" section. Proposed modification is to relocate current section A106.2.2.2 to A106.2.3.

Proposes that Section A106.2.2.2 be incorporated into the portion of the Code that addresses masonry testing.

Section A106.2.2.2 deals with masonry testing, but it is located under Section A106.2.2, which is entitled "Lay-up of walls". The testing is not related to the lay-up of masonry walls.

The proposed change moves masonry testing of concrete block and structural clay load-bearing tile into the "Testing of masonry" section.

Section A106.2.2.2 deals entirely with testing of masonry materials. However, it is located under Section A106.2.2 "Lay-up of walls". The more appropriate location for these testing requirements would be under Section A106.2.3 "Testing of masonry."

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Proposal does not change code requirement, simply relocates code subsection to a more appropriate section.

Proposal # 5565

EB137-19

EB138-19

IEBC@: [BS] A106.2.3.1, [BS] A106.2.3.2

Proponent: Michael Fillion, representing National Council of Structural Engineers Associations (mrf.structure@verizon.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Revise as follows:

[BS] A106.2.3.1 **In-place mortar joint shear tests.** Mortar joint shear test values, v_{to} , shall be obtained by one of the following:

1. ASTM C1531.
2. For masonry walls that have high shear strength mortar, or where in-place testing is not practical because of crushing or other failure mode of the masonry, alternative procedures for testing shall be used in accordance with Section A106.2.3.2.

[BS] A106.2.3.2 **Alternative test procedures for testing masonry.** The ~~tensile splitting~~ ~~splitting tensile~~ strength of existing masonry, f_{sp} , or the prism strength of existing masonry, f_m , is permitted to be determined in accordance with ASTM C496 and calculated by the following equation:

$$f_{sp} = \frac{0.494P}{a_n}$$

(Equation A1-1)

Reason: Note that the cdpAccess system did not let us modify existig text, so it has been submitted under the "new text" section.

What the proposal does: Proposes that masonry tests be labeled so as to designate their intended purpose. Also, where necessary, the proposal changes the currently used test name so as to match the name in the referenced ASTM Standard.

Summary of the current problem and why it's unacceptable: The text of various sections (A106.2.3.1, A106.2.3.3, and A106.2.3.5) refer to shear test results. However, the current section heading language does not make it clear which tests are intended to provide information about shear capacity. The alternative procedure is described as splitting tensile test, but if the bed joints are oriented at 45 degrees from horizontal, this is actually a diagonal tension test, which is also effectively a measure of shear capacity.

How the proposal solves it, in concept: The proposed language provides more specific information to the user of the Code regarding the purpose of each type of masonry testing.

Point by point explanation and rationale for each change: While the purpose and function of ASTM C1531 testing is relatively clearly defined by the text as providing information related to masonry joint shear capacity, the purpose of the splitting tensile testing is not as clearly described. The later sections of the text reference masonry "quality," and the earlier sections describe "splitting tensile" behavior. Splitting tensile testing is generally associated with direct tensile capacity. However, if the test is conducted in the manner described in the 2015 IEBC (with bed joints oriented at a 45-degree angle), the failure will actually generally be a "diagonal tension" failure in the bed joint, which is more like a shear failure in a wall. There could be confusion by an engineer attempting to use this Code section regarding the purpose of the diagonal tension / splitting tensile testing as the section is currently written. Providing labels that describe the purpose of each type of test, and using test names that match those in the referenced ASTM Standards, would make the intent of each type of testing more clear.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

Proposed modification clarifies the relevant masonry testing.

Proposal # 5570

EB138-19

EB139-19

IEBC@: [BS] A106.2.3.6

Proponent: Michael Fillion, representing National Council of Structural Engineers Associations (mrf.structure@verizon.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Revise as follows:

[BS] A106.2.3.6 Minimum quality of masonry. Where the alternative procedures of Section A106.2.3.2 are used to determine masonry quality, the following minimums apply:

1. The minimum average value of ~~tensile-splitting~~ splitting tensile strength, f_{sp} , as calculated by Equation A1-1 shall be 50 pounds per square inch (344.7 kPa).
2. Individual unreinforced masonry walls with average ~~tensile-splitting~~ splitting tensile strength of less than 50 pounds per square inch (344.7 kPa) shall be pointed and retested.
3. The lower-bound mortar strength f_{spl} is defined as the mean minus one standard deviation $PD+L$ of the ~~tensile-splitting~~ splitting tensile test values f_{sp} .

Reason: What the proposal does: Clarifies the requirements for the alternative procedures for testing of existing masonry.

It also corrects certain terminology used in the provision so that it correctly corresponds with the ASTM test method that the provision references.

Summary of the current problem and why it's unacceptable: Section A106.2 of the IEBC includes what appear to be parallel sections regarding mortar testing and masonry testing. However, the labelling of these sections makes the intent of the code provisions unclear as to when and where the requirements of Section A106.2.3.6 are applicable.

Also, Section A106.2.3.2 references ASTM C496, which is titled Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens. However, the terminology used throughout Section A106.2.3.6 incorrectly refers to tensile-splitting strength rather than to splitting tensile strength

How the proposal solves it, in concept: The proposed language clarifies the relationship between Section A106.2.3.2 and Section A106.2.3.6. It also corrects terminology to correspond with the referenced ASTM standard.

Point by point explanation and rationale for each change: Section A106.2 of the IEBC includes what appear to be parallel sections regarding mortar testing and masonry testing. However, the labelling of these sections makes the intent of the code provisions unclear.

Section A106.2.3.1 is titled "In-place mortar tests." The following section (A106.2.3.2) is titled "Alternative procedures for testing masonry" and describes splitting tensile strength testing. This labelling strongly suggests that the designer can choose either to test existing masonry mortar shear (using ASTM C1531), or the designer can elect to conduct splitting tensile testing. The language in Section A106.2.3.2 confirms that the splitting tensile test is an alternate approach.

However, later in the Section, there are two additional parallel paragraphs. The first is titled "A106.2.3.5 Minimum quality of mortar," which appears to reference the mortar shear testing of A106.2.3.1. The following paragraph is labelled "A106.2.3.6 Minimum quality of masonry," and it references minimum splitting tensile. However, the title and language of A106.2.3.6 do not indicate whether or not this is intended to be an alternate means of qualifying masonry or if, in fact, masonry must meet BOTH the minimum quality of mortar requirements of the previous section AND the minimum quality of masonry requirements of this section. If the intent is for this paragraph to provide an alternate approach to qualifying masonry, both the title and the introductory language should indicate that this paragraph is an alternate to the previous.

The reference to tensile-splitting strength is changed to splitting tensile strength to match ASTM C496 referenced in A106.2.3.2.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

Proposal clarifies that certain acceptance criteria is only relevant for the alternative procedures for masonry testing.

Proposal # 5578

EB139-19

EB140-19

IEBC@: [BS] A202.1

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

[BS] A202.1 Scope. The provisions of this chapter shall apply to wall anchorage systems that resist out-of-plane forces and to collectors in existing reinforced concrete or reinforced masonry buildings with flexible diaphragms. Wall anchorage systems that were designed and constructed in accordance with the 1997 *Uniform Building Code*, ~~1999 *BOCA National Building Code*, 1999 *Standard Building Code*~~ or the 2000 ~~and or~~ subsequent editions of the International Building Code shall be deemed to comply with these provisions.

Reason: The proposal updates the benchmark codes to match ASCE 41-17. In ASCE 41-17, the latest edition of *Seismic Evaluation and Retrofit of Existing Buildings*, Table 3-2 gives benchmark codes deemed to comply with a safety-based retrofit such as that contemplated by Chapter A2. In Table 3-2, the only benchmarks given for tilt-up (PC1, PC1A) and reinforced masonry (RM1) structural systems are the 1997 UBC and 2000 IBC. Buildings designed with the NBC or SBC are not benchmarked.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

Tilt-up or 1-story CMU buildings designed with the 1999 NBC or 1999 SBC that are not also in compliance with the 2000 IBC will no longer be benchmarked and therefore might be subject to retrofit costs, but these are expected to be exceptionally rare, and effectively non-existent in California and other high seismic areas that traditionally used the UBC.

Proposal # 5782

EB140-19

EB141-19

IEBC@: [BS] A203.1, (New), [BS], [BS] A205.3, [BS] A206.3

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Revise as follows:

[BS] A203.1 Definitions. For the purpose of this chapter, the applicable definitions listed in ~~Chapters 16, 19, 21, 22 and 23~~ of the International Building Code and the following shall apply:

Add new definition as follows:

CONTINUITY CONNECTOR A component, typically a plate, rod, strap, or hold-downs, that ensures load path continuity along the full length of a ~~crosstie or strut.~~

CROSSTIE A member continuous across the main diaphragm that connects opposite wall lines and transfers out-of-plane wall anchorage forces into the diaphragm.

Revise as follows:

[BS] FLEXIBLE DIAPHRAGMS: DIAPHRAGM. ~~Roofs and floors including, but not limited to, those~~ A roof or floor sheathed with plywood, wood decking (1-by or 2-by) or metal ~~decks-deck~~ without a concrete topping ~~slabs-slab.~~

Add new definition as follows:

STRUT A member continuous across a subdiaphragm that transfers out-of-plane wall anchorage forces into the subdiaphragm.

WALL ANCHORAGE SYSTEM The components comprising a complete load path for out-of-plane wall forces from the wall to the main diaphragm, typically including anchors embedded in or fastened to the wall; rods, straps, plates, hold-downs or other hardware; subdiaphragms and their chords; crossties; struts; and continuity connectors.

[BS] A205.3 Requirements for plans. The plans shall accurately reflect the results of the engineering investigation and design and shall show all pertinent dimensions and sizes for plan review and construction. The following shall be provided:

1. Floor plans and roof plans shall show existing framing construction, diaphragm construction, proposed wall anchors, ~~cross-ties~~ crossties and collectors. Existing nailing, anchors, ~~cross-ties~~ crossties and collectors shall be shown on the plans if they are considered part of the lateral force-resisting systems.
2. At elevations where there are *alterations* or damage, details shall show roof and floor heights, dimensions of openings, location and extent of existing damage and proposed *repair*.
3. Typical wall panel details and sections with panel thickness, height, pilasters and location of anchors shall be provided.
4. Details shall include existing and new anchors and the method of developing anchor forces into the diaphragm framing, existing and new ~~cross-ties~~ crossties, and existing and new or improved support of roof and floor girders at pilasters or walls.
5. The basis for design and the building code used for the design shall be stated on the plans.

[BS] A206.3 Development of anchor loads into the diaphragm. Development of anchor loads into roof and floor diaphragms shall comply with Section 1613 of the International Building Code using horizontal forces that are 75 percent of those used for new construction.

In wood diaphragms, anchorage shall not be accomplished by use of toenails or nails subject to withdrawal. Wood ledgers, top plates or framing shall not be used in cross-grain bending or cross-grain tension. The ~~continuous ties~~ crossties required in Section 1613 of the International Building Code shall be in addition to the diaphragm sheathing.

Lengths of development of anchor loads in wood diaphragms shall be based on existing field nailing of the sheathing unless existing edge nailing is positively identified on the original construction plans or at the site.

Exception: If continuously tied girders are present, the maximum spacing of the ~~continuity ties~~ crossties is the greater of the girder spacing or 24 feet (7315 mm).

Reason: This proposal supplements the Chapter A2 definitions and corrects references to defined terms.

A203.1: The IBC now has all of its definitions in Chapter 2. There is no need to cite specific chapters or sections.

In addition to the added definitions, ASCE 7 already provides adequate definitions for two other terms used in the chapter: subdiaphragm and collector.

CONTINUITY CONNECTOR, CROSSTIE, STRUT: Definitions added to clarify the provisions and ensure consistency. The term “crosstie,” a single word with no hyphen, is consistent with the terminology used in ASCE 7 Section 12.11.2.2.1. (Some RWFD retrofit references, including the Los Angeles Building Code and the SEAOC commentary, refer to continuity connectors as “continuity ties.” However, continuity connectors is the more traditional term and is preferred in part because “continuity ties” is easily confused with the phrase “continuous crossties.”)

FLEXBLE DIAPHRAGM(S): Make the defined term singular. Simplify the definition to match ASCE 7 Section 12.3.1.1, which refers only to “diaphragms constructed of untopped steel decking or wood structural panels.”

WALL ANCHORAGE SYSTEM: The proposed definition is based on ASCE 7 Section 12.11.2.2.1, which lists the components that need to be provided to carry the prescribed forces.

A205.3: Replace “cross-ties” with “crossties” in three places.

A206.3: In two places, the correct term “crossties” replaces similar but confusing wording. The crossties must be continuous, but 'continuous ties' or 'continuity ties' is confusingly close to 'continuity connectors'."

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The proposal is editorial and therefore will have no effect on cost.

Proposal # 5701

EB141-19

EB142-19

IEBC@: [BS] A203.1, [BS], (New), [BS] A206.2

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

[BS] A203.1 Definitions. For the purpose of this chapter, the applicable definitions listed in Chapters 16, 19, 21, 22 and 23 of the International Building Code and the following shall apply:

[BS] FLEXIBLE DIAPHRAGMS. Roofs and floors including, but not limited to, those sheathed with plywood, wood decking (1-by or 2-by) or metal decks without concrete topping slabs.

Add new definition as follows:

WALL SEGMENT Any length of concrete or reinforced masonry wall not interrupted or intersected by a pilaster or vertical construction joint.

Revise as follows:

[BS] A206.2 Special requirements for wall anchorage systems. The steel elements of the wall anchorage system shall be designed in accordance with the International Building Code without the use of the 1.33 short duration allowable stress increase where using allowable stress design.

The maximum spacing between wall anchors shall be 8 feet, and each wall segment shall have at least two wall anchors.

Wall anchors shall be provided to resist out-of-plane forces, independent of existing shear anchors.

Expansion anchors are only allowed with special inspection and *approved* testing for seismic loading.

Attaching the edge of plywood sheathing to steel ledgers is not considered compliant with the positive anchoring requirements of this chapter. Attaching the edge of steel decks to steel ledgers is not considered as providing the positive anchorage of this chapter unless testing or analysis is performed to establish shear values for the attachment perpendicular to the edge of the deck. Where steel decking is used as a wall anchor system, the existing connections shall be subject to field verification and the new connections shall be subject to special inspection.

Exception: Existing cast-in-place shear anchors are allowed to be used as wall anchors if the tie element can be readily attached to the anchors, and if the engineer or architect can establish tension values for the existing anchors through the use of *approved* as-built plans or testing and through analysis showing that the bolts are capable of resisting the total shear load (including dead load) while being acted on by the maximum tension force caused by an earthquake. Criteria for analysis and testing shall be determined by the building official.

Reason: This proposal adds a prescriptive requirement based on ASCE 41 Table 17-28, which considers the lack of two anchors per precast wall panel to be a potential deficiency. The 8-ft maximum spacing proposed is larger than the spacing that would be expected for a typical Chapter A2 retrofit and thus represents a limit to guard against unusual or extreme cases.

A definition of wall segment is provided to facilitate the new requirement.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposal guards against extreme cases and will not apply frequently thus generally not affecting the cost of construction.

Proposal # 5708

EB142-19

EB143-19

IEBC@: [BS] A205.1, [BS] A206.1, [BS] A206.2, [BS] A206.3, [BS] A206.4, [BS] A206.5, [BS] A206.8

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Revise as follows:

[BS] A205.1 General. The seismic-resisting elements specified in this chapter shall comply with applicable provisions of Section 1613 of the International Building Code and Chapter 12 of ASCE 7, except as modified herein.

[BS] A206.1 Reinforced concrete and reinforced masonry wall anchorage. Concrete and masonry walls shall be anchored to all floors and roofs that provide lateral support for the ~~wall~~ wall in accordance with ASCE 7 Section 12.11.2. The anchorage shall provide a ~~positive~~ direct connection ~~between the wall and floor or roof construction~~ capable of resisting 75 percent of the ~~horizontal~~ forces specified in ~~Section 1613 of the International Building Code~~ ASCE 7 Section 12.11.2.1.

Exceptions:

1. Existing walls need not be evaluated or retrofitted for bending between anchors.
2. Work required by this chapter need not consider shrinkage, thermal changes, or differential settlement.

[BS] A206.2 Special ~~Additional~~ requirements for wall anchorage systems. The wall anchorage system shall comply with the requirements of this section and of ASCE 7 Section 12.11.2.2.

The steel elements of the wall anchorage system shall be designed in accordance with the International Building Code without the use of the 1.33 short duration allowable stress increase where using allowable stress design.

Wall anchors shall be provided to resist out-of-plane forces, independent of existing shear anchors.

Expansion anchors are only allowed with special inspection and *approved* testing for seismic loading.

Attaching the edge of plywood sheathing to steel ledgers is not considered compliant with the positive anchoring requirements of this chapter. Attaching the edge of steel decks to steel ledgers is not considered as providing the positive anchorage of this chapter unless testing or analysis is performed to establish shear values for the attachment perpendicular to the edge of the deck. Where steel decking is used as a wall anchor system, the existing connections shall be subject to field verification and the new connections shall be subject to special inspection.

Exception: Existing cast-in-place shear anchors are allowed to be used as wall anchors if the tie element can be readily attached to the anchors, and if the engineer or architect can establish tension values for the existing anchors through the use of *approved* as-built plans or testing and through analysis showing that the bolts are capable of resisting the total shear load (including dead load) while being acted on by the maximum tension force caused by an earthquake. Criteria for analysis and testing shall be determined by the building official.

[BS] A206.3 Development of ~~anchor loads~~ anchorage forces into the diaphragm. Development of ~~anchor loads~~ the required anchorage forces into roof and floor diaphragms shall comply with the requirements of this section and of ASCE 7 Section 12.11.2.2. ~~Section 1613 of the International Building Code using horizontal forces that are 75 percent of those used for new construction.~~

In wood diaphragms, anchorage shall not be accomplished by use of toenails or nails subject to withdrawal. Wood ledgers, top plates or framing shall not be used in cross-grain bending or cross-grain tension. The continuous ties required in Section 1613 of the International Building Code shall be in addition to the diaphragm sheathing. Lengths of development of anchor loads in wood diaphragms shall be based on existing field nailing of the sheathing unless existing edge nailing is positively identified on the original construction plans or at the site.

Exception: If continuously tied girders are present, the maximum spacing of the continuity ties is the greater of the girder spacing or 24 feet (7315 mm).

[BS] A206.4 Anchorage at pilasters. ~~Anchorage at pilasters shall be designed for the tributary wall anchoring load per Section A206.1, considering the wall as a two-way slab. The edges of the two-way slab shall be considered to be fixed where there is continuity at pilasters and shall be considered to be pinned at roof and floor. Where pilasters are present, the wall anchorage system shall comply with the requirements of this section and of ASCE 7 Section 12.11.2.2.7. The pilasters or the walls immediately adjacent to the pilasters shall be anchored directly to the roof framing such that the existing vertical anchor bolts at the top of the pilasters are bypassed without permitting tension or shear failure at the top of the pilasters. The minimum anchorage force at a floor or roof between the pilasters shall be that specified in Section A206.1.~~

Exception: If existing vertical anchor bolts at the top of the pilasters are used for the anchorage, additional exterior confinement shall be provided

as required to resist the total anchorage force.

Delete without substitution:

~~**[BS] A206.5 Symmetry.** Symmetry of wall anchorage and continuity connectors about the minor axis of the framing member is required.~~

~~**Exception:** Eccentricity shall be allowed where it can be shown that all components of forces are positively resisted. The resistance must be supported by calculations or tests.~~

~~**[BS] A206.8 Collectors.** If collectors are not present Collectors designed in accordance with this section shall be provided at reentrant corners ~~or and at interior shear walls, they shall be provided.~~ walls. Existing or new collectors shall ~~be designed for~~ have the capacity required to develop into the diaphragm a force equal to the lesser of the rocking or shear capacity of the reentrant wall or the tributary shear based on 75 percent of the ~~horizontal diaphragm design forces specified in Chapter 16 of the International Building Code.~~ ASCE 7 Section 12.10. The capacity of the collector need not exceed the capacity of the diaphragm to deliver loads to the collector. A connection shall be provided from the collector to the reentrant wall to transfer the full collector force (load). ~~internal force.~~ If a truss or beam other than a rafter or purlin is supported by the reentrant wall or by a column integral with the reentrant wall, then an independent secondary column is required to support the roof or floor members whenever rocking or shear capacity of the reentrant wall is less than the tributary shear.~~

Reason: This proposal improves coordination, and removes conflicts, between Chapter A2 and the reference codes and standards it already cites. The intent is to avoid duplication, leaving in Chapter A2 only those specific existing building provisions not found in ASCE 7. Since the current Chapter A2 already requires the designer to consult the IBC, which then invokes ASCE 7, this proposed approach does not result in any additional work.

Rationale for each change is as follows:

A205.1: The provision cites IBC Section 1613 as criteria, but Section 1613 merely references ASCE 7. IBC Section 1613.5.1 used to modify the ASCE 7 provisions for wall anchorage, but those modifications are no longer in the 2018 IBC. Therefore, since ASCE 7 is an approved reference standard, and since compliance with IBC Section 1613 would already require its use without modification, it is preferable to refer directly to ASCE 7. Citing ASCE 7 within the general provisions of Section A205.1 facilitates the reference to specific ASCE 7 sections within Section A206.

A206.1:

- Edits to match the wording of ASCE 7 Section 12.11.2.1.
- Two exceptions added to maintain the current scope of Chapter A2, which considers only the wall anchorage system and collectors, but does not require a check of the walls themselves or the main diaphragm under global lateral loads. The wording of the two exceptions refers to requirements for new construction in ASCE 7 Section 12.11.2.1. Without these proposed exceptions, a plain reading of the current provision would invoke IBC Section 1613, which would invoke ASCE 7, which would include all requirements in Section 12.11.2.1.

A206.2:

- Edit the section title to match ASCE 7 Sec 12.11.2.2.
- Add reference to ASCE 7 Sec 12.11.2.2.

A206.3:

- Edit the section title to match wording of ASCE 7 Sec 12.11.2 and subsections.
- Add reference to ASCE 7 Sec 12.11.2.2. The reference to "75 percent" forces is deleted as unnecessary; it is preferable to avoid duplication of the same allowance given in A206.1.
- Delete the paragraph about wood diaphragms. ASCE 7 Sec 12.11.2.2.3 already makes similar restrictions on nailing, cross-grain bending, and separate cross-ties.

A206.4: Add reference to ASCE 7 Sec 12.11.2.2.7 and delete redundant provision.

A206.5: Delete, as eccentricity is already covered by ASCE 7 Sec 12.11.2.2.6.

A206.8: Refer to ASCE 7 instead of IBC Chapter 16. Note that Chapter A2 allows a capacity design approach per this section as an alternative to ASCE 7 with reduced forces.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal is editorial and provides coordination only.

EB144-19

IEBC@: [BS] A205.2, [BS] A205.3

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Delete without substitution:

~~**[BS] A205.2 Alterations and repairs.** *Alterations and repairs* required to meet the provisions of this chapter shall comply with applicable structural requirements of the building code unless specifically modified in this chapter.~~

Revise as follows:

[BS] A205.3 Requirements for plans. The plans shall accurately reflect the results of the engineering investigation and design and shall show all pertinent dimensions and sizes for plan review and construction. The following shall be provided:

1. Floor plans and roof plans shall show existing framing construction, diaphragm construction, proposed wall anchors, cross-ties and collectors. Existing nailing, anchors, cross-ties and collectors shall be shown on the plans if they are considered part of the lateral force-resisting systems.
2. At elevations where there are ~~alterations or damage~~, details shall show roof and floor heights, dimensions of openings, location and extent of existing damage and proposed repair.
3. Typical wall panel details and sections with panel thickness, height, pilasters and location of anchors shall be provided.
4. Details shall include existing and new anchors and the method of developing anchor forces into the diaphragm framing, existing and new cross-ties, and existing and new or improved support of roof and floor girders at pilasters or walls.
5. The basis for design and the building code used for the design shall be stated on the plans.

Reason: This proposal removes provisions that are unnecessary and outside the scope of Chapter A2. There is no need for Section A205.2, as the applicable codes already cover these same generic circumstances. Neither IEBC Chapter A3 nor IEBC Chapter A4 has a similar provision, demonstrating that it is unnecessary in Chapter A2. (EBC Chapter A1 does have a similar provision, but it's unnecessary and obsolete there, too.) Similarly, since alteration and repair (other than the contemplated retrofit) is outside the scope of Chapter A2, Section A205.3 item 2 is not needed and potentially misleading. Where other alterations or repairs are being made, the IEBC or governing code will already have provisions for proper documentation.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal has no substantive impact as these provisions are addressed elsewhere.

Proposal # 5703

EB144-19

EB145-19

IEBC@: [BS] A205.4, 205.5 (New), A205.6 (New)

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Revise as follows:

[BS] A205.4 Structural ~~observation, testing and inspection.~~ **observation.** Structural observation ~~in accordance with Section 1709-1704.6 of the International Building Code, shall be required for all structures in which seismic retrofit is being performed in accordance with this chapter. is required, regardless of seismic design category, height, or other conditions.~~ Structural observation shall include visual observation of work for conformance to the *approved* construction documents and confirmation of existing conditions assumed during design. ~~Structural testing and inspection for new construction materials shall be in accordance with the building code, except as modified by this chapter.~~

Add new text as follows:

205.5 Contractor responsibility. Contractor responsibility shall be in accordance with Section 1704.4 of the International Building Code.

A205.6 Testing and Inspection Structural testing and inspection for new construction materials, submittals, reports, and certificates of compliance, shall be in accordance with Sections 1704 and 1705 of the International Building Code. Work done to comply with this chapter shall not be eligible for Exception 1 to International Building Code Section 1704.2, Exception 2 to International Building Code Section 1705.12, or the Exception to International Building Code Section 1705.12.2.

Reason: This proposal corrects a code reference and clarifies that typical quality assurance provisions from IBC Chapter 17 apply to Chapter A2 projects.

A205.4: For clarity, the current provision is broken into three subsections. Regarding structural observation, the proposal corrects a mistaken IBC section number and clarifies that the requirement applies despite IBC waivers for buildings of certain heights or assigned to certain seismic design categories.

A205.5: Regarding the contractor statement of responsibility, the proposed new section confirms that IBC section 1704.4 applies.

A205.6: Regarding testing and inspection, proposed Section A205.6 clarifies the existing reference to “the building code” and disallows certain exemptions in IBC Chapter 17 that apply to new construction of a minor nature but should not apply to Chapter A2 retrofits.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposal merely clarifies existing requirements. In rare cases, the cost of testing and inspection might increase slightly.

Proposal # 5704

EB145-19

EB146-19

IEBC@: A205.4.1 (New), A205.4.2 (New), A205.4.3 (New), [BS] A206.2

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Add new text as follows:

A205.4.1 Additional special inspection. In addition to the requirements of International Building Code Section 1705.12, special inspection shall be required for:

1. Installation of anchors into existing concrete or masonry walls to form part of a wall anchorage system.
2. Fastening of new or existing steel deck forming part of a wall anchorage system.

A205.4.2 Testing to establish adequacy of existing wall anchors. Testing shall show that the existing anchors can sustain a test load of 1.5 times the design tension load without noticeable deformation or damage to the anchor, to the masonry or concrete element, or to any part of the existing load path between the anchor and new retrofit components. Three anchors of each existing detail type shall be tested, and all three shall satisfy the requirement. Prior to testing, the design professional shall submit a test plan for code official approval identifying the expected locations of the existing anchors in question, the locations of the proposed tests, and the test procedure and criteria. After testing, the design professional shall submit a report of the satisfactory testing showing the test results, the design strengths derived from them, and the size and spacing as confirmed by investigation.

A205.4.3 Testing to establish adequacy of existing steel deck connections. Testing shall show that the existing construction can sustain a test load of 1.5 times the design load without noticeable deformation or damage to the deck, to the fasteners, or to any part of the existing load path. Three tests of each existing detail type shall be tested, and all three shall satisfy the requirement. Prior to testing, the design professional shall submit a test plan for code official approval including the findings of condition assessment, the expected locations of each detail type in question, the locations of the proposed tests, and the test procedure and criteria. After testing, the design professional shall submit a report of the satisfactory testing showing the test results and the design strengths derived from them.

[BS] A206.2 Special requirements for wall anchorage systems. The steel elements of the wall anchorage system shall be designed in accordance with the International Building Code without the use of the 1.33 short duration allowable stress increase where using allowable stress design.

~~Wall anchors shall be provided to resist out-of-plane forces, independent of existing shear anchors.~~

~~Expansion anchors are only allowed with special inspection and approved testing for seismic loading.~~

~~Attaching Wall anchorage shall not be provided solely by fastening the edge of plywood sheathing to steel ledgers is not considered compliant with the positive anchoring requirements of this chapter. Attaching the ledgers. Wall anchorage shall not be provided solely by fastening the edge of steel decks decking to steel ledgers is not considered as providing the positive anchorage of this chapter unless testing or analysis is performed to establish shear values for the attachment perpendicular to the edge of the deck. Where steel decking is used as a wall anchor system, the unless testing in accordance with Section A205.4.3 establishes acceptable capacity. The existing connections shall be subject to field verification and the new connections shall be subject to special inspection.~~

New wall anchors shall be provided to resist the full wall anchorage design force independent of existing shear or tension anchors.

Exception: Existing cast-in-place shear anchors ~~are allowed to~~ shall be used permitted as part of the wall anchors anchorage system if the tie element can be readily attached to the anchors, and if the engineer or architect can establish tension values for the existing anchors through the use of approved as-built plans or testing and through analysis showing that the bolts are capable of resisting the total vertical and lateral shear load (including dead load) while being acted on by the maximum wall anchorage tension force caused by an earthquake. Criteria for analysis and testing Acceptable tension values for the existing anchors shall be determined by the building official, established by testing in accordance with Section A205.4.2.

Reason: This proposal coordinates the testing and inspection requirements given in Section A206.2 with Section A205.4, which is already meant to cover testing and inspection. It adds several new subsections to A205.4 to clarify the intent of the testing and inspection in Section A206.2.

A205.4.1: The two listed conditions already require special inspection per Section A206.2.

A205.4.2: These test requirements are consistent with ASCE 41-17 Section 10.2.2.4.1, which addresses testing of cast-in-place and post-installed anchors in concrete, and which reads, in part, "If the test load is used as the basis for anchor strength calculation, the available anchor strength shall not be taken as greater than 2/3 of the test load." Thus, successful tests to 1.5 times the design strength will justify use of the existing anchors. The requirement to test three existing anchors is also consistent with ASCE 41, though ASCE 41 requires testing 5 percent of the existing anchors

as well, so in large buildings, the ASCE 41 requirement can be more conservative.

A205.4.3: These test requirements parallel those proposed in Section A205.4.2.

A206.2: This section is edited to coordinate with the new section on special inspection, as follows:

- The provision regarding expansion anchors is replaced by the special inspection requirement in A205.4.1 and the testing requirement in A205.4.2.
- The sentence regarding independent wall anchors is moved to the end of the section to be adjacent to the Exception; it is also edited for clarity. The Exception applies only to this part of Section A206.2. The Exception is edited for clarity and to refer to the new testing requirement in Section A205.4.2.
- The plywood provision is edited for clarity.
- The steel deck provision is edited for clarity, with a reference to the related inspection and testing requirements in A205.4.1 and A205.4.3. Note that compliance of existing attachments by analysis is no longer considered reliable, so the provision has been modified to rely on testing alone.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposal merely clarifies existing requirements. In rare cases, the cost of testing and inspection might increase slightly.

Proposal # 5705

EB146-19

EB147-19

IEBC@: A205.4.1 (New), [BS] A206.2

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Add new text as follows:

A205.4.1 Additional special inspection. In addition to the requirements of International Building Code Section 1705.12, special inspection shall be required for:

1. Installation of continuity connectors along the length of crossties, to ensure properly sized fastener holes and adequate crosstie stiffness.

[BS] A206.2 Special requirements for wall anchorage systems. The steel elements of the wall anchorage system shall be designed in accordance with the International Building Code without the use of the 1.33 short duration allowable stress increase where using allowable stress design.

The wall anchorage system, excluding subdiaphragms and existing roof or floor framing members, shall be stiff enough to limit the relative movement between the wall and the diaphragm to no more than 1/8" before engagement of the anchors, when subject to the wall anchorage design forces.

Wall anchors shall be provided to resist out-of-plane forces, independent of existing shear anchors.

Expansion anchors are only allowed with special inspection and *approved* testing for seismic loading.

Attaching the edge of plywood sheathing to steel ledgers is not considered compliant with the positive anchoring requirements of this chapter. Attaching the edge of steel decks to steel ledgers is not considered as providing the positive anchorage of this chapter unless testing or analysis is performed to establish shear values for the attachment perpendicular to the edge of the deck. Where steel decking is used as a wall anchor system, the existing connections shall be subject to field verification and the new connections shall be subject to special inspection.

Exception: Existing cast-in-place shear anchors are allowed to be used as wall anchors if the tie element can be readily attached to the anchors, and if the engineer or architect can establish tension values for the existing anchors through the use of *approved* as-built plans or testing and through analysis showing that the bolts are capable of resisting the total shear load (including dead load) while being acted on by the maximum tension force caused by an earthquake. Criteria for analysis and testing shall be determined by the building official.

Reason: This proposal adds a stiffness requirement for the wall anchorage system. The proposed requirement is consistent with ASCE 41-17 Table 17-34. It has the same intent as a stiffness requirement discussed in the SEAOC commentary to IEBC Chapter A2 and implemented by the City of Los Angeles Department of Building and Safety. The SEAOC and Los Angeles approach limits the elongation under load. The ASCE 41 approach, which is the approach adopted here, limits the slack in the system (including continuity connectors along the length of the cross-ties) provided by the detailing and construction.

In addition to the proposed design criteria in Section A206.2, the proposal adds a special inspection requirement to Section A205.4 to ensure that additional slack is not introduced as continuity connectors are added to crossties.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Typical applications are expected to already satisfy the new stiffness requirement.

Proposal # 5707

EB147-19

EB148-19

IEBC@: A206.1.1 (New)

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Add new text as follows:

A206.1.1 Seismicity parameters, Site Class, and geologic hazards. For any site designated as Site Class E, the value of F_a shall be taken as 1.3. Site-specific procedures are not required for compliance with this chapter. Mitigation of existing geologic site hazards such as liquefiable soil, fault rupture, or landslide is not required for compliance with this chapter.

Reason: This proposal clarifies the intended scope of Chapter A2. The proposed clarifications have been vetted by the Structural Engineers Association of Northern California Existing Buildings Committee (SEAONC EBC) with respect to “soft story” retrofits and have been implemented as proposed here by an RWFD retrofit program in Berkeley, California.

The first two sentences simplify the application of IBC Section 1613 and ASCE 7 Section 12.11 to these retrofit projects, helping to keep them economically feasible. The value of $F_a = 1.3$, which is the default value for Site Class E in areas of high (but not highest or near-fault) seismicity, comes from a SEAONC EBC recommendation related to observed performance and recorded ground motions in the Loma Prieta earthquake. This value is allowed as a possibly conservative convenience, avoiding the need for expensive site-specific investigation (per ASCE 7 Table 11.4-1 and Section 11.4.8). Site-specific investigation remains an option, but is not required. This simplification is consistent in principle with the exceptions and waivers already provided in ASCE 7 Sections 11.4.8 and 20.3.1.

The site-specific ground motion procedures normally required by ASCE 7 Section 11.4.8 are waived for these retrofit projects. Many buildings eligible for Chapter A2 would be exempt from site response analysis by the exception to ASCE 7 Section 20.3.1.

The final proposed sentence clarifies that mitigation beyond the critical wall anchorage system is not intended by Chapter A2. Just as the chapter requires no retrofit of walls and no mitigation of nonstructural hazards, the proposal would waive geologic hazard mitigation that might be required for new construction or for more comprehensive triggered retrofits. Consistent with the limited scope of Chapter A2, these clarifications regarding geologic hazards are intended to keep Chapter A2 retrofits cost-effective.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

In some cases, it will decrease the cost of construction by avoiding the cost of investigation and mitigation. In some cases it will increase the cost of construction by defaulting to a possibly conservative value.

Proposal # 5700

EB148-19

EB149-19

IEBC@: [BS] A206.2, [BS] A206.3

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Revise as follows:

[BS] A206.2 Special requirements for wall anchorage systems. The steel elements of the wall anchorage system shall be designed in accordance with the International Building Code without the use of the 1.33 short duration allowable stress increase where using allowable stress design.

Where new members are added as crossties, they shall be spaced no more than 24 feet (7315 mm) apart. Where existing girders are used as crossties, their actual spacing shall be deemed adequate even where the spacing exceeds 24 feet (7315 mm), as long as the girders are provided with adequate continuity connectors.

Wall anchors shall be provided to resist out-of-plane forces, independent of existing shear anchors.

Expansion anchors are only allowed with special inspection and *approved* testing for seismic loading.

Attaching the edge of plywood sheathing to steel ledgers is not considered compliant with the positive anchoring requirements of this chapter. Attaching the edge of steel decks to steel ledgers is not considered as providing the positive anchorage of this chapter unless testing or analysis is performed to establish shear values for the attachment perpendicular to the edge of the deck. Where steel decking is used as a wall anchor system, the existing connections shall be subject to field verification and the new connections shall be subject to special inspection.

Exception: Existing cast-in-place shear anchors are allowed to be used as wall anchors if the tie element can be readily attached to the anchors, and if the engineer or architect can establish tension values for the existing anchors through the use of *approved* as-built plans or testing and through analysis showing that the bolts are capable of resisting the total shear load (including dead load) while being acted on by the maximum tension force caused by an earthquake. Criteria for analysis and testing shall be determined by the building official.

[BS] A206.3 Development of anchor loads into the diaphragm. Development of anchor loads into roof and floor diaphragms shall comply with Section 1613 of the International Building Code using horizontal forces that are 75 percent of those used for new construction.

In wood diaphragms, anchorage shall not be accomplished by use of toenails or nails subject to withdrawal. Wood ledgers, top plates or framing shall not be used in cross-grain bending or cross-grain tension. The continuous ties required in Section 1613 of the International Building Code shall be in addition to the diaphragm sheathing.

Lengths of development of anchor loads in wood diaphragms shall be based on existing field nailing of the sheathing unless existing edge nailing is positively identified on the original construction plans or at the site.

~~**Exception:** If continuously tied girders are present, the maximum spacing of the continuity ties is the greater of the girder spacing or 24 feet (7315 mm).~~

Reason: This editorial proposal corrects a misplaced provision and clarifies its intent. The current exception to Section A206.3 is out of place for two reasons. First, it is unrelated to the issue of load development into the diaphragm (crossties must be continuous across the full diaphragm width), so it really belongs in Section A206.2. Second, since ASCE 7 sets no limit on the maximum spacing of crossties, the provision is not really an exception at all. Therefore, as the existing text is relocated to Section A206.2, it has been edited to clarify the intended spacing limit and the allowance where existing members act as adequate crossties.

Cost Impact: The code change proposal will not increase or decrease the cost of construction Editorial therefore will have no impact on cost.

Proposal # 5709

EB149-19

EB150-19

IEBC@: [BS] A206.2

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

[BS] A206.2 Special requirements for wall anchorage systems. ~~The steel elements of the wall anchorage system shall be designed in accordance with the International Building Code without the use of the 1.33 short duration allowable stress increase where using allowable stress design.~~

Wall anchors shall be provided to resist out-of-plane forces, independent of existing shear anchors.

Expansion anchors are only allowed with special inspection and *approved* testing for seismic loading.

Attaching the edge of plywood sheathing to steel ledgers is not considered compliant with the positive anchoring requirements of this chapter. Attaching the edge of steel decks to steel ledgers is not considered as providing the positive anchorage of this chapter unless testing or analysis is performed to establish shear values for the attachment perpendicular to the edge of the deck. Where steel decking is used as a wall anchor system, the existing connections shall be subject to field verification and the new connections shall be subject to special inspection.

Exception: Existing cast-in-place shear anchors are allowed to be used as wall anchors if the tie element can be readily attached to the anchors, and if the engineer or architect can establish tension values for the existing anchors through the use of *approved* as-built plans or testing and through analysis showing that the bolts are capable of resisting the total shear load (including dead load) while being acted on by the maximum tension force caused by an earthquake. Criteria for analysis and testing shall be determined by the building official.

Reason: This proposal deletes an obsolete requirement. The ASD provision is no longer included in ASCE 7, and LRFD or strength design of steel elements no longer uses a 1.33 load duration factor. ASCE 7 Section 12.11.2.2 already provides special provisions for steel elements and for coordination with SDPWS.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The provisions are outdated and do not apply. Therefore this revision will not affect construction cost.

Proposal # 5706

EB150-19

EB151-19

IEBC@: [BS] A401.2

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

[BS] A401.2 Scope. The provisions of this chapter shall apply to all existing Occupancy Group R-1 and R-2 buildings of wood construction or portions thereof that contain residential occupancy and are assigned to Risk Category II, and where the structure has a soft, weak, or open-front wall line, and there exists one or more stories above.

Reason: The proposal clarifies the intended limitations of Chapter A4.

The words "shall" and "all" are deleted to correct the impression that adoption of Chapter A4 necessarily imposes a retroactive requirement. The purpose of Section A401.2 is to describe the buildings for which the chapter might be useful, not those that are required to comply. Charging language is found elsewhere in the IEBC, or is sometimes found in separate legislative mandates.

"Occupancy Group R-1 and R-2" is replaced with a more generic reference to R occupancy and a reference to Risk Category II because there is no reason why an R-4 facility (or even an R-3 dwelling) cannot use Chapter A4, as long as it is not a high hazard (RC III) or essential facility (RC IV).

The word "contain" is added to indicate that the building may have non-residential occupancy as well. Indeed, it is typically the presence of S or U occupancy (parking) in the first story that makes the building a candidate for Chapter A4. Many eligible buildings also have B or M occupancy in the critical story.

The phrase "or portions thereof" is deleted because it is unnecessary and potentially confusing.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposal recognizes how Chapter A4 is currently used and the conditions to which it is meant to apply, some of which might be excluded by a misreading of the current provision

Proposal # 5774

EB151-19

EB152-19

IEBC@: CHAPTER A4 (New), [BS] A401.2, [BS] A402.1, [BS], (New), [BS] A403.2, [BS] A403.9.1, SECTION A404, [BS] A404.1.1

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Revise as follows:

CHAPTER A4

EARTHQUAKE RISK REDUCTION IN WOOD-FRAME RESIDENTIAL BUILDINGS WITH ~~SOFT, WEAK~~ OR OPEN-FRONT WALLS TARGET STORIES

~~[BS] A401.2 Scope.~~ The provisions of this chapter shall apply to all existing Occupancy Group R-1 and R-2 buildings of wood construction or portions thereof where the structure has a ~~soft, weak, or open-front wall line, and there exists one or more stories above~~ target story.

~~[BS] A402.1 Definitions.~~ Notwithstanding the applicable definitions, symbols and notations in the building code, the following definitions shall apply for the purposes of this chapter:

Delete without substitution:

~~[BS] OPEN-FRONT WALL LINE.~~ An exterior wall line, without vertical elements of the lateral force-resisting system, that requires tributary seismic forces to be resisted by diaphragm rotation or excessive cantilever beyond parallel lines of shear walls. Diaphragms that cantilever more than 25 percent of the distance between lines of lateral force-resisting elements from which the diaphragm cantilevers shall be considered to be excessive. Exterior exit balconies of 6 feet (1829 mm) or less in width shall not be considered excessive cantilevers.

~~[BS] SOFT WALL LINE.~~ A wall line whose lateral stiffness is less than that required by story drift limitations or deformation compatibility requirements of this chapter. In lieu of analysis, a soft wall line may be defined as a wall line in a story where the story stiffness is less than 70 percent of the story above for the direction under consideration.

Add new definition as follows:

TARGET STORY. Either (1) a basement story or underfloor area that extends above grade at any point or (2) any story above grade, in which a significant portion of lateral or torsional story strength or story stiffness is provided by wood frame walls, and where the wall configuration of such basement, underfloor area, or story is substantially more vulnerable to earthquake damage than the wall configuration of the story above, except that a story is not a target story if it is the topmost story or if the difference in vulnerability is primarily due to the story above being a penthouse or an attic with a pitched roof.

Delete without substitution:

~~[BS] WEAK WALL LINE.~~ A wall line in a story where the story strength is less than 80 percent of the story above in the direction under consideration.

~~[BS] A403.2 Scope of analysis.~~ This chapter requires the *alteration, repair, replacement or addition* of structural elements and their connections to meet the strength and stiffness requirements herein. The lateral load-path analysis shall include the resisting elements and connections from the wood diaphragm ~~immediately above any soft, weak or open-front wall lines at the top of the uppermost target story~~ to the foundation soil interface or to the uppermost story of a podium structure comprised of steel, masonry, or concrete structural systems that supports the upper, wood-framed structure. Stories above the uppermost ~~story with a soft, weak, or open-front wall line target story~~ shall be considered in the analysis but need not be modified. The lateral load-path analysis for added structural elements shall include evaluation of the allowable soil-bearing and lateral pressures in accordance with the building code. Where any portion of a building within the scope of this chapter is constructed on or into a slope steeper than one unit vertical in three units horizontal (33-percent slope), the lateral force-resisting system at and below the base level diaphragm shall be analyzed for the effects of concentrated lateral forces at the base caused by this hillside condition.

Exception: Where ~~an open-front, weak or soft wall line a target story~~ exists because of parking at the ground floor of a two-story building and the parking area is less than 20 percent of the ground floor area, then only the wall lines in the ~~open, weak or soft directions of the enclosed critical direction around the adjacent~~ parking area need comply with the provisions of this chapter.

~~[BS] A403.9.1 Gypsum or cement plaster products.~~ Gypsum or cement plaster products shall not be used to provide lateral resistance in a ~~soft or weak story or in a story with an open-front wall line, whether or not new elements are added to mitigate the soft, weak or open-front condition.~~ the strength required by Section A403.3 or the stiffness required by Section A403.4.

SECTION A404 PRESCRIPTIVE MEASURES FOR WEAK STORY

[BS] A404.1.1 Additional conditions. To qualify for these prescriptive measures, the following additional conditions need to be satisfied by the retrofitted structure:

1. Diaphragm aspect ratio L/W is less than 0.67, where W is the diaphragm dimension parallel to the ~~soft, weak or open front wall line~~ target story critical direction and L is the distance in the orthogonal direction between ~~that the perimeter wall line~~ and the rear wall of the ground floor open area.
2. Minimum length of side shear walls = 20 feet (6096 mm).
3. Minimum length of rear shear wall = three-fourths of the total rear wall length.
4. Plan or vertical irregularities shall not be other than ~~a soft, weak or open front wall line~~ those associated with the target story.
5. Roofing weight less than or equal to 5 pounds per square foot (240 N/m²).
6. Aspect ratio of the full second floor diaphragm meets the requirements of the building code for new construction.

Reason: This proposal replaces three troublesome definitions unique to Chapter A4 with a more concise term already proven feasible in retrofit programs involving thousands of structures.

The proposal looks like it's big and makes a complicated change. It's actually straightforward and largely editorial – just an improvement in terminology. The three problematic definitions – open-front wall line, soft wall line, and weak wall line – are actually not that important to the substance of Chapter A4. Their purpose is merely to describe the buildings to which the chapter applies. Their job is to get you properly into the chapter, but they are not needed to get you out, as they are not used to measure compliance. Similarly, the definition and use of TARGET STORY proposed here is merely to identify candidate buildings. It will have no impact at all on the retrofit criteria or the resulting retrofit designs.

The three definitions represent attempts nearly 25 years ago to define the building type of interest. It's one every engineer in earthquake country knows by sight, but it's surprisingly hard to define. Most people know these simply as "soft story buildings," borrowing a term from ASCE 7 and ASCE 41, and that quickly reveals the problem in Chapter A4. As ASCE 7 and FEMA P-807 (*Seismic Evaluation and Retrofit of Multi-Unit Wood-Frame Buildings With Weak First Stories*, 2012) make clear, the issue is a collapse-prone *whole story*, a combination of lateral and torsional vulnerability. Yet the current definitions in Chapter A4 relate only to individual wall lines. Further, the quantitative aspects of the definitions conflict with the retrofit criteria; it is possible to satisfy the Chapter A4 design criteria and still have a soft, weak, or open wall line by the current definitions. Finally, by using words and concepts similar to those used in ASCE 7 to define certain irregularities and in ASCE 41 to identify certain deficiencies, these Chapter A4 definitions create confusion about how those standards apply (or don't). Each of the definitions presents its own specific problems as well:

- OPEN WALL LINE is problematic because it is both under- and over-prescribed. Does "without vertical elements" mean there must be zero wall length for the wall line to be considered "open"? If there's ample wall length, but it's all stucco and gypsum board (not allowed for the retrofit by Section A403.9.1), does that count? If not, the isn't every wall line of a stucco building "open"? And what is the basis for the "25 percent" rule? Clearly this "definition" is relying on a lot of judgment, both from the code writers and the evaluating engineer. That's ok, but let's not pretend the definition is cut and dried.
- SOFT WALL LINE is confusingly defined two ways, first in absolute terms as a wall line that merely lacks the required stiffness, and second in relative terms by comparison of one story to the next (borrowing, but straying from the similar definitions in ASCE 7 and ASCE 41). The absolute definition is circular: a wall line is subject to Chapter A4 if it doesn't satisfy Chapter A4, so you can't know if the Chapter is necessary until you've done all the work. Since the definition is meant to establish (per Section A401.2) whether the chapter even applies, this tautology is not helpful. The relative definition is problematic first because it might not find the same buildings as the absolute definition but also because there is no consistent way to determine the stiffness of either story if, as Section A403.9.1 specifies, stucco and gypsum board are not to be considered. Many buildings that would benefit from Chapter A4 have nothing *but* stucco and gypboard, so is their upper story stiffness zero? If so, how can the first story stiffness be less than 70 percent of that? Finally, if a soft wall line is any wall line in a soft story, does that mean the wall lines normal to the soft direction are also deficient? Even if only wall lines in the critical direction are considered, is *every* wall line aligned in the weak direction considered a weak wall line that must be stiffened?
- WEAK WALL LINE uses only a relative definition, but it poses similar problems. What is the story strength if nonconforming materials must be ignored in accordance with Section A403.9.1? And which wall lines in a weak story are considered the weak ones that need to be strengthened through retrofit?

The solution to these problems is to use terminology that 1) does not twist similar terms from ASCE 7, 2) does not conflict with other provisions in the chapter, 3) allows a determination of Chapter applicability without conflicting with the design criteria, and 4) identifies the critical deficiency as a story issue, not a line issue.

The proposed definition of TARGET STORY satisfies these criteria. This definition (or similar) was developed to resolve issues that arose from applying Chapter A4 to a variety of vulnerable wood-frame residential buildings in California, and it is now in use by retrofit programs covering thousands of buildings in San Francisco, Berkeley, and Oakland. Features of the proposed new term:

- By considering partial basements and unfinished underfloor areas, it accounts for common conditions of sloped sites.
- It considers the whole story, not just individual wall lines, thus incorporating the lessons of FEMA P-807 and better matching the spirit of the ASCE 7 and ASCE 41 concepts without appropriating their terminology.
- It is relative, comparing a lower story to the story above it. This is consistent with the intent of Chapter A4 to capture not just overstress or high drift, but likely concentrations of lateral deformation that lead to P-delta collapse.
- It is based on vulnerable wood-frame construction, eliminating confusion about whether Chapter A4 should apply (it should not) to a building with an open front but with full-height CMU first story walls.

By using “significant” and “substantially,” the definition relies on the judgment of the evaluator or retrofit designer and on that of the code official. This is likely to be a point of concern for some, but it shouldn’t be, as there is ample precedent for use of these words. “Significant” or “substantial” appears in plenty of IBC and IEBC definitions (dangerous, Risk Category III, dry floodproofing, health hazard, live/work unit, thermosetting material) and provisions (IBC 408.8.4 re smoke-tight doors, IBC 909.10.2 re ducts, IBC 1106.6 re accessible parking, IEBC 1301.6.3 re fire doors, IEBC A106.1 re “significant cracking”, IEBC A304.2 and C103.1 re wood defects, etc.).

Further, the work contemplated by Chapter A4 is not do-it-yourself. It requires a design professional and a building permit, so it is appropriate for the chapter to rely on the judgment of professionals. In the case of “soft story” buildings, as noted above, there is ample reference material available without the need for a quantitative definition. Indeed, the current definitions were developed with certain Southern California building styles and configurations in mind, but they have proven inadequate for equally eligible buildings on sloped sites or of older styles and materials. The more generic definition of TARGET STORY is an improvement, even if it relies to a degree on engineering and code official judgment.

Finally, as noted above, the definition and use of TARGET STORY proposed here is merely to identify candidate buildings. It has no impact at all on the retrofit criteria or the resulting retrofit designs.

Ultimately, the proof is in the programs. Over the last five years, thousands of “soft story” evaluations and retrofits have been done using a definition of TARGET STORY essentially identical to the one proposed here. San Francisco screened over 6000 buildings on the basis of this judgmental definition with broad success and essentially 100% compliance.

To implement this improvement in terminology, the proposal would make the following changes:

- The chapter title, Section A401.2, A403.2, and A404.1.1 are changed to replace “soft, weak or open-front” with the new term, “target story.” Note that in Section A401.2, it is no longer necessary to reference the existence of a story above, as that condition is built into the new definition of TARGET STORY.
- Section A402.1: The three definitions are deleted, and the new definition is added.
- Section A403.2: The critical diaphragm is properly identified as the one “at the top of” the target story, not the one “immediately above” it. This is because the definition of STORY from the IBC includes the diaphragm above.
- Section A403.2 Exception and Section A404.1.1: The critical direction is properly described. With the current definitions, there is no “open, weak or soft direction” defined.
- Section A403.9.1: The proposal clarifies the intent of the section, regardless of terminology. The current chapter does not define a soft, weak, or open-front story; those terms are currently used only to define specific wall lines. Further, nothing in Chapter A4 requires the retrofit elements to be located along the specific wall lines identified as soft, weak, or open-front, so the limitation intended by this section should not apply only there.
- Section A404: The Section title is corrected. Even with the current definitions, Section A404 applies to more than just weak stories. Also note: “weak story” is not defined.

Note that Section A403.3, which refers to soft story and weak story irregularities, is not changed, because these correct references are to the terms defined in ASCE 7.

Cost Impact: The code change proposal will not increase or decrease the cost of construction Terminology change and will not change the cost of construction.

EB153-19

IEBC@: [BS] A403.2

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

[BS] A403.2 Scope of analysis. This chapter requires the *alteration, repair, replacement or addition* of structural elements and their connections to meet the strength and stiffness requirements herein. The lateral load-path analysis shall include the resisting elements and connections from the wood diaphragm immediately above any soft, weak or open-front wall lines to the foundation soil interface or to the uppermost story of a podium structure comprised of steel, masonry, or concrete structural systems that supports the upper, wood-framed structure. Stories above the uppermost story with a soft, weak, or open-front wall line shall be considered in the analysis but need not be modified. The lateral load-path analysis for added structural elements shall include evaluation of the allowable soil-bearing and lateral pressures in accordance with the building code. Where any portion of a building within the scope of this chapter is constructed on or into a slope steeper than one unit vertical in three units horizontal (33-percent slope), the lateral force-resisting system at and below the base level diaphragm shall be analyzed for the effects of concentrated lateral forces at the base caused by this hillside condition.

~~**Exception:** Where an open-front, weak or soft wall line exists because of parking at the ground floor of a two-story building and the parking area is less than 20 percent of the ground floor area, then only the wall lines in the open, weak or soft directions of the enclosed parking area need comply with the provisions of this chapter.~~

Reason: This proposal removes an unnecessary and obsolete exception. The exception is unnecessary because the buildings for which it was intended can often be shown to be acceptable (that is, not possessing any of Chapter A4's targeted deficiencies) and are already afforded a simplified prescriptive solution in Section A404.

The exception is obsolete because it improperly focuses on individual wall lines. As shown in FEMA P-807 (May 2012), *Seismic Evaluation and Retrofit of Multi-Unit Wood-Frame Buildings With Weak First Stories*, it is important to consider full-story behavior, including possible torsion, so any reduced retrofit scope should be justified by full-story calculations.

Finally, the "20 percent" criterion and the reference to an "enclosed parking area" are too vague. While originally conceived for buildings with parking only in one end bay, the provision as written could apply to any number of collapse-prone wall configurations for which the prescriptive exception might not be adequate.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The alternative solution allowed by the exception might reduce the design cost slightly, but it would not likely change the construction cost. In some cases, deleting the exception as proposed could even decrease the construction cost.

Proposal # 5710

EB153-19

EB154-19

IEBC@: [BS], [BS] A403.2, [BS] A404.1

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Delete without substitution:

~~**[BS] GROUND FLOOR.** Any floor whose elevation is immediately accessible from an adjacent grade by vehicles or pedestrians. The ground floor portion of the structure does not include any floor that is completely below adjacent grades.~~

Revise as follows:

[BS] A403.2 Scope of analysis. This chapter requires the *alteration, repair, replacement or addition* of structural elements and their connections to meet the strength and stiffness requirements herein. The lateral load-path analysis shall include the resisting elements and connections from the wood diaphragm immediately above any soft, weak or open-front wall lines to the foundation soil interface or to the uppermost story of a podium structure comprised of steel, masonry, or concrete structural systems that supports the upper, wood-framed structure. Stories above the uppermost story with a soft, weak, or open-front wall line shall be considered in the analysis but need not be modified. The lateral load-path analysis for added structural elements shall include evaluation of the allowable soil-bearing and lateral pressures in accordance with the building code. Where any portion of a building within the scope of this chapter is constructed on or into a slope steeper than one unit vertical in three units horizontal (33-percent slope), the lateral force-resisting system at and below the base level diaphragm shall be analyzed for the effects of concentrated lateral forces at the base caused by this hillside condition.

Exception: Where an open-front, weak or soft wall line exists because of parking at the ground floor of grade in a two-story building and the parking area is less than 20 percent of the ground floor area, then only the wall lines in the open, weak or soft directions of the enclosed parking area need comply with the provisions of this chapter.

[BS] A404.1 Limitation. These prescriptive measures shall apply only to two-story buildings and only where deemed appropriate by the *code official*. These prescriptive measures rely on rotation of the second floor diaphragm to distribute the seismic load between the side and rear walls of the around a ground floor open area. In the absence of an existing floor diaphragm of wood structural panel or diagonal sheathing at the top of the first story, a new wood structural panel diaphragm of minimum thickness of $\frac{3}{4}$ inch (19.1 mm) and with 10d common nails at 6 inches (152 mm) on center shall be applied.

Reason: This proposal is editorial. It removes an unnecessary term used confusingly in two places in Chapter A4, replacing it with clearer, more consistent wording that better conveys the intent.

The current definition of GROUND FLOOR includes the phrase, "immediately accessible from an adjacent grade." What does this mean? It has nothing to do with disabled access. Rather, it is meant to indicate typical grade- or street-level parking. But does it include a ramp? Does it include a main floor one or two steps up from grade? Does it include a floor that is at grade in one part of building but above or below grade in the rest of the building due to a sloped site? Fortunately, we need not resolve these questions because the term is used in only two places in Chapter A4, and the intent in both places can be better conveyed simply by using common words that can be understood in context, without a special definition.

In the exception to Section A403.2, the proposal replaces "at the ground floor" with "at grade." This has a common meaning appropriate to the context, and it eliminates confusion over a needlessly complicated definition.

In Section A404.1, two small edits clarify the intent. The walls of interest are "around" the area of interest, and the floor diaphragm of interest is the one at the top of the critical story, not the "ground floor." By eliminating the definition of GROUND FLOOR, the phrase "ground floor open area" in Section A404.1 and again in A404.1.1 can take on its common sense meaning as a portion of floor area, without undue focus on grade issues. Any complications due to sloping grade, etc. can be resolved by this section's reliance on approval by the code official.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is an editorial clarification of intent which will not change cost of construction.

Proposal # 5714

EB154-19

EB155-19

IEBC@: [BS] A403.3

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

[BS] A403.3 Design base shear and design parameters. The design base shear in a given direction shall be permitted to be 75 percent of the value required for similar new construction in accordance with the building code. The value of R used in the design of the strengthening of any story shall not exceed the lowest value of R used in the same direction at any story above. The system overstrength factor, ΔO , and the deflection amplification factor, C_d , shall be not less than the largest respective value corresponding to the R factor being used in the direction under consideration.

Exceptions:

1. For structures assigned to Seismic Design Category B, values of R , Δ and C_d shall be permitted to be based on the seismic force-resisting system being used to achieve the required strengthening.
2. For structures assigned to Seismic Design Category C or D, values of R , Δ and C_d shall be permitted to be based on the seismic force-resisting system being used to achieve the required strengthening, provided that when the strengthening is complete, the strengthened structure will not have an extreme weak story irregularity defined as Type 5b in ASCE 7, Table 12.3-2.
3. For structures assigned to Seismic Design Category E, values of R , Δ and C_d shall be permitted to be based on the seismic force-resisting system being used to achieve the required strengthening, provided that when the strengthening is complete, the strengthened structure will not have an extreme soft story, a weak story, or an extreme weak story irregularity defined, respectively, as Types 1b, 5a and 5b in ASCE 7, Table 12.3-2.
4. For retrofit systems involving different seismic force-resisting systems in the same direction within the same story, resisting elements are permitted to be designed using the least value of R for the different structural systems found in each independent line of resistance if the following conditions are met: (1) The building is assigned to Risk Category I or II (2) The building height is no more than four stories above grade plane, and (3) the seismic force-resisting systems of the retrofitted building comprise only wood structural panel shear walls, steel moment-resisting frames, steel cantilever columns, and steel braced frames. Values for C_d and ΔO shall be consistent with the R value used.

Reason: This proposal adds an exception that effectively allows different structural systems to be combined for retrofit without the restrictions that would apply in new construction.

The concept has been vetted with analytical studies by the Structural Engineers Association of Northern California Existing Buildings Committee and has been implemented as proposed here by retrofit programs affecting thousands of buildings in San Francisco, Berkeley, and Oakland, California.

This allows the effective use of typical retrofit schemes that involve different structural systems on different lines. Without this exception, a retrofit using an intermediate or ordinary steel frame along one line and wood structural panels elsewhere would be forced to over-design the wood elements. Studies by the SEAONC EBC showed that combining systems as proposed here would not result in worse performance.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal will decrease the cost of construction by allowing more efficient use of materials and avoiding unnecessary overdesign."

Proposal # 5711

EB155-19

EB156-19

IEBC@: [BS] A403.3

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

[BS] A403.3 Design base shear and design parameters. The design base shear in a given direction shall be permitted to be 75 percent of the value required for similar new construction in accordance with the building code. The value of R used in the design of the strengthening of any story shall not exceed the lowest value of R used in the same direction at any story above. The system overstrength factor, ΔO , and the deflection amplification factor, C_d , shall be not less than the largest respective value corresponding to the R factor being used in the direction under consideration.

Exceptions:

1. For structures assigned to Seismic Design Category B, values of R , ΔO and C_d shall be permitted to be based on the seismic force-resisting system being used to achieve the required strengthening.
2. For structures assigned to Seismic Design Category C or D, values of R , ΔO and C_d shall be permitted to be based on the seismic force-resisting system being used to achieve the required strengthening, provided that when the strengthening is complete, the strengthened structure will not have an extreme weak story irregularity defined as Type 5b in ASCE 7, Table 12.3-2.
3. For structures assigned to Seismic Design Category E, values of R , ΔO and C_d shall be permitted to be based on the seismic force-resisting system being used to achieve the required strengthening, provided that when the strengthening is complete, the strengthened structure will not have an extreme soft story, a weak story, or an extreme weak story irregularity defined, respectively, as Types 1b, 5a and 5b in ASCE 7, Table 12.3-2.
4. With reference to ASCE 7 Table 12.2-1, building height limitations on seismic force-resisting systems are not applicable where those systems are used only for retrofit to comply with the requirements of this Chapter.

Reason: This proposal adds an exception that allows typical retrofit solutions to be used without the restrictions that would apply in new construction.

The concept has been vetted by the Structural Engineers Association of Northern California Existing Buildings Committee and has been implemented as proposed here by retrofit programs affecting thousands of buildings in San Francisco, Berkeley, and Oakland, California.

The proposed exception recognizes that height limits applicable when certain structural systems are used for a whole building should not apply when the same system is used only within a single story, which is the case with retrofit under Chapter A4. In this regard, the proposed exception is like current Exceptions 1 through 3, in that it decouples the design of the new retrofit system from non-conforming conditions in the existing structure.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal will decrease the cost of construction by waiving inapplicable limits and allowing more choices for retrofit systems.

Proposal # 5712

EB156-19

EB157-19

IEBC@: [BS] A403.3, [BS] A407.1, [BS] A406.3.2, [BS] A406.3.3

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

[BS] A403.3 Design base shear and design parameters. The design base shear in a given direction shall be permitted to be 75 percent of the value required for similar new construction in accordance with the building code. The value of R used in the design of the strengthening of any story shall not exceed the lowest value of R used in the same direction at any story above. The system overstrength factor, $\Delta\Omega_D$, and the deflection amplification factor, C_d , shall be not less than the largest respective value corresponding to the R factor being used in the direction under consideration.

Exceptions:

1. For structures assigned to Seismic Design Category B, values of R , $\Delta\Omega_D$ and C_d shall be permitted to be based on the seismic force-resisting system being used to achieve the required strengthening.
2. For structures assigned to Seismic Design Category C or D, values of R , $\Delta\Omega_D$ and C_d shall be permitted to be based on the seismic force-resisting system being used to achieve the required strengthening, provided that when the strengthening is complete, the strengthened structure will not have an extreme weak story irregularity defined as Type 5b in ASCE 7, Table 12.3-2.
3. For structures assigned to Seismic Design Category E, values of R , $\Delta\Omega_D$ and C_d shall be permitted to be based on the seismic force-resisting system being used to achieve the required strengthening, provided that when the strengthening is complete, the strengthened structure will not have an extreme soft story, a weak story, or an extreme weak story irregularity defined, respectively, as Types 1b, 5a and 5b in ASCE 7, Table 12.3-2.

[BS] A407.1 Structural observation, testing and inspection. Structural observation, in accordance with Section ~~1709~~-1704.6 of the International Building Code, shall be required for all structures in which seismic retrofit is being performed in accordance with this chapter. Structural observation shall include visual observation of work for conformance to the *approved* construction documents and confirmation of existing conditions assumed during design.

Structural testing and inspection for new construction materials shall be in accordance with the building code, except as modified by this chapter.

[BS] A406.3.2 Framing plan elements. The framing plan shall include the length, location and material of shear walls; the location and material of frames; references ~~on~~ or details for the column-to-beam connectors, beam-to-wall connections and shear transfers at floor and roof diaphragms; and the required nailing and length for wall top plate splices.

[BS] A406.3.3 Shear wall schedule, notes and details. Shear walls shall have a referenced schedule on the plans that includes the correct shear wall capacity in pounds per foot (N/m); the required fastener type, length, gage and head size; and a complete specification for the sheathing material and its thickness. The schedule shall also show the required location of 3-inch (76 mm) nominal or two 2-inch (51 mm) nominal edge members; the spacing of shear transfer elements such as framing anchors or added sill plate nails; the required hold-down with its bolt, screw or nail sizes; and the dimensions, lumber grade and species of the attached framing member.

Notes shall show required edge distance for fasteners ~~on~~ of structural wood panels and framing members; required flush nailing at the plywood surface; limits of mechanical penetrations; and the sill plate material assumed in the design. The limits of mechanical penetrations shall be detailed showing the maximum notching and drilled hole sizes.

Reason: Editorial corrections, if not errata. A403.3: Replace delta with omega in four places. A407.1: Correct section reference. A406.3.2: Typo. A406.3.3: Typo.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The proposal is editorial only.

Proposal # 5781

EB157-19

EB158-19

IEBC@: [BS], 403.3.1 (New), [BS] A403.9.1, [BS] A406.2

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Delete without substitution:

~~**[BS] STORY STRENGTH.** The total strength of all seismic-resisting elements sharing the same story shear in the direction under consideration.~~

~~**[BS] WEAK WALL LINE.** A wall line in a story where the story strength is less than 80 percent of the story above in the direction under consideration. For purposes of this definition, nonconforming structural materials shall not be considered.~~

Add new text as follows:

403.3.1 Expected story strength. Despite any other requirement of Section A403.3 or A403.4, the total expected strength of retrofit elements added to any story need not exceed 1.7 times the expected strength of the story immediately above in a two-story building, or 1.3 times the expected strength of the story immediately above in a three-story or taller building, as long as the retrofit elements are located symmetrically about the center of mass of the story above or so as to minimize torsion in the retrofitted story. Calculation of expected story strength and identification of irregularities in Section A403.3 shall be based on the expected strength of all wall lines, even if sheathed with nonconforming materials. The strength of a wall line shall be permitted to be reduced to account for inadequate load path or overturning resistance.

Revise as follows:

~~**[BS] A403.9.1 Gypsum or cement plaster products.** Gypsum or cement plaster products shall not be used to provide lateral resistance in a soft or weak story or in a story with an open-front wall line, whether or not new elements are added to mitigate the soft, weak or open-front condition. the strength required by Section A403.3 or the stiffness required by Section A403.4.~~

~~**[BS] A406.2 Existing construction.** The plans shall show existing diaphragm and shear wall sheathing and framing materials; fastener type and spacing; diaphragm and shear wall connections; continuity ties; collector elements; and the portion of the existing materials that needs verification during construction. If the cap allowed by Section A403.3.1 is used to limit the scope of retrofit, the foregoing information shall be shown for each retrofitted story and at least one story above the uppermost retrofitted story. If the cap allowed by Section A403.3.1 is not used, the foregoing information need only be shown for each retrofitted story and for the floor at the top of that story.~~

Reason: This proposal introduces a concept from FEMA P-807 (May 2012), *Seismic Evaluation and Retrofit of Multi-Unit Wood-Frame Buildings With Weak First Stories*. The concept is that over-strengthening of the critical story (typically the ground story) relative to the upper stories is wasteful and, in the worst cases, risks shifting the collapse mechanism to the less ductile upper stories. The concept has been confirmed in multiple analytical studies, has been endorsed by the Structural Engineers Association of Northern California Existing Buildings Committee, and has been implemented as proposed here by retrofit programs affecting thousands of buildings in San Francisco and Berkeley. To apply the concept to IEBC Appendix A4, the required retrofit strength is capped relative to the calculated strength of the story above, as shown in proposed Section A403.3.1. The cap is optional.

To complete the proposal, the following additional changes are made:

- The unnecessary term STORY STRENGTH is deleted so as not to be confused with the “expected story strength” as used in new Section A403.3.1.
- In current Chapter A4, the term STORY STRENGTH is used only in the definition of WEAK WALL LINE, where it is actually not needed. Nevertheless, the proposal also clarifies this definition to preserve the current intent that nonconforming structural materials are not counted as “seismic-resisting elements” and are therefore not considered where the WEAK WALL LINE definition applies. The new capping provision, however, follows the FEMA P-807 requirement to consider all existing strength contributions.
- If the cap is applied, nonconforming materials must be considered. Therefore, Section A403.9.1, which prohibits nonconforming materials, is clarified to apply only to the basic strength and stiffness, exclusive of the capping provision.
- If the optional cap is applied, then because it relies on the existing conditions in the story above, those conditions should be documented as part of the project record, even though no retrofit is performed there. Section A406.2 is modified to make this documentation requirement.

Finally, note that the proposed text refers in several places to the “retrofitted story.” If the term “target story” is approved through a separate proposal, it would be preferable to replace all incidents of “retrofitted story” with “target story.”

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The cap is optional. If used, it could decrease the cost of construction.

EB159-19

IEBC@: A403.3.1 (New)

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Add new text as follows:

A403.3.1 Seismicity parameters, Site Class, and geologic hazards. For any site designated as Site Class E, the value of F_a shall be taken as 1.3. Site-specific procedures are not required for compliance with this chapter. Mitigation of existing geologic site hazards such as liquefiable soil, fault rupture, or landslide is not required for compliance with this chapter.

Reason: This proposal clarifies the intended scope of Chapter A4. The proposed clarifications have been vetted by the Structural Engineers Association of Northern California Existing Buildings Committee (SEAONC EBC) and have been implemented as proposed here by retrofit programs affecting thousands of buildings in San Francisco, Berkeley, and Oakland, California.

The first two sentences simplify the application of IBC Section 1613.2 or ASCE 7 Section 11.4 to these retrofit projects, helping to keep them economically feasible. The value of $F_a = 1.3$, which is the default value for Site Class E in areas of high (but not highest or near-fault) seismicity, comes from a SEAONC EBC recommendation related to observed performance and recorded ground motions in the Loma Prieta earthquake. This value is allowed as a possibly conservative convenience, avoiding the need for expensive site-specific investigation (per ASCE 7 Table 11.4-1 and Section 11.4.8). Site-specific investigation remains an option, but is not required. This simplification is consistent in principle with the exceptions and waivers already provided in ASCE 7 Sections 11.4.8 and 20.3.1.

The site-specific ground motion procedures normally required by ASCE 7 Section 11.4.8 are waived for these retrofit projects. Many buildings eligible for Chapter A4 would be exempt from site response analysis by the exception to ASCE 7 Section 20.3.1.

The final proposed sentence clarifies that mitigation beyond the critical collapse-prone story is not intended by Chapter A4. Just as the chapter requires no retrofit above the critical story and no mitigation of nonstructural hazards, the proposal would waive geologic hazard mitigation that might be required for new construction or for more comprehensive triggered retrofits. Consistent with the limited scope of Chapter A4, these clarifications regarding geologic hazards are intended to keep Chapter A4 retrofits cost-effective.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

In some cases, it will decrease the cost of construction by avoiding the cost of investigation and mitigation. In some cases it will increase the cost of construction by defaulting to a possibly conservative value.

Proposal # 5713

EB159-19

EB160-19

IEBC@: [BS] A403.7

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Delete without substitution:

~~**[BS] A403.7 Collector elements.** Collector elements shall be provided that can transfer the seismic forces originating in other portions of the building to the elements within the scope of Section A403.2 that provide resistance to those forces.~~

Reason: This proposal removes a provision that is both unnecessary and confusing. Section A403.7, while well-intended, is unnecessary because Section A403.1 already requires design in accordance with the IBC, and Section A403.6 already calls for ties and continuity that would include collectors where needed.

Section A403.7 is also potentially confusing because it refers to "other portions of the building," in conflict with Section A403.2, which clearly waives any modification above the uppermost retrofitted story.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This section is unnecessary as it is already required by the IBC. The proposal merely removes a redundant and confusing provision.

Proposal # 5775

EB160-19

EB161-19

IEBC@: [BS] A403.8

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Delete and substitute as follows:

~~**[BS] A403.8 Horizontal diaphragms.** The strength of an existing horizontal diaphragm sheathed with wood structural panels or diagonal sheathing need not be investigated unless the diaphragm is required to transfer lateral forces from vertical elements of the seismic force-resisting system above the diaphragm to elements below the diaphragm because of an offset in placement of the elements. Rotational effects shall be accounted for where asymmetric wall stiffness increases shear demands.~~

[BS] A403.8 Floor diaphragms. Floor diaphragms within the scope of Section A403.2 shall be shown to have adequate strength at the following locations:

1. For straight lumber sheathed diaphragms without integral hardwood flooring: Throughout the diaphragm. The code official is authorized to waive the requirement where the condition occurs only in relatively small portions of each residential unit.
2. For other diaphragms: At locations where forces are transferred between the diaphragm and a new or strengthened vertical element of the seismic force-resisting system. Collector elements may be provided to distribute the transferred force over a greater length of diaphragm.

Exception: Where the existing vertical elements of the seismic force-resisting system are shown to comply with this chapter, diaphragms need not be evaluated.

Reason: This proposal clarifies the chapter's intent regarding the need for diaphragm strengthening. The current provision focuses on locations where the walls above and below the diaphragm are offset from each other, but this can be read improperly to mean the entire diaphragm since a lack of stacked walls in the lower story is typically what makes a building a candidate for Chapter A4. Instead, the focus should be on proper force transfer between the critical diaphragm and the new or existing wall lines below.

The proposal implements a recommendation by the Structural Engineers Association of Northern California Existing Buildings Committee that has already been adopted by retrofit programs affecting thousands of buildings in San Francisco, Berkeley, and Oakland, California.

The proposal recognizes that diaphragms are rarely the critical elements in these buildings. In many cases, the proposed requirement will require less work than the current provision. This is appropriate for the limited objective of Chapter A4.

The proposal also adds clarity by stating requirements for vulnerable diaphragm types that the current provision only implies.

Straight lumber sheathed diaphragms without integral hardwood flooring are weaker and more flexible than other diaphragm systems. Though there are no known collapses due to this condition, expected poor performance could compromise the building's ability to meet even the limited objective of Chapter A4. Integral hardwood flooring – but not newer “floating” wood flooring – provides significant added strength and stiffness. Even in buildings with original hardwood flooring, some remodeled, carpeted, or tiled areas might have had the original wood flooring removed. Areas of the diaphragm that form a roof for the critical story (such as the portion of a garage that extends beyond the wall line above, or at a lightwell or building setback) are also unlikely to have hardwood flooring to supplement the straight sheathing. Small isolated areas without hardwood flooring are not expected to affect overall building performance, so the provision grants a waiver for these cases.

For less vulnerable diaphragm types, the provision requires a local check for each new or strengthened SFRS element but does not require an overall analysis of the full diaphragm. Diaphragm capacity need not be checked at existing vertical elements that are not strengthened because (except for straight lumber sheathed diaphragms) it is assumed that the unit capacities of the existing vertical elements and the diaphragm are comparable.

The exception waives any retrofit of the diaphragms if the existing walls and frames are already found adequate.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. In some cases, it could decrease the cost of construction as it may require less work than the current provisions.

Proposal # 5776

EB161-19

EB162-19

IEBC@: [BS] A403.9, [BS] A403.9.1

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Revise as follows:

[BS] A403.9 Wood-framed shear walls. Wood-framed shear walls shall have strength and stiffness sufficient to resist the seismic loads and shall conform to the requirements of this section. Where new sheathing is applied to existing studs to create new wood-framed shear walls, the new wall elements shall be designed as bearing wall systems.

[BS] A403.9.1 Gypsum or cement plaster products. Gypsum or cement plaster products shall not be used to provide lateral resistance in a soft or weak story or in a story with an open-front wall line, ~~whether or not new elements are added to mitigate the soft, weak or open-front condition.~~ the strength required by Section A403.3 or the stiffness required by Section A403.4.

Reason: This proposal clarifies the chapter's design requirements.

Section A403.9: Since existing studs are presumed to carry existing gravity loads, the walls they frame must be considered bearing walls, as opposed to "building frame" systems. This affects the selection of seismic design coefficients R , C_d , and Ω_0 .

Section A403.9.1: The proposal clarifies the intent of the section, regardless of terminology, combined systems, etc. In particular, the chapter does not define a soft, weak, or open-front story; those terms are currently used only to define specific wall lines. Further, nothing in Chapter A4 requires the retrofit elements to be located along the specific wall lines identified as soft, weak, or open-front, so the limitation intended by this section should not apply only there.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal is simply a clarification.

Proposal # 5777

EB162-19

EB163-19

IEBC@: A403.10 (New), A403.10.1 (New), A403.10.2 (New), A403.10.3 (New), A403.10.4 (New), AISC (New)

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Add new text as follows:

A403.10 Steel retrofit systems. Steel retrofit systems shall have strength and stiffness sufficient to resist the seismic loads and shall conform to the requirements of this section.

A403.10.1 Special moment frames. Steel special moment frames shall comply with all applicable provisions of AISC 341, except that the "strong-column/weak-beam" provision of AISC 341-10, Section E3.4a is waived for columns that carry no gravity load. Proprietary frame systems that qualify as special moment frames shall be permitted.

A403.10.2 Intermediate or ordinary moment frames. Steel intermediate or ordinary moment frames shall comply with all applicable provisions of AISC 341.

A403.10.3 Cantilevered column systems. Steel special or ordinary cantilevered column systems shall comply with all applicable provisions of AISC 341.

A403.10.4 Inverted moment frame systems. Cantilevered column systems shall be permitted to be designed as inverted special, intermediate, or ordinary moment frames, with corresponding moment frame seismic design coefficients, where the system satisfies the following conditions:

1. The columns carry no gravity load.
2. The columns are configured in pairs or larger groups connected by a continuous reinforced concrete foundation or grade beam.
3. The foundation or grade beam shall be designed to resist the expected plastic moment at the base of each column, computed as $R_y F_y Z$ in accordance with AISC 341.
4. The flexibility of the foundation or grade beam, considering cracked section properties of the reinforced concrete, shall be included in computing the deformation of the steel frame system.
5. The column height shall be taken as twice the actual height when checking lateral torsional buckling.

Add new standard(s) as follows:

AISC

American Institute of Steel Construction
Construction One East Wacker, Suite 700
Chicago IL 60601-18021
US

341-16: Seismic Provisions for Structural Steel Buildings

Reason: This proposal adds details for structural systems commonly used in Chapter A4 retrofits. The proposal implements a recommendation by the Structural Engineers Association of Northern California Existing Buildings Committee that has already been adopted by retrofit programs affecting thousands of buildings in San Francisco, Berkeley, and Oakland, California.

The inverted moment frame (proposed Section A403.10.4) is a modification of traditional cantilevered column systems. Cantilevered column systems for new construction are normally assigned seismic design coefficients that severely limit their use. When used for retrofit of wood frame structures, however, the columns are less vulnerable to buckling failure because they carry no gravity load. SEAONC EBC has therefore recommended that these cantilever column systems, configured as upside-down moment frame bents (with concrete cross beams), should be allowed to be designed as moment frame systems.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal merely codifies typical practices already in use and shown to be feasible.

Staff Analysis: Note that AISC 341 is new to the IEBC but is currently referenced in the IBC.

Proposal # 5778

EB163-19

EB164-19

IEBC@: SECTION A406, [BS] A406.1

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

Revise as follows:

SECTION A406

~~INFORMATION REQUIRED TO BE ON THE PLANS CONSTRUCTION DOCUMENTS~~

[BS] A406.1 General. The plans shall show all information necessary for plan review and for construction ~~and~~ shall accurately reflect the results of the ~~engineering investigation and design~~ ~~design~~ and shall otherwise comply with all requirements established by the code official. The plans shall contain a note that states that this retrofit was designed in compliance with the criteria of this chapter.

Reason: This proposal revises the Chapter A4 administrative requirements to better align with IEBC Section 106 and with practices already adopted by the local building department.

The reference to "engineering investigation" is removed to avoid confusion (Chapter A4 does not explicitly require any such investigation) and because the "design" should already account for existing conditions, which are required to be documented per Section A406.2.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal is consistent with Section 106 and is also consistent with local building department practices and therefore will not have an effect on cost.

Proposal # 5779

EB164-19

EB165-19

IEBC@: [BS] A407.1, A407.2 (New), A407.3 (New)

Proponent: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Existing Building Code

~~[BS] A407.1 Structural observation, testing and inspection. observation. Structural observation in accordance with Section 1709-1704.6 of the International Building Code shall be required for all structures in which seismic retrofit is being performed in accordance with this chapter. is required, regardless of seismic design category, height, or other conditions. Structural observation shall include visual observation of work for conformance to the approved construction documents and confirmation of existing conditions assumed during design. Structural testing and inspection for new construction materials shall be in accordance with the building code, except as modified by this chapter.~~

Add new text as follows:

A407.2 Contractor responsibility. Contractor responsibility shall be in accordance with Section 1704.4 of the International Building Code.

A407.3 Testing and inspection. Structural testing and inspection for new construction materials, submittals, reports, and certificates of compliance, shall be in accordance with Sections 1704 and 1705 of the International Building Code. Work done to comply with this chapter shall not be eligible for Exceptions 1, 2, or 3 of International Building Code Section 1704.2 or for the Exception to International Building Code Section 1705.12.2.

Reason: This proposal corrects a code reference and clarifies that typical quality assurance provisions from IBC Chapter 17 apply to Chapter A4 projects.

For clarity, the current provision is broken into three subsections. Regarding structural observation, the proposal corrects a mistaken IBC section number and clarifies that the requirement applies despite IBC waivers for buildings of certain heights or assigned to certain seismic design categories.

Regarding the contractor statement of responsibility, proposed Section A407.2 confirms that IBC section 1704.4 applies.

Regarding testing and inspection, proposed Section A407.2 clarifies the existing reference to “the building code” and disallows certain exemptions in IBC Chapter 17 that apply to new construction of a minor nature but should not apply to Chapter A4 retrofits.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposal merely clarifies existing requirements. In rare cases, the cost of testing and inspection might increase slightly.

Proposal # 5780

EB165-19

2019 GROUP B – PROPOSED CHANGES TO THE INTERNATIONAL ENERGY CONSERVATION CODE

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TENTATIVE ORDER OF DISCUSSION 2019 PROPOSED CHANGES TO THE INTERNATIONAL ENERGY CONSERVATION CODE - COMMERCIAL

The following is the tentative order in which the proposed changes to the code will be discussed at the public hearings. Proposed changes which impact the same subject have been grouped to permit consideration in consecutive changes.

Proposed change numbers that are indented are those which are being heard out of numerical order. Indentation does not necessarily indicate that one change is related to another. Proposed changes may be grouped for purposes of discussion at the hearing at the discretion of the chair. Note that some CE code change proposals may not be included on this list, as they are being heard by another committee.

CE1-19 Part I	CE29-19 Part I	CE66-19	CE102-19
CE2-19	CE30-19 Part I	CE67-19	CE103-19 Part I
CE3-19 Part I	CE31-19 Part I	CE68-19	CE104-19
CE4-19 Part I	CE28-19 Part I	CE69-19	CE105-19
CE5-19 Part I	CE32-19 Part I	CE70-19	CE106-19
CE6-19 Part I	CE33-19	CE71-19	CE107-19
CE7-19 Part I	CE34-19 Part I	CE72-19	CE108-19
ADM9-19 Part II	CE35-19	CE73-19	CE109-19
ADM10-19 Part III	CE36-19 Part 1	CE74-19	CE110-19
CE8-19 Part I	CE37-19 Part I	CE75-19	CE111-19
CE9-19 Part I	CE38-19	CE76-19	CE112-19
CE10-19 Part I	CE40-19 part I	CE77-19	CE113-19
CE11-19 Part I	CE41-19	CE78-19 Part I	CE114-19
ADM46-19 Part III	CE42-19 Part I	CE79-19	CE115-19 Part I
CE12-19 Part I	CE43-19	CE80-19	CE116-19 Part I
CE13-19 Part I	CE44-19	CE81-19	CE117-19
CE14-19	CE45-19	CE82-19	CE118-19
CE15-19 Part I	CE46-19	CE83-19	CE119-19 Part I
ADM33-19 Part II	CE47-19	CE84-19	CE119-19
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CE17-19 Part I	CE50-19	CE87-19	CE122-19
ADM41-19 Part III	CE51-19 Part I	CE88-19	CE123-19
ADM40-19 Part III	CE52-19	CE39-19	CE124-19
CE18-19 Part 1	CE53-19	CE89-19	CE125-19
CE20-19 Part I	CE54-19 Part I	CE90-19	CE126-19
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CE21-19	CE56-19	CE92-19	CE128-19
ADM1-19 Part II	CE57-19	CE93-19 Part I	CE129-19
ADM2-19 Part II	CE58-19	CE94-19	CE130-19
ADM3-19 Part II	CE59-19	CE95-19	CE131-19
CE23-19 Part I	CE60-19 Part I	CE96-19	CE132-19
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CE143-19	CE198-19	CE254-19
CE144-19	CE199-19	CE255-19 Part I
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CE146-19	CE201-19	CE257-19
CE147-19	CE202-19	CE258-19
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CE150-19 Part I	CE205-19	CE261-19
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CE153-19	CE209-19	CE262-19
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CE159-19 Part I	CE215-19	
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CE161-19	CE217-19 Part I	
CE162-19	CE218-19	
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CE165-19	CE221-19	
CE166-19	CE222-19	
CE167-19	CE223-19	
CE168-19	CE224-19	
CE169-19	CE225-19	
CE170-19	CE226-19	
CE171-19	CE227-19	
CE172-19	CE228-19	
CE173-19	CE229-19	
CE174-19	CE230-19	
CE175-19	CE231-19	
CE176-19	CE232-19	
CE177-19	CE233-19	
CE178-19	CE234-19	
CE179-19	CE235-19	
CE180-19	CE236-19	
CE181-19	CE237-19	
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CE192-19	CE248-19 Part I	

CE1-19 Part I

PART I — IECC: Part I: SECTION C101.2, C101.3, C101.4.1, C101.5, C202, C202, (New), C401.1, C401.2, C401.2.1(New),

IECC: Part II R101.2, R101.3(N1101.2) , R101.4.1, R101.5, R202 (N1101.6), R202 (N1101.6) (New), R401, R401.2.1(N1101.13.1)(New), R401.2.2(N1101.13.2)(New), R401.3(N1101.14)

PART II — IECC: R101.2, R101.3 (IRC N1101.2), R101.4.1, R101.5, R202 (IRC N1101.6), R401.1, R401.2 (IRC N1101.13), R401.2.1 (IRC 1101.13.1) (New), R401.2.1 (IRC N1101.13.1, R401.3 (IRC N1101.14)

Proponent: Darren Meyers, P.E., International Energy Conservation Consultants LLC, representing Self (dmeyers@ieccode.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

SECTION C101 SCOPE AND GENERAL REQUIREMENTS

C101.1 Title. This code shall be known as the Energy Conservation Code of [NAME OF JURISDICTION], and shall be cited as such. It is referred to herein as “this code.”

Revise as follows:

C101.2 Scope. This code applies to *commercial buildings* and ~~the buildings' sites and associated systems and equipment; structures , their associated sites , systems and equipment; and energy-using systems and equipment associated with sites considered areas of land under the control of a single owner or entity.~~

C101.3 Intent. This code shall regulate the design and construction of *buildings* , structures and sites for the effective use and conservation of energy over ~~the their useful life of each building.~~ This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

C101.4.1 Mixed residential and commercial buildings, structures and sites. Where a *building, structure or site* includes both *residential building uses* and *commercial building portions uses*, each ~~portion use group~~ shall be separately considered and meet the applicable provisions of IECC—Commercial Provisions or IECC—Residential Provisions.

C101.5 Compliance. *Residential buildings, structures and sites* shall meet the provisions of IECC—Residential Provisions. *Commercial buildings, structures and sites* shall meet the provisions of IECC—Commercial Provisions.

SECTION C202 GENERAL DEFINITIONS

~~**BUILDING-SITE.**~~ A contiguous area of land that is under the ownership or control of one owner or entity.

Add new definition as follows:

[A] STRUCTURE. That which is built or constructed.

SECTION C401 GENERAL

Revise as follows:

C401.1 Scope. The provisions in this chapter are applicable to commercial *buildings, structures* and their *building-sites*.

C401.2 Application. *Commercial buildings, structures, and sites* shall comply with one of the following:

1. The requirements of ANSI/ASHRAE/IESNA 90.1.
2. The requirements of Sections C402 through C405 and C408. In addition, *commercial buildings, associated structures and sites* shall comply with Section C406 and tenant spaces shall comply with Section C406.1.1.
3. The requirements of Sections C402.5, C403.2, C403.3 through C403.3.2, C403.4 through C403.4.2.3, C403.5.5, C403.7, C403.8.1 through C403.8.4, C403.10.1 through C403.10.3, C403.11, C403.12, C404, C405, C407 and C408. The *aggregate building, structure and site* energy cost shall be equal to or less than 85 percent of the standard reference design building.

Add new text as follows:

C401.2.1 Application to structures and sites. Energy-using systems and equipment serving sites or structures, with or without a contiguous building, including site lighting; motors for pumps, fountain pumps and water moving equipment; and vertical transportation equipment, elevators and escalators, shall meet the applicable provisions of this code as described in Sections C403, C404, C405, C407 and C408

Proposal # 5602

CE1-19 Part I

CE1-19 Part II

IECC: R101.2, R101.3 (IRC N1101.2), R101.4.1, R101.5, R202 (IRC N1101.6), R401.1, R401.2 (IRC N1101.13), R401.2.1 (IRC 1101.13.1) (New), R401.2.1 (IRC N1101.13.1, R401.3 (IRC N1101.14)

Proponent: Darren Meyers, P.E., International Energy Conservation Consultants LLC, representing Self (dmeyers@ieccode.com)

2018 International Energy Conservation Code

Revise as follows:

SECTION R101 (IRC N1101) SCOPE AND GENERAL REQUIREMENTS

R101.1 Title. This code shall be known as the Energy Conservation Code of [NAME OF JURISDICTION], and shall be cited as such. It is referred to herein as “this code.”

R101.2 Scope. This code applies to *residential buildings* and ~~the *building sites* and associated systems and equipment~~ *structures*, their associated *sites*, systems and equipment; and energy-using systems and equipment associated with *sites* considered areas of land under the control of a single owner or entity.

R101.3 (IRC N1101.2) Intent. This code shall regulate the design and construction of *buildings, structures and sites* for the effective use and conservation of energy over the their useful life ~~of each building~~. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

R101.4.1 Mixed residential and commercial *buildings, structures and sites*. Where a *building, structure or site* includes both *residential building uses* and *commercial building portions uses*, each ~~portion use group~~ shall be separately considered and meet the applicable provisions of the IECC—Commercial Provisions or IECC—Residential Provisions.

R101.5 Compliance. *Residential buildings, structures and sites* shall meet the provisions of IECC—Residential Provisions. *Commercial buildings, structures and sites* shall meet the provisions of IECC—Commercial Provisions.

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

~~BUILDING SITE.~~ A ~~contiguous~~ contiguous area of land that is under the ownership or control of one owner or entity.

Add new text as follows:

STRUCTURE. That which is built or constructed.

Revise as follows:

SECTION R401 GENERAL

R401.1 Scope. This chapter applies to *residential buildings, structures and sites*.

R401.2 (IRC N1101.13) Compliance. Projects Buildings , structures and sites shall comply with one of the following:

1. Sections R401 through R404.
2. Section R405 and the provisions of Sections R401 through R404 indicated as "Mandatory."
3. The energy rating index (ERI) approach in Section R406.

Add new text as follows:

R401.2.1 (IRC N1101.13.1) Application to structures and sites. Energy-using systems and equipment servicing sites or structures , with or without a contiguous residential building , including site lighting; motors for pumps, fountain pumps and water moving equipment; and vertical transportation equipment, lifts, elevators and escalators, shall meet the applicable provisions of this code as described in Sections R403, R404, R405 and R406.

Revise as follows:

~~R401.2.1~~ **R401.2.2 (IRC N1101.13.2) Tropical zone.** Residential buildings, structures and sites in the tropical zone at elevations less than 2,400 feet (731.5 m) above sea level shall be deemed to be in compliance with this chapter provided that the following conditions are met:

1. Not more than one-half of the *occupied* space is air conditioned.
2. The *occupied* space is not heated.
3. Solar, wind or other renewable energy source supplies not less than 80 percent of the energy for service water heating.
4. Glazing in *conditioned* spaces has a *solar heat gain coefficient* of less than or equal to 0.40, or has an overhang with a projection factor equal to or greater than 0.30.
5. Permanently installed lighting is in accordance with Section R404.
6. The exterior roof surface complies with one of the options in Table C402.3 or the roof or ceiling has insulation with an *R-value* of R-15 or greater. Where attics are present, attics above the insulation are vented and attics below the insulation are unvented.
7. Roof surfaces have a slope of not less than one-fourth unit vertical in 12 units horizontal (21-percent slope). The finished roof does not have water accumulation areas.
8. Operable fenestration provides a ventilation area of not less than 14 percent of the floor area in each room. Alternatively, equivalent ventilation is provided by a ventilation fan.
9. Bedrooms with exterior walls facing two different directions have operable fenestration on exterior walls facing two directions.
10. Interior doors to bedrooms are capable of being secured in the open position.
11. A ceiling fan or ceiling fan rough-in is provided for bedrooms and the largest space that is not used as a bedroom.

R401.3 (IRC N1101.14) Certificate (Mandatory). A permanent certificate shall be completed by the builder or other *approved* party and posted on a wall in the space where the furnace is located, a utility room or an *approved* location inside the *building*, at the structure , or in a conspicuous location on site. Where located on an electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label or other required labels. The certificate shall indicate the predominant *R-values* of insulation installed in or on ceilings, roofs, walls, foundation components such as slabs, *basement walls*, crawl space walls and floors and ducts outside *conditioned spaces*; *U-factors* of fenestration and the *solar heat gain coefficient* (SHGC) of fenestration, and the results from any required duct system and *building* envelope air leakage testing performed on the *building*. Where there is more than one value for each component, the certificate shall indicate the value covering the largest area. The certificate shall indicate the types and efficiencies of heating, cooling and service water heating equipment. Where a gas-fired unvented room heater, electric furnace or

baseboard electric heater is installed in the residence, the certificate shall indicate “gas-fired unvented room heater,” “electric furnace” or “baseboard electric heater,” as appropriate. An efficiency shall not be indicated for gas-fired unvented room heaters, electric furnaces and electric baseboard heaters.

Reason: There are areas outside of residential buildings where energy savings is possible by applying provisions currently in the IECC. Examples include lighting in parking lots that may or may not be directly associated with a commercial or residential building or lighting and equipment associated with a physical plant or pump, public or private parks a public or private campus or planned-unit-development. Imagine the additional and credible energy savings that could be acquired by expanding the scope and applicaiton of the residential provisions of the IECC, as such.

This proposal expands the scope and application of the residential provisions of the IECC to apply to energy-using systems in areas outside of the building structure itself. The proposal revises an existing term "BUILDING SITE" and introduces term, "STRUCTURE" utilized throughout the ICC Family of *International Codes*, to define those types of environments where the building may not enclose the extent of energy-using lighting, motor, pumping and vertical transportation systems and equipment addressed in the code as currently constituted. Also, a new provision is included in Chapter 4 [RE] "Application" to address structures and sites with or without buildings.

Cost Impact: The code change proposal will increase the cost of construction. While there will be a cost impact associated with this change when compared to current provisions, the change better positions the IECC to be clearer, more easily applied to structures and sites constructed without associated buildings, and more competitive than the 90.1 Standard or the Standard 90.2 alternatives on the issues.

Proposal # 5626

CE1-19 Part II

CE2-19

IECC: Section C101.3

Proponent: Sharon Bonesteel, Salt River Project, representing Salt River Project (sharon.bonesteel@srpnet.com); Steven Rosenstock, representing Edison Electric Institute (srosenstock@eei.org)

2018 International Energy Conservation Code

Revise as follows:

C101.3 Intent. This code shall regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building. The shift of a load from on-peak period to off-peak shall be considered a part of the effective use of energy. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

Reason: The conservation of energy and its related cost are the foundation of the IECC. Since the cost of energy is time dependent, it makes sense to include the shift of a load from *on-peak* (most expensive per kw) to *off peak* (least expensive) as a part of the effective use of energy. The definitions for *load*, *on-peak* and *off peak* are included in another code change proposal. Those proposed definitions are as follows:

- **LOAD** A portion of a system that consumes electric energy. The total electrical *load* of a building is the sum of all electricity consuming appliances, lights and systems, necessary for a building to function as designed.
- **ON-PEAK** The time of use during which the cost per kiloWatt-hour (kWh) is the highest and when the maximum generation resources are required to supply electricity to the customer.
- **OFF-PEAK** The time of use during which the cost per kiloWatt-hour (kWh) is the lowest and when generation resources are being underutilized.

The terms are found defined in on-line sources. These could be added to the proposal, if needed, at public comment stage.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This code change clarifies that load shifting is a part of the efficient use of energy and does not increase or decrease the cost of construction.

Proposal # 5002

CE2-19

CE3-19 Part I

PART I — IECC: Part I: C101.3

IECC: Part II: R101.3(N1101.2)

PART II — IECC: R101.3 (IRC N1101.2)

Proponent: Joseph H. Cain, Solar Energy Industries Association (SEIA), representing Solar Energy Industries Association (SEIA) (JoeCainPE@gmail.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

Revise as follows:

C101.3 Intent. This code shall regulate the design and construction of buildings and systems for the effective use and conservation of energy over the useful life of each building, including effective integration of energy efficiency measures, renewable energy systems, and energy storage systems. This code is intended to provide flexibility to permit the use of innovative approaches and techniques, including innovative approaches and techniques ~~to achieve this objective; that achieve the most cost-effective means of compliance.~~ This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

Proposal # 5487

CE3-19 Part I

CE3-19 Part II

IECC: R101.3 (IRC N1101.2)

Proponent: Joseph H. Cain, Solar Energy Industries Association (SEIA), representing Solar Energy Industries Association (SEIA) (JoeCainPE@gmail.com)

2018 International Energy Conservation Code

Revise as follows:

R101.3 (IRC N1101.2) Intent. This code shall regulate the design and construction of *buildings and systems* for the effective use and conservation of energy over the useful life of each building, including effective integration of energy efficiency measures, renewable energy systems, and energy storage systems. This code is intended to provide flexibility to permit the use of innovative approaches and techniques, including innovative approaches and techniques ~~to achieve this objective.~~ that achieve the most cost-effective means of compliance. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

Reason: Renewable energy systems are an important component of the IECC, but the Intent section is presently silent on them. Effective integration of energy efficiency measures and renewable energy systems is critical to the future of energy codes and green/stretch/reach codes. At the time of submittal of these code change proposals, there are four states with 100% renewable energy goals: Hawaii, California, New Jersey, and New York. Other communities are committing to renewable energy goals through their own local renewable goals for power supply or for installation of renewable energy systems.

As grid penetration of renewable energy systems increases, the need to energy storage systems -- mostly battery storage -- also increases. The Intent section of the IECC should evolve with our societal needs, as by the time this edition is in effect there will be even more renewable energy systems and battery storage systems.

Renewable energy is already explicitly included in the IECC in multiple locations, including, but not limited to: Section C202 Definitions; Section C407.3 Performance-based compliance; Appendix CA Solar Ready Zone; Section R406 Energy Rating Index; Appendix RA Solar Ready Provisions. The Intent section needs to catch up with the provisions within the code.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal represents a forward-thinking clarification of intent only, with no increase or decrease in cost of construction.

Proposal # 5695

CE3-19 Part II

CE4-19 Part I

PART I — IECC: Part I: Section C101.3

IECC: Part II: Section R101.3(N1101.2)

PART II — IECC: R101.3 (IRC N1101.2)

Proponent: William McHugh, The McHugh Company, representing Chicago Roofing Contractors Association
(billmchugh-jr@att.net)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE.
PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER
FOR THESE COMMITTEES.

2018 International Energy Conservation Code

Revise as follows:

C101.3 Intent. This code shall regulate the design and construction of buildings for the ~~effective-use and conservation~~ of energy over the useful life of each building. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

Proposal # 5330

CE4-19 Part I

CE4-19 Part II

IECC: R101.3 (IRC N1101.2)

Proponent: William McHugh, The McHugh Company, representing Chicago Roofing Contractors Association (billmchugh-jr@att.net)

2018 International Energy Conservation Code

R101.3 (IRC N1101.2) Intent. This code shall regulate the design and construction of *buildings* for the ~~effective use and conservation~~ of energy over the useful life of each building. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

Reason: The International Energy Conservation Code should regulate the minimum energy use requirements for a building throughout its life cycle. The IECC's Intent Section goes beyond minimum requirements and sets an unenforceable tone of 'effective use' and 'conservation of energy'. While these are noble goals, codes are to regulate minimum requirements. This proposal brings the section in line with the statements in the section above intent:

"The code is intended to be adopted as a legally enforceable document and it cannot be effective without adequate provisions for its administration and enforcement."

Adding words 'effective use' and 'conservation of energy', is not legally enforceable, confusing and brings opinion into the intent of the code. The intent sections should state that the code consists of minimum technical requirements as stated in the Energy Code sections - the 'provisions'. This proposal clarifies that the code is the minimum requirements, which is very clearly, legally enforceable.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal is neutral when it comes to costs as it clarifies language and purpose of the code.

Proposal # 5758

CE4-19 Part II

CE5-19 Part I

PART I — IECC: Part I: Section C101.3

IECC: Part II: Section R101.3(N1101.2)

PART II — IECC: R101.3 (IRC N1101.2)

Proponent: Hope Medina, representing Self (hmedina@coloradocode.net)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

Revise as follows:

C101.3 Intent. This code shall regulate the design and construction of buildings for life safety along with the effective use and conservation of energy over the useful life of each building. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

Proposal # 5470

CE5-19 Part I

CE5-19 Part II

IECC: R101.3 (IRC N1101.2)

Proponent: Hope Medina, representing Self (hmedina@coloradocode.net)

2018 International Energy Conservation Code

Revise as follows:

R101.3 (IRC N1101.2) Intent. This code shall regulate the design and construction of *buildings* for life safety along with the effective use and conservation of energy over the useful life of each building. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

Reason: There is a misconception among some end users that the energy code is not a life safety code and this is not correct. The energy code either independently or working in conjunction with the other codes assist with several aspects of what is considered the main stream life safety. It assists with tight construction for fire, moisture diffusion within assemblies, and usability during extreme conditions. The intent should identify that this code is promoting life safety as it is stated in the other I-codes.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This change just acknowledges the life safety contribution.

Proposal # 5468

CE5-19 Part II

CE6-19 Part I

PART I — IECC: Part I: Section C101.3

IECC: Part II: Section R101.3(N1101.2)

PART II — IECC: R101.3 (IRC N1101.2)

Proponent: Darren Meyers, P.E., International Energy Conservation Consultants LLC, representing Self (dmeyers@ieccode.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

Revise as follows:

C101.3 Intent. This code shall regulate the design and construction of buildings for the effective use and conservation of energy primarily for human comfort over the useful life of each building. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

Proposal # 5400

CE6-19 Part I

CE6-19 Part II

IECC: R101.3 (IRC N1101.2)

Proponent: Darren Meyers, P.E., International Energy Conservation Consultants LLC, representing Self (dmeyers@ieccode.com)

2018 International Energy Conservation Code

Revise as follows:

R101.3 (IRC N1101.2) Intent. This code shall regulate the design and construction of *buildings* for the effective use and conservation of energy primarily for human comfort over the useful life of each building. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

Reason: Indeed, it remains the intent of the IECC to apply to energy using systems designed primarily for human occupancy (i.e., thermal comfort, visual comfort and service hot-water comfort), and -- unless specifically noted to otherwise -- does not apply to energy using systems designed for commercial, business, educational or industrial processes. This interpretation of the IECC, the Code Council has offered in the past remains the same.

While there remain some direct and indirect inferences to commercial, business, educational or industrial process energy uses throughout the IECC, there exist no "explicit" or "all-inclusive" delineations as to energy end uses designed primarily for humans to live, sleep, eat, work, and play in and around residential buildings and residential building sites. Some examples of the direct and indirect inferences to commercial, business, educational or industrial process energy uses, include:

1. C402.1.1 Greenhouses.
2. C402.1.2 [*telecommunications*] Equipment buildings.
3. C403.5 Economizers (Prescriptive), Exception 2; "... spaces designed to be humidified above 35°F (1.7°C) dewpoint temperature to satisfy "process needs."
4. C403.5.4.1 Design capacity; for:
 - "Systems primarily serving computer rooms ...",
 - "Systems where dehumidification requirements cannot be met using outdoor air temperatures of 50°F (10°C)
 - dry bulb/45°F (7°C) wet bulb
 - and where 100 percent of the expected system cooling load at 45°F (7°C) dry bulb/40°F (4°C) wet bulb is met with evaporative water economizers."
5. C403.7.1 Demand control ventilation (Mandatory), Exception 5; Ventilation provided only for "process loads."
6. C403.10.1 or C403.10.2 for Walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers.
7. C405.3.1 Total connected interior lighting power, Several exemptions:

- Lighting for photographic processes,
- Lighting for plant growth,
- Lighting for food warming, and
- Lighting in demonstration equipment for education,

8. C405.4.1 Total connected exterior lighting power, Several exemptions:

- Lighting associated with transportation,
- Temporary lighting, Industrial production, material handling and transportation lighting, and
- Theme element lighting in theme parks.

9. C406.7.1 Load fraction, Exception 2; "Waste heat recovery from ... building equipment, or process equipment."

10. C407.1 Scope; with reference to: "... receptacle loads and process loads," and energy used to recharge or refuel vehicles used for on-road and off-site transportation purposes.

Therefore, as was the case with the 2003 IECC, it is our opinion that neither the 2006 IECC nor its 2009, 2012, 2015, 2018 or forthcoming 2021 editions are intended to require greenhouses (heated/cooled primarily to preserve the commodity - plants) to meet the envelope provisions of the code.

Section 101.3 the 2006 IECC (our opinion) was inadvertently truncated by the Department of Energy in an effort to improve the utility and enforceability of the IECC vis-a-vis a 'MONSTROUS' scoping and technical content change (see EC48-03/04).

So then, without the proposed language, and interpreted literally, the IECC could indeed be read as limiting the amount of energy put into a blast furnace at a foundry, energy dedicated to civilian booster pumping stations and wastewater treatment facilities keeping our civilian water supply clean, energy to operate fermenting casks at a distillery, energy to run a conveyor at a packaging plant, or even the energy to modulate cabinet temperatures within telecommunication shelters dedicated to switching and signal receiving. However, this is simply not pragmatic and not the case.

Bibliography: A copy of p.1 from the 2003 ICC International Energy Conservation Code.

SECTION 101
GENERAL

101.1 Title. These regulations shall be known as the *Energy Conservation Code* of [NAME OF JURISDICTION], and shall be cited as such. It is referred to herein as "this code."

101.2 Scope. This code establishes minimum prescriptive and performance-related regulations for the design of energy-efficient buildings and structures or portions thereof that provide facilities or shelter for public assembly, educational, business, mercantile, institutional, storage and residential occupancies, as well as those portions of factory and industrial occupancies designed primarily for human occupancy. This code thereby addresses the design of energy-efficient building envelopes and the selection and installation of energy-efficient mechanical, service water-heating, electrical distribution and illumination systems and equipment for the effective use of energy in these buildings and structures.

Exception: Energy conservation systems and components in existing buildings undergoing repair, alteration or additions, and change of occupancy, shall be permitted to comply with the *International Existing Building Code*.

101.2.1 Exempt buildings. Buildings and structures indicated in Sections 101.2.1.1 and 101.2.1.2 shall be exempt from the building envelope provisions of this code, but shall comply with the provisions for building, mechanical, service water heating and lighting systems.

101.2.1.1 Separated buildings. Buildings and structures, or portions thereof separated by building envelope assemblies from the remainder of the building, that have a peak design rate of energy usage less than 3.4 Btu/h per square foot (10.7 W/m²) or 1.0 watt per square foot (10.7 W/m²) of floor area for space conditioning purposes.

101.2.1.2 Unconditioned buildings. Buildings and structures or portions thereof which are neither heated nor cooled.

101.2.2 Applicability. The provisions of this code shall apply to all matters affecting or relating to structures and premises, as set forth in Section 101. Where, in a specific case, different sections of this code specify different materials, methods of construction or other requirements, the most restrictive shall govern.

[EB] 101.2.2.1 Existing installations. Except as otherwise provided for in this chapter, a provision in this code shall not require the removal, alteration or abandonment of, nor prevent the continued utilization and maintenance of, an existing building envelope, mechanical, service water-heating, electrical distribution or illumination system lawfully in existence at the time of the adoption of this code.

[EB] 101.2.2.2 Additions, alterations or repairs. Additions, alterations, renovations or repairs to a building en-

velope, mechanical, service water-heating, electrical distribution or illumination system or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portion(s) of the existing system to comply with all of the requirements of this code. Additions, alterations or repairs shall not cause any one of the aforementioned and existing systems to become unsafe, hazardous or overloaded.

[EB] 101.2.2.3 Historic buildings. The provisions of this code relating to the construction, alteration, repair, enlargement, restoration, relocation or movement of buildings or structures shall not be mandatory for existing buildings or structures specifically identified and classified as historically significant by the state or local jurisdiction, listed in *The National Register of Historic Places* or which have been determined to be eligible for such listing.

[EB] 101.2.2.4 Change in occupancy. It shall be unlawful to make a change in the occupancy of any building or structure which would result in an increase in demand for either fossil fuel or electrical energy supply unless such building or structure is made to comply with the requirements of this code or otherwise approved by the authority having jurisdiction. The code official shall certify that such building or structure meets the intent of the provisions of law governing building construction for the proposed new occupancy and that such change of occupancy does not result in any increase in demand for either fossil fuel or electrical energy supply or any hazard to the public health, safety or welfare.

101.2.3 Mixed occupancy. When a building houses more than one occupancy, each portion of the building shall conform to the requirements for the occupancy housed there. Where minor accessory uses do not occupy more than 10 percent of the area of any floor of a building, the major occupancy shall be considered the building occupancy. Buildings other than detached one- and two-family dwellings and townhouses, with a height of four or more stories above grade shall be considered commercial buildings for the purposes of this code, regardless of the number of floors that are classified as residential occupancy.

101.3 Intent. The provisions of this code shall regulate the design of building envelopes for adequate thermal resistance and low air leakage and the design and selection of mechanical, electrical, service water-heating and illumination systems and equipment which will enable effective use of energy in new building construction. It is intended that these provisions provide flexibility to permit the use of innovative approaches and techniques to achieve effective utilization of energy. This code is not intended to abridge safety, health or environmental requirements under other applicable codes or ordinances.

2003 INTERNATIONAL ENERGY CONSERVATION CODE®

Cost Impact: The code change proposal will not increase or decrease the cost of construction. There is no cost implication aligned with this proposal. Rather, it is an exercise steeped in clarification of the IECC Purpose and Scope. The resulting exclusions would mean the process energies assigned to domestic water pressure booster and sprinkler system pumping stations, wastewater treatment facilities, greenhouses

and telecommunication shelters on residential property would be "excluded" from the scope and applicability of the IECC, without the need for explicitly articulated lists or exceptions. No change to stringency is proposed.

Proposal # 5637

CE6-19 Part II

CE7-19 Part I

PART I — IECC: Part I: Section C101.3
IECC: Part II: Section R101.3(IRC N1101.2)

PART II — IECC: R101.3 (IRC N1101.2)

Proponent: Steven Rosenstock, Edison Electric Institute, representing Edison Electric Institute
(srosenstock@eei.org)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE.
PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER
FOR THESE COMMITTEES.

2018 International Energy Conservation Code

Revise as follows:

C101.3 Intent. This code shall regulate the design and construction of buildings for the effective use, conservation, production, and ~~conservation~~ storage of energy over the useful life of each building. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

Proposal # 4692

CE7-19 Part I

CE7-19 Part II

IECC: R101.3 (IRC N1101.2)

Proponent: Steven Rosenstock, representing Edison Electric Institute (srosenstock@eei.org)

2018 International Energy Conservation Code

Revise as follows:

R101.3 (IRC N1101.2) Intent. This code shall regulate the design and construction of *buildings* for the effective use ~~of~~ conservation, production, and conservation storage of energy over the useful life of each building. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

Reason: This proposal updates the intent to show that the IECC is now starting to regulate energy production and energy storage systems that are installed in new homes. This update is needed to account for trends in certain areas of the US.

For example, Appendix RB contains requirements for solar-ready provisions installed on single-family homes and townhouses. In Section 406, the Energy Rating Index Compliance Alternative, renewable energy production can be used to obtain a better score. Therefore, the code is now starting to regulate renewable energy production systems that are installed in residential facilities.

Renewable energy systems are a form of energy production, not building energy use. The production of renewable energy does not conserve the amount of energy a building or end-use system or appliance will use. The intent of the code should be updated to account for the recent code changes.

In addition, in California's Title 24, PV energy production systems are now required on new homes (with some exceptions). One of the options with this mandate is to include an on-site energy storage system in the home, as shown below:

From CA Title 24-2019:

"PV sizes from Equation 150.1-C may be reduced by 25 percent if installed in conjunction with a battery storage system. The battery storage system shall meet the qualification requirements specified in Joint Appendix JA12 and have a minimum capacity of 7.5 kWh."

Therefore, code officials will be enforcing the installation of on-site renewable energy production systems, along with the installation of on-site energy storage systems in some cases. This will in addition to enforcing the energy conservation requirements of the energy code.

Bibliography: California Energy Commission, "*2019 BUILDING ENERGY EFFICIENCY STANDARDS FOR RESIDENTIAL AND NONRESIDENTIAL BUILDINGS*", December 2018
<https://www.energy.ca.gov/2018publications/CEC-400-2018-020/CEC-400-2018-020-CMF.pdf>

Cost Impact: The code change proposal will not increase or decrease the cost of construction. In this proposal, the requirements in the code are not being changed. This proposal only clarifies the intent of the energy code to account for what is already occurring in certain building energy codes.

Proposal # 4691

CE8-19 Part I

PART I — IECC: Part I: Section C102.1

IECC: Part II: Section R102.1

PART II — IECC: R102.1

Proponent: Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy
(dbresette@ase.org)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE.
PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER
FOR THESE COMMITTEES.

2018 International Energy Conservation Code

Revise as follows:

C102.1 General. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been *approved*. An alternative material, design or method of construction shall be *approved* where the *code official* finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code in quality, strength, effectiveness, *fire resistance*, durability and safety. Where the alternative material, design or method of construction is not *approved*, the *code official* shall respond in writing, stating the reasons why the alternative was not *approved*. The requirements identified as "mandatory" in Chapter 4 shall be met.

Proposal # 5266

CE8-19 Part I

CE8-19 Part II

IECC: R102.1

Proponent: Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy
(dbresette@ase.org)

2018 International Energy Conservation Code

Revise as follows:

R102.1 General. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code. The *code official* shall have the authority to approve an alternative material, design or method of construction upon application of the owner or the owner's authorized agent. The code official shall first find that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code for strength, effectiveness, fire resistance, durability and safety. Where the alternative material, design or method of construction is not *approved*, the *code official* shall respond to the applicant, in writing, stating the reasons why the alternative was not *approved*. The requirements identified as "mandatory" in Chapter 4 shall be met.

Reason: The purpose of this code change proposal is to help ensure that critical energy conservation measures are included in every new home, irrespective of the compliance path selected. Although Section R102.1.1/C102.1.1 of the IECC already requires that all above-code programs meet the "mandatory" measures of the code, there is currently no specific language that requires alternative materials, designs or methods of construction (in R102.1/C102.1) meet these important requirements. We believe that these alternative methods (for which there is very little direction provided in the code) should at a minimum require compliance with "mandatory" measures. Without such a requirement, we are concerned that this section could serve as a massive loophole for any code user that does not want to comply with one of the mandatory provisions.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The mandatory measures are already required by the code.

Staff Analysis: There is not a coordinate section in Chapter 11 of the IRC.

Proposal # 4017

CE8-19 Part II

CE9-19 Part I

PART I — IECC: Part I: Section C102.1

IECC: Part II: Section R102.1

PART II — IECC: R102.1

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

Revise as follows:

C102.1 General. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been *approved*. An alternative material, design or method of construction shall be *approved* where the *code official* finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code in quality, strength, effectiveness, *fire resistance*, durability, energy conservation and safety. Where the alternative material, design or method of construction is not *approved*, the *code official* shall respond in writing, stating the reasons why the alternative was not *approved*.

Proposal # 5267

CE9-19 Part I

CE9-19 Part II

IECC: R102.1

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org)

2018 International Energy Conservation Code

Revise as follows:

R102.1 General. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code. The *code official* shall have the authority to approve an alternative material, design or method of construction upon application of the owner or the owner's authorized agent. The code official shall first find that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code for strength, effectiveness, fire resistance, durability, energy conservation and safety. Where the alternative material, design or method of construction is not *approved*, the *code official* shall respond to the applicant, in writing, stating the reasons why the alternative was not *approved*.

Reason: The purpose of this code change proposal is to help ensure that energy conservation will be considered in any request for approval of alternative materials, designs, or methods of construction. Although the current language of Section R102.1/C102.1 requires alternatives to be "not less than the equivalent" of the code requirement for quality, strength, effectiveness, fire resistance, durability, and safety, it is important that the energy conservation impact be considered as well – particularly in the International Energy Conservation Code.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal merely clarifies that energy conservation must be considered in assessing alternatives to IECC requirements.

Staff Analysis: There is not a coordinate section in IRC Chapter 11, however IRC Section R104.11 covers the subject matter.

Proposal # 4018

CE9-19 Part II

CE10-19 Part I

PART I — IECC: Part I: Section C102.1

IECC: Part II: Section R102.1

PART II — IECC: R102.1

Proponent: Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

Revise as follows:

C102.1 General. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been *approved*. ~~An~~ The code official shall have the authority to approve an alternative material, design or method of construction shall be approved where the code official finds upon the written application of the owner or the owner's authorized agent. The code official shall first find that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety. Where the alternative material, design or method of construction is not approved, the The code official shall respond to the applicant, in writing, stating the reasons why the alternative was approved or was not approved.

Proposal # 5264

CE10-19 Part I

CE10-19 Part II

IECC: R102.1

Proponent: Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org)

2018 International Energy Conservation Code

Revise as follows:

R102.1 General. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. The *code official* shall have the authority to approve an alternative material, design or method of construction upon the written application of the owner or the owner's authorized agent. The code official shall first find that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code for strength, effectiveness, fire resistance, durability and safety. ~~Where the alternative material, design or method of construction is not approved, the~~ The code official shall respond to the applicant, in writing, stating the reasons why the alternative was approved or was not *approved*.

Reason: The purpose of this code change proposal is to bring more consistency and transparency in code enforcement by helping to ensure that requests for recognition of alternative materials, designs, or methods of construction, and responses to these requests, be put in writing. This proposal does not change any substantive requirements of the code, but creates a record of the process for seeking alternatives to code requirements. The current code language already requires a written response in cases when a request is not approved, but does not specify what the code official should do when an alternative is approved. We do not believe that requiring a request and a response to be written in both cases will be onerous – in fact, we believe that many building code officials already require this.

This proposal also synchronizes the language in the residential and commercial chapters. In the 2018 IECC, the language of C102.1 and R102.1 were updated, but with some differences between the two. We have proposed adopting the language from each section that provides the most clarity for code users.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. These changes do not modify any code requirements.

Staff Analysis: There is not a coordinate section in IRC Chapter 11, however IRC Section R104.11 covers the subject matter.

Proposal # 4016

CE10-19 Part II

CE11-19 Part I

PART I — IECC: Part I: Section C102.1.1

IECC: Part II: Section R102.1.1(N1101.4)

PART II — IECC: R102.1.1 (IRC N1101.4)

Proponent: Shaunna Mozingo, City of Westminster, representing Self (smozingo@cityofwestminster.us)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

Revise as follows:

C102.1.1 ~~Above code~~ Alternate Energy Efficiency programs. The *code official* or other authority having jurisdiction shall be permitted to deem a national, state or local energy efficiency program to exceed the energy efficiency required by this code. Buildings *approved* in writing by such an energy efficiency program shall be considered to be in compliance with this code. The requirements identified as “mandatory” in Chapter 4 shall be met.

Proposal # 5434

CE11-19 Part I

CE11-19 Part II

IECC: R102.1.1 (IRC N1101.4)

Proponent: Shaunna Mozingo, City of Westminster, representing Self (smozingo@cityofwestminster.us)

2018 International Energy Conservation Code

Revise as follows:

R102.1.1 (IRC N1101.4) ~~Above code~~ Alternate Energy Efficiency programs. The *code official* or other authority having jurisdiction shall be permitted to deem a national, state or local energy-efficiency program to exceed the energy efficiency required by this code. *Buildings approved* in writing by such an energy-efficiency program shall be considered to be in compliance with this code. The requirements identified as “mandatory” in Chapter 4 shall be met.

Reason: This section references national, state or local energy efficiency programs so the title should reflect that. It tells you in the wording that the program must exceed the code, it doesnt have to say it in the title as well.

Cost Impact: The code change proposal will not increase or decrease the cost of construction simple title change, no cost involved.

Proposal # 5694

CE11-19 Part II

CE12-19 Part I

PART I — IECC: Part I: Section C102.1.1, Chapter 6CE

IECC: Part II: Section R102.1.1(N1101.4)

PART II — IECC: R102.1.1 (IRC N1101.4)

Proponent: Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

Revise as follows:

C102.1.1 Above code programs. The *code official* or other authority having jurisdiction shall be permitted to deem a national, state or local energy efficiency program to exceed the energy efficiency required by this code. Buildings *approved* in writing by such an energy efficiency program shall be considered to be in compliance with this code where such buildings meet the requirements identified as “mandatory” in Chapter 4 shall be met, and the building thermal envelope is greater than or equal to levels of efficiency and Solar Heat Gain Coefficients in Table 502.3 and either Table 502.1.2 or 502.2(1) of the 2009 International Energy Conservation Code .

Add new text as follows:

ICC

International Code Council, Inc.
500 New Jersey Avenue NW 6th
Floor
Washington DC 20001

IECC-2009: International Energy Conservation Code

Proposal # 5504

CE12-19 Part I

CE12-19 Part II

IECC: R102.1.1 (IRC N1101.4)

Proponent: Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

R102.1.1 (IRC N1101.4) Above code programs. The code official or other authority having jurisdiction shall be permitted to deem a national, state or local energy-efficiency program to exceed the energy efficiency required by this code. Buildings approved in writing by such an energy-efficiency program shall be considered to be in compliance with this code where such buildings also meet the requirements identified as “mandatory” in Chapter 4 ~~shall be met~~, and the building thermal envelope is greater than or equal to levels of efficiency and Solar Heat Gain Coefficients in Table 402.1.1 or 402.1.3 of the 2009 International Energy Conservation Code.

Reason: The purpose of this code change proposal is to establish a reasonable level of efficiency for the permanent thermal envelope in buildings constructed to “above code” programs. The IECC already requires that buildings constructed to the standards of an above-code program demonstrate compliance with the “mandatory” measures of the IECC; this proposal applies a minimum thermal envelope backstop similar to the one that applies to the Energy Rating Index in Section R406. If a minimum backstop is necessary for the ERI, it stands to reason that a minimum backstop would be even more valuable in an even less fully defined and potentially less rigorous “above code” program.

We have proposed the 2009 IECC in this proposal to maintain consistency with the current section R406, but we would also support referencing the 2012 IECC. (We have proposed updating the Section R406 backstop to the 2012 IECC in a separate proposal because we believe that as the IECC improves in efficiency, so also should the backstops and consumer protection provisions of the code.)

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Because the 2018 IECC is the baseline for any above-code program (and any cost impact statement), and because this backstop is far less stringent than the base code requirements, we do not expect any added construction costs as a result.

Proposal # 4019

CE12-19 Part II

CE13-19 Part I

PART I — IECC: Part I: C103.2
IECC: Part II: R103.2 (N1101.5)

PART II — IECC: R103.2 (IRC N1101.5)

Proponent: Hope Medina, representing Self (hmedina@coloradocode.net)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

Revise as follows:

C103.2 Information on construction documents. Construction documents shall be drawn to scale on suitable material. Electronic media documents are permitted to be submitted where *approved* by the *code official*. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the building, systems and equipment as herein governed. Details shall include, but are not limited to, the following as applicable:

1. Energy compliance path
2. Insulation materials and their *R*-values.
3. Fenestration *U*-factors and solar heat gain coefficients (SHGCs).
4. Area-weighted *U*-factor and solar heat gain coefficient (SHGC) calculations.
5. Mechanical system design criteria.
6. Mechanical and service water heating systems and equipment types, sizes and efficiencies.
7. Economizer description.
8. Equipment and system controls.
9. Fan motor horsepower (hp) and controls.
10. Duct sealing, duct and pipe insulation and location.
11. Lighting fixture schedule with wattage and control narrative.
12. Location of *daylight* zones on floor plans.
13. Air sealing details.

Proposal # 5674

CE13-19 Part I

CE13-19 Part II

IECC: R103.2 (IRC N1101.5)

Proponent: Hope Medina, representing Self (hmedina@coloradocode.net)

2018 International Energy Conservation Code

Revise as follows:

R103.2 (IRC N1101.5) Information on construction documents. Construction documents shall be drawn to scale on suitable material. Electronic media documents are permitted to be submitted where *approved* by the *code official*. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the *building*, systems and equipment as herein governed. Details shall include the following as applicable:

1. Energy compliance path
2. Insulation materials and their *R*-values.
3. Fenestration *U*-factors and *solar heat gain coefficients* (SHGC).
4. Area-weighted *U*-factor and *solar heat gain coefficients* (SHGC) calculations.
5. Mechanical system design criteria.
6. Mechanical and service water-heating systems and equipment types, sizes and efficiencies.
7. Equipment and system controls.
8. Duct sealing, duct and pipe insulation and location.
9. Air sealing details.

Reason: The plan examiner needs to know what energy compliance path the project was designed to, so they are able to determine if the project demonstrates compliance with the specific energy requirements. Often this information is not provided on the construction documents, and plans examiners are required to investigate which add time to the review process. This extension may be in the form of a review comment, or the time it takes to retrieve the information by email or phone. Providing this information at submittal will allow the plans examiner to review the plans to the intended energy compliance path the architect/designer chose for the project.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The reason it will not increase the cost is because essentially the architect or designer is just declaring which energy compliance path they chose for the project. It is usually a few words placed on the plans i.e. Prescriptive path or Performance path.

Proposal # 5669

CE13-19 Part II

CE14-19

IECC: C103.2

Proponent: donald sivigny, State of MN, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Energy Conservation Code

Revise as follows:

C103.2 Information on construction documents. Construction documents shall be drawn to scale on suitable material. Electronic media documents are permitted to be submitted where *approved* by the *code official*. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the building, systems and equipment as herein governed. Details shall include, but are not limited to, the following as applicable:

1. Insulation materials and their R -values.
2. Fenestration U -factors and solar heat gain coefficients (SHGCs).
3. Area-weighted U -factor and solar heat gain coefficient (SHGC) calculations.
4. Mechanical system design criteria.
5. Mechanical and service water heating systems and equipment types, sizes and efficiencies.
6. Economizer description.
7. Equipment and system controls.
8. Fan motor horsepower (hp) and controls.
9. Duct sealing, duct and pipe insulation and location.
10. Lighting fixture schedule with wattage and control narrative.
11. Location of *daylight* zones on floor plans.
12. Air sealing details.
13. Heating and cooling load values for all systems, including documentation of heating and cooling load calculations, such as clear notation of the software or methodology used and key inputs and outputs for all zones, or the 25 largest capacity zones where a project has more than 25 zones.
14. Fan motor brake horsepower (bhp) required for fan motors 1 hp and larger
15. Provisions for HVAC system commissioning and balancing.
16. Provisions for functional testing of lighting controls.

17. Others items as determined by the code official

Reason: 1. Why is the proposed code change needed?

A. Additional information is required in the 2018 IECC section C103.2 that is important for the ability of code officials to complete a proper review of plans. It is important to know and understand how the building is going to be built at time of permit application. Building it, and then submitting as built documents make absolutely no sense if you want the building to perform correctly and actually save energy. We would not build things such as automobiles, pacemakers and other things, without knowing ahead of time, exactly how to build them and how they interact with other components, so why do we think we should be able to do that with buildings. We need to do it right and have all the building information available ahead of time before the permit is issued.

B. The current list's omission of two other specific construction document requirements, in the 2018 IECC, makes it likely that these will often be overlooked. These requirements are in section C408.2 Mechanical systems, and service water-heating systems commissioning and completion requirements, and section C403.8.2 Motor nameplate horsepower.

C. There are currently no other construction document requirements that will allow a plan reviewer to verify that the requirements of the following sections are met: C403.1.1 Calculation of heating and cooling loads, C403.3.1 Equipment sizing, and C408.3 Functional testing of lighting controls will be met.

d. All of the above items are needed and should be required to be submitted at time of plan review in order for the Code official to be able to do a proper plan review for a building that will perform in compliance with the code.

1. Why is the proposed code change a reasonable solution?

The only requirement that will require more than a very modest amount of additional design team effort is for heating and cooling load sizing, and its' documentation (item 5 in the list). These calculations are already required by code, so this just adds a requirement that a listing of results and documentation be provided. The amount of effort is kept reasonable for large buildings by limiting the documentation to the largest 25 zones for buildings with more than 25 zones.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. There is not cost that will be associated with this code change. These items are already being calculated and done as part of the building's construction. All this change is doing is asking for the information at the time of permit application. It is important to design the building and then build to it instead of building it and then trying to make it work with the design. Providing this information up front assures that the building is designed properly and it the specs it will need to be built and inspected to.

Proposal # 5068

CE14-19

CE15-19 Part I

PART I — IECC: Part I: C103.2.2(New)

IECC: Part II: R103.2 (N1101.5.2.2)(New)

PART II — IECC: R103.2.2 (IRC N1101.5.2.2) (New)

Proponent: Hope Medina, representing Self (hmedina@coloradocode.net)

2018 International Energy Conservation Code

Add new text as follows:

C103.2.2 Energy reference construction documents The requirements in this code shall be represented on the construction documents and specifically identification as energy reference sheets. Each trade has the option to locate their specific requirements within their section of the construction documents.

Proposal # 5473

CE15-19 Part I

CE15-19 Part II

IECC: R103.2.2 (IRC N1101.5.2.2) (New)

Proponent: Hope Medina, representing Self (hmedina@coloradocode.net)

2018 International Energy Conservation Code

Add new text as follows:

R103.2.2 (IRC N1101.5.2.2) Energy reference construction documents The requirements in this code shall be represented on the construction documents and specifically identification as energy reference sheets. Each trade has the option to locate their specific requirements within their section of the construction documents.

Reason: The concept represented in this proposal is not a new concept. Construction plans will place the accessibility requirements and/or fire rated construction requirements on their own sheets with references to them throughout the construction plans. The intent of this proposal is similar to this concept. The intent of this proposal is to assist with gaining compliance with the requirements within this code. Often the requirements are placed intermittently throughout the plans and notes, which are then often inadvertently missed by plans examiners, builders, contractors, and inspectors because of the inconsistent locations they are placed. When placing all of the energy requirements within the construction plans on one or more sheets as needed will allow for the end users to be able to apply the energy requirements the architect, designers, and engineers have designed the project to. The proposal acknowledges that each trade may need to provide their respective energy requirements within their own section of the construction plans, but each trade is still required to provide the information on their sheets.

When everything is placed in one location it becomes easier to verify that all the requirements have been identified. When located in many places throughout the plans often plans examiners will write a review comment that will require the architect/designer to locate it on the plans, write a response to the comments, and take up valuable time for both the architect/designer and plans examiner. This may eliminate the needless review comments because one cannot find the information on the plans, and reduce the time needed to respond by the architect/designer. The idea is to reduce the time needed to get the project through the permitting process. This will allow for those involved with the construction process to install the energy requirements as designed and allow the inspector to inspect for them.

Cost Impact: The code change proposal will increase the cost of construction

This proposal may increase the cost of construction on the front end with possible additional construction sheets. It may decrease the time in the permitting process which should decrease the cost of construction. It may also decrease the cost of construction for the builders when they are able to comply with the energy requirements and how the project was designed to by decreasing the number of reinspection. Which will also assist with the construction schedule.

Proposal # 5485

CE15-19 Part II

CE16-19 Part I

PART I — IECC Part I: C105.4, C105.4.1(New), C105.4.2(New), C105.4.3(New)

IECC Part II: R105.4, R105.4.1(New), R105.4.2(New), R105.4.3(New)

PART II — IECC: R105.4, R105.4.1 (New), R105.4.2 (New), R105.4.3 (New)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com); Shaunna Mozingo, representing self (sdmozingo@shaunnamozingo.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

SECTION C105 INSPECTIONS

Revise as follows:

C105.4 Approved third-party inspection agencies. The *code official* is authorized to accept reports of third-party inspection agencies not affiliated with the building design or construction, provided that such agencies are *approved* as to qualifications and reliability relevant to the building components and systems that they are inspecting.

Add new text as follows:

C105.4.1 Authorization of approved third-party inspection agency. When the code official authorizes the use of a third-party inspection agency for all or some aspects of code compliance inspections, the agency shall be authorized as a third-party extension of the code official to verify compliance.

C105.4.2 Approved third-party inspections agreement. The third-party inspection agency and the code official shall agree upon which compliance verification measures will be incorporated within each of their inspection processes. These measures shall include mandatory or other provisions required by the specific path of compliance chosen from C401.2.

C105.4.3 Approved third-party inspections reporting. The approved agency shall submit inspection reports to the code official and to the owner's representative in accordance with Section 1704.2.4 of the *International Building Code*.

Proposal # 5268

CE16-19 Part I

CE16-19 Part II

IECC: R105.4, R105.4.1 (New), R105.4.2 (New), R105.4.3 (New)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com); Shaunna Mozingo (sdmozingo@shaunnamozingo.com)

2018 International Energy Conservation Code

SECTION R105 INSPECTIONS

Revise as follows:

R105.4 Approved third-party inspection agencies. The *code official* is authorized to accept reports of third-party inspection agencies not affiliated with the *building* design or construction, provided that such agencies are *approved* as to qualifications and reliability relevant to the *building* components and systems that they are inspecting.

Add new text as follows:

R105.4.1 Authorization of approved third- party inspection agency. When the code official authorizes the use of a third-party inspection agency for all or some aspects of code compliance inspections, the agency shall be authorized as a third-party extension of the code official to verify compliance.

R105.4.2 Approved third-party inspections agreement. The third-party inspection agency and the code official shall agree upon which compliance verification measures will be incorporated within each of their inspection processes. These measures shall include mandatory or other provisions required by the specific path of compliance chosen from R401.2.

R105.4.3 Approved third-party inspections reporting. The approved agency shall submit inspection reports to the code official and to the owner's representative in accordance with Section 1704.2.4 of the *International Building Code*.

Reason: In relation to the International Energy Conservation Code, third-party inspection agencies and building officials currently have a variety of ideas regarding what should constitute the work of the agency. For the ERI path, for example, many Raters understand that they must develop an ERI score, but do not fully understand their relationship to inspection of the mandatory requirements of the IECC. Jurisdictions having authority, are often either abdicating inspections or believe that Rater's are looking at mandatory inspection items. In addition, the creation of a HERS Index score is different from the creation of an ERI score. A HERS Index score is an asset rating which allows for the derating of the R-value of poorly installed insulation in the energy model, as the objective is to benchmark the energy performance of the home on the HERS Index scale. An IECC ERI evaluation of the installation of Insulation does not allow for the deration of poorly installed insulation. If insulation is not installed in accordance with the manufactures instruction and the guidance given in table R402.4.1.1, then the installation should fail inspection and be reinstalled until it meets the mandatory requirement of the code. This disconnect in understanding is the genesis of this code change proposal. Building on the charging language of the approved inspection agency this proposal makes it clear that the inspection agency is third party. This proposal states that when acting as a third party the agency is actually acting as an extension of the jurisdiction having full delegated authority in order to better ensure there is no confusion between the project owner and their construction representatives on site. The most important part of this proposed language is the requirement to create a scope of work that defines the relationship between the third-party inspection agency and the authority having jurisdiction. Ultimately neither identity can rely on

assumptions, and this proposal requires a level of coordination and dialog that is not overly burdensome yet extremely important.

As with the outlined special inspections of the IBC, the proposal ends by demonstrating to the project owner and their representative that defined inspection must occur either through the authority having jurisdiction or the approved third-party inspection agency and that the construction schedule can not proceed with subsequent phases of construction until all sequential inspections take place and pass. Lastly, the proposal seeks documentation that all approved inspections occurred and meet the intent of the code.

The clarity gained in the relationship between the authority having jurisdiction and the approved third-party inspection agency is crucial as we progress into more complicated and meaningful energy codes. Nationally, jurisdictions are losing experienced professionals to retirement. Consequently, more third-party inspection agencies are stepping in to fill the gap. These third-party inspection agencies tend to be solely focused on energy and are capable, and eager to work in the energy code compliance niche. They are filling a need for jurisdictions that are either under staffed or lack a desire to fully enforce the energy components of the code. This proposal clearly defines a path forward to meet the need by defining scope and responsibilities to better ensure compliance and thus achieve expected energy savings.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal does not increase cost but better allocates dollars currently being spent to ensure that the job being undertaken by approved third party inspection agencies truly meets the needs of the authority having jurisdiction.

Staff Analysis: There is not a coordinate section for R105.4 in Chapter 11 of the IRC.

Proposal # 5797

CE16-19 Part II

CE17-19 Part I

PART I — IECC: Part I: C107.1.2

IECC: Part II: R107.1.2

IRC: Part III: R102.4.2

PART II — IECC: R107.1.2

PART III — IRC®: R102.4.2

Proponent: Craig Drumheller, National Association of Home Builders, representing National Association of Home Builders (CDrumheller@nahb.org)

THIS IS A 3 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. PART III WILL BE HEARD BY THE IRC BUILDING COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

Revise as follows:

C107.1.2 Provisions in referenced codes and standards. Where the extent of the reference to a referenced code or standard includes subject matter that is within the scope of this code, the provisions of this code, as applicable, shall take precedence over the provisions in the referenced code or standard. Compliance materials, as cited in Section C101.5.1, shall incorporate the provisions of this code instead of the provisions in the referenced code or standard. Where proof of compliance is embedded in materials such as software, an affidavit attesting that software or other materials comply with this section shall be available..

Proposal # 5314

CE17-19 Part I

CE17-19 Part II

IECC: R107.1.2

Proponent: Craig Drumheller, National Association of Home Builders, representing National Association of Home Builders (CDrumheller@nahb.org)

2018 International Energy Conservation Code

Revise as follows:

R107.1.2 Provisions in referenced codes and standards. Where the extent of the reference to a referenced code or standard includes subject matter that is within the scope of this code, the provisions of this code, as applicable, shall take precedence over the provisions in the referenced code or standard. Compliance materials, as cited in Section R101.5.1, shall incorporate the provisions of this code instead of the provisions in the referenced code or standard. Where proof of compliance is embedded in materials such as software, an affidavit attesting that software or other materials comply with this section shall be available..

Proposal # 5749

CE17-19 Part II

CE17-19 Part III

IRC®: R102.4.2

Proponent: Craig Drumheller, National Association of Home Builders, representing National Association of Home Builders (CDrumheller@nahb.org)

2018 International Residential Code

R102.4.2 Provisions in referenced codes and standards. Where the extent of the reference to a referenced code or standard includes subject matter that is within the scope of this code, the provisions of this code, as applicable, shall take precedence over the provisions in the referenced code or standard. Compliance materials, as cited in Section N1101.3, shall incorporate the provisions of this code instead of the provisions in the referenced code or standard. Where proof of compliance is embedded in materials such as software, an affidavit attesting that software or other materials comply with this section shall be available..

Reason: There are supporting materials provided by third party developers which are referenced in the IECC. Often, these materials don't clearly state that they are fully compliant with the requirements of the code. This language change provides the AHJ the clear authority to ask for a written statement from the developer of the materials that they attest their product is compliant with the requirements of this code.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This code change proposal may raise the cost for supporting materials that were non-compliant.

Proposal # 5750

CE17-19 Part III

CE18-19 Part I

PART I — IECC: Part I: C202(New)

IECC: Part II: R202 (N1101.6)(New)

PART II — IECC: R202 (IRC N1101.6)

Proponent: Hope Medina, representing Self (hmedina@coloradocode.net)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Add new definition as follows:

ACCESSORY STRUCTURE. A structure that is accessory to and incidental to that of the building and that is located on the same lot.

Proposal # 5510

CE18-19 Part I

CE18-19 Part II

IECC: R202 (IRC N1101.6)

Proponent: Hope Medina, representing Self (hmedina@coloradocode.net)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Add new definition as follows:

ACCESSORY STRUCTURE. A structure that is incidental to that of the dwelling and that is located on the same lot.

Reason: The scope of this code states accessory structures are to comply with the requirements but does not provide a definition for what would be considered an accessory structure. This is similar to what is found in the International Residential Code.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
New definition

Staff Analysis: The purpose of providing definitions in I-codes is to define terms used in that specific I-code. The term “accessory structure” is not used in the IECC.

Proposal # 5508

CE18-19 Part II

CE19-19 Part I

PART I — IECC: Part I: C202(New)

IECC: Part II: R202 (N1101.6); Chapter 6RE(New)

PART II — IECC: R202 (IRC N1101.6), ASTM Chapter 6

Proponent: Donald Sivigny, State of Minnesota, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Add new definition as follows:

AIR-IMPERMEABLE INSULATION. An Insulation that functions as an air barrier material having an air permeance equal to or less than $0.02\text{L/s}=\text{m}^2$ at 75 Pa pressure differential as tested in accordance with ASTM E2178 or E283.

Proposal # 5365

CE19-19 Part I

CE19-19 Part II

IECC: R202 (IRC N1101.6), ASTM Chapter 6

Proponent: Donald Sivigny, State of Minnesota, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Revise as follows:

AIR-IMPERMEABLE INSULATION. An Insulation that functions as an air barrier material having an air permeance equal to or less than $0.02L/s = m^2$ at 75 Pa pressure differential as tested in accordance with ASTM E2178 or E283.

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken, PA 19428-
2959

Add new standard(s) as follows:

ASTM E2178-13 Standard Test Method for Air Permanence of Building Materials

Reason: This change combines and utilizes the language of the IRC and IECC definitions together for consistency, and accuracy as to what air impermeable insulation must meet to reduce both, air infiltration and exfiltration. This definition will create better enforcement and understanding of the code by providing a test standard. Because the definition in Section IRC Section N1101.6 is incomplete, this revision will allow the IRC Chapter 2 definition to cover Chapter 11 uses of the term. This will avoid confusion for both the builder and the code official.

If this proposal is successful, there will be no need to have a special definition just for Chapter 11. The definition can therefore be removed from Section N1101.6 to avoid duplication in the same document, and reduce confusion and document size and cost.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal simply adds the already required standard for air impermeable to the definitions of air impermeable insulation. There is not going to be any added costs or savings for clarifying the standard the insulation must meet.

Staff Analysis: The referenced standard, ASTM E2178-13, is currently referenced in the 2018 IECC-Commercial Provisions.

Proposal # 5371

CE19-19 Part II

CE20-19 Part I

PART I — IECC: Part I: C202(New)

IECC: Part II: R202 (N1101.6) (New)

PART II — IECC: R202 (IRC N1101.6)

Proponent: Donald Sivigny, State of Minnesota, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Add new definition as follows:

AIR, OUTDOOR. Air that is taken from the external atmosphere, and therefore not previously circulated through the HVAC system or the conditioned space.

Proposal # 5355

CE20-19 Part I

CE20-19 Part II

IECC: R202 (IRC N1101.6)

Proponent: Donald Sivigny, State of Minnesota, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Add new definition as follows:

AIR, OUTDOOR. Air that is taken from the external atmosphere, and therefore not previously circulated through the HVAC system or the conditioned space.

Reason: *There are three types of air addressed in buildings today. They include make-up air, combustion air and ventilation air. Of these three types of air, only ventilation air is addressed in the energy code. Make-up and combustion air are addressed in the Mechanical Code. Since the energy code does not have a definition of Outdoor Air, which is part of the ventilation air for a building, and since the term is used throughout the code, it is important to define what outdoor air is for clarity and use of the code to the code official and builder as well.*

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This change is simply defining one of the three airs associated with Buildings. It is good to define them so the user of the code understands the differences.

Proposal # 5763

CE20-19 Part II

CE21-19

IECC: C202(New), C202

Proponent: jim edelson, representing New Buildings Institute (jim@newbuildings.org)

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Add new definition as follows:

BIOMASS GAS. A medium Btu gas containing methane and carbon dioxide, resulting from the action of microorganisms on organic materials such as a landfill.

BIOMASS WASTE. Organic non-fossil material of biological origin that is a byproduct or a discarded product. Biomass waste includes municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural crop byproducts, straw, and other biomass solids, liquids, and gases; but excludes wood and wood-derived fuels (including black liquor), biofuels feedstock, biodiesel, and fuel ethanol.

Revise as follows:

ON-SITE RENEWABLE ENERGY. Energy derived from solar radiation, wind, waves, tides, ~~landfill biomass gas, biogas,~~ biomass or the internal heat of waste or extracted from hot fluid or steam heated within the earth. The energy system providing on-site renewable energy shall be located on the ~~project~~ building site.

Reason: The existing definition in IECC dates to the 2012 IECC. It was proposed by the team of New Buildings Institute, US Department of Energy and American Institute of Architects. It was one clause in a comprehensive overhaul of the 2009 IECC. When it was written in 2010, it was the first time that renewable energy had been defined in an I-code, and it reflected a very early understanding of a much less mature industry. It has not been significantly revised since.

This proposal does indeed update the language by further refining biomass energy sources with terms that were not available at the time it was drafted in 2010. Revised language makes the proper distinction between geothermal energy sources and geothermal heat pumps. The revision also limits the biomass sources to those that meet specifications as waste products. There are many flavors of biomass energy, but this proposal ensures that virgin material of unknown origin is not used as a steady source of energy, which in the provisions of C406 is a trade-off for energy efficiency features of the building. The definitions of *biomass gas* and *biomass waste* are taken from the glossary of the Energy Information Administration.

This proposal does not restrict the geographic sourcing of the waste material, but it does ensure that the system converting the fuel is located on the building site.

Bibliography: U.S. Energy Information Administration Glossary; <https://www.eia.gov/tools/glossary/>

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal is a definition of renewable energy that will not have an impact on construction costs. The modification of the definition only applies only to the fuel used after occupancy.

CE22-19 Part I

PART I — IECC: Part I: C202

IECC: Part II: R202 (N1101.6)

PART II — IECC: R202 (IRC N1101.6)

Proponent: David Collins, SEHPCAC, representing SEHPCAC (SEHPCAC@iccsafe.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

CIRCULATING HOT WATER SYSTEM. A specifically designed water distribution system where one or more pumps are operated in the service hot water piping to circulate heated water from the water-heating equipment to the fixture supply and back to the water-heating equipment.

Revise as follows:

DEMAND RECIRCULATION WATER SYSTEM. A water distribution system ~~having where~~ one or more recirculation pumps that pump water from a heated water supply pipe back to the heated water source through ~~a cold water supply pipe.~~ pumps prime the service hot water piping with heated water upon a demand for hot water.

Proposal # 4760

CE22-19 Part I

CE22-19 Part II

IECC: R202 (IRC N1101.6)

Proponent: David Collins, SEHPCAC, representing SEHPCAC (SEHPCAC@iccsafe.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

CIRCULATING HOT WATER SYSTEM. A specifically designed water distribution system where one or more pumps are operated in the service hot water piping to circulate heated water from the water-heating equipment to fixtures and back to the water-heating equipment.

Revise as follows:

DEMAND RECIRCULATION WATER SYSTEM. A water distribution system ~~having where~~ one or more recirculation pumps that pump water from a heated water supply pipe back to the heated water source through a cold water supply pipe. pumps prime the service hot water piping with heated water upon demand for hot water.

Reason: This code change replicates the IPC definitions for "demand recirculation water systems definition". This provides consistency in the use of the term between the two codes. The "circulating hot water system" definition is already consistent, and is included here for reference and context.

This proposal is submitted by the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx> (<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>)

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This change does not add to nor detract from the design and construction requirements.

Proposal # 5753

CE22-19 Part II

CE23-19 Part I

PART I — IECC: Part I: C202(New)

IECC: Part II: R202 (N1101.6) (New)

PART II — IECC: R202 (IRC N1101.6)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Add new definition as follows:

COMPLIANCE REPORT. Documents created to demonstrate compliance with the intent of the code for the purpose of obtaining the building permit and subsequently acquiring the certificate of occupancy.

Proposal # 4792

CE23-19 Part I

CE23-19 Part II

IECC: R202 (IRC N1101.6)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Add new definition as follows:

COMPLIANCE REPORT Documents created to demonstrate compliance with the intent of the code for the purpose of obtaining the building permit and subsequently acquiring the certificate of occupancy.

Proposal # 5798

CE23-19 Part II

CE24-19

IECC: C202

Proponent: Donald Sivigny, State of Minnesota, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Revise as follows:

COMPUTER ROOM. A room whose primary function is to house equipment for the processing and storage of electronic data and that has a design electronic data equipment power density of ~~less~~greater than 20 watts per square foot (20 watts per 0.092 m²) of conditioned floor area or a connected design electronic data equipment load of ~~less~~greater than 10 kW.

Reason: Why is the proposed code change needed?

Computer room spaces are designed with watt densities greatly exceeding 20 watts per square foot. This is an obvious error. In checking with the ASHRAE 90.1 definition, they identify greater than 20 watts per square foot.

Why is the proposed code change a reasonable solution? Because it corrects the metric parameters that define a space as a Computer Room.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This Change will not alter the cost of the Building as it is only a typographical correction.

Proposal # 5120

CE24-19

CE25-19

IECC: C202(New)

Proponent: Hope Medina, representing Self (hmedina@coloradocode.net)

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Add new definition as follows:

CORE AND SHELL. The construction of the base building including but not limited to exterior structural walls, structural columns, roof structure including covering, floor structure, and exterior cladding. The defined thermal envelope including insulation in all required locations, the air barrier, and air sealing must be installed. Utilities are brought to the structure with limited installment within the structure. The required grading per the International Building Code and approved construction documents, and include a route to the building from the public way.

Reason: The intent of this definition is to define when a project is considered a core and shell, and what the requirements are. This will help to alleviate the discussion on who is responsible for which energy requirements at which stage of construction and build out.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This definition may shift the cost from one party of a project to another.

Staff Analysis: The purpose of providing definitions in I-Codes is to define terms using in that specific I-code. The term 'core and shell' is not used in the IECC.

Proposal # 5502

CE25-19

CE26-19 Part I

IECC: C202 (New), C403.6.1

Proponent: Shaunna Mozingo, City of Westminster, representing Colorado Chapter of ICC Energy Code Development Committee (smozingo@cityofwestminster.us)

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Add new definition as follows:

DIRECT DIGITAL CONTROL (DDC) a type of control where controlled and monitored analog or binary data such as temperature and contact closures, are converted to digital format for manipulation and calculations by a digital computer or microprocessor, then converted back to analog or binary form to control physical devices.

Revise as follows:

C403.6.1 Variable air volume and multiple-zone systems. Supply air systems serving multiple zones shall be variable air volume (VAV) systems that have zone controls configured to reduce the volume of air that is reheated, recooled or mixed in each zone to one of the following:

1. Twenty percent of the zone design peak supply for systems with direct digital control (DDC) and 30 percent for other systems.
2. Systems with *DDC* where all of the following apply:
 - 2.1. The airflow rate in the deadband between heating and cooling does not exceed 20 percent of the zone design peak supply rate or higher allowed rates under Items 3, 4 and 5 of this section.
 - 2.2. The first stage of heating modulates the zone supply air temperature setpoint up to a maximum setpoint while the airflow is maintained at the deadband flow rate.
 - 2.3. The second stage of heating modulates the airflow rate from the deadband flow rate up to the heating maximum flow rate that is less than 50 percent of the zone design peak supply rate.
3. The outdoor airflow rate required to meet the minimum ventilation requirements of Chapter 4 of the International Mechanical Code.
4. Any higher rate that can be demonstrated to reduce overall system annual energy use by offsetting re-heat/recool energy losses through a reduction in outdoor air intake for the system as approved by the code official.
5. The airflow rate required to comply with applicable codes or accreditation standards such as pressure relationships or minimum air change rates.

Exception: The following individual zones or entire air distribution systems are exempted from the requirement for VAV control:

1. *Zones* or supply air systems where not less than 75 percent of the energy for reheating or for providing warm air in mixing systems is provided from a site-recovered, including condenser heat, or site-solar energy source.
2. Systems that prevent reheating, recooling, mixing or simultaneous supply of air that has been previously cooled, either mechanically or through the use of economizer systems, and air that has been previously mechanically heated.

Reason: Section C403.6.1 makes reference to "DDC" but nowhere in the code does it tell you what that is. there were a few different proposals for the 2018 IECC that covered DDC but the one that had the definition didn't pass so it left a hole here. we were hoping this would be handled by an errata but that never happened so we are bringing forth the definition as currently found in ASHRAE 90.1. We also added the italicized wording to the code section for clarity.

Cost Impact: The code change proposal will not increase or decrease the cost of construction clarification only

Proposal # 5427

CE26-19 Part I

CE27-19

IECC: C202

Proponent: Donald Sivigny, representing State of MN and Association of Minnesota Building Officials
(don.sivigny@state.mn.us)

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Revise as follows:

GREENHOUSE. A structure or a thermally isolated area of a building that maintains a specialized sunlit environment exclusively used for, and essential to, the cultivation, protection or maintenance of plants. Greenhouse buildings or spaces have their own thermal envelope requirements that are independent of the rest of the conditioned spaces within the building.

Reason: 1. Why is the proposed code change needed?

It has been identified that an interpretation could be made that Section C403.12, Mechanical systems located outside of the building thermal environment could apply to greenhouse spaces, which is not the intent. This proposed change clearly identifies that greenhouses have their own building thermal envelopes, and therefore would not be defined as a space “outside the building thermal envelope.”

2. Why is the proposed code change a reasonable solution?

It easily clarifies an interpretation

Cost Impact: The code change proposal will not increase or decrease the cost of construction
There is no Cost Change as this proposal only provides clarifying in a definition.

Proposal # 5351

CE27-19

CE28-19 Part I

PART I — IECC: Part I: C202

IECC: Part II: R202 (N1101.6)

PART II — IECC: R202 (IRC N1101.6)

Proponent: Eric Makela, representing Northwest Energy Codes Group (ericM@newbuildings.org)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

GROUP R. Buildings or portions of buildings that contain any of the following occupancies as established in the International Building Code:

1. *Group R-1.*
2. *Group R-2* ~~where located more than three stories in height above grade plane.~~
3. *Group R-4* where located more than three stories in height above grade plane.

RESIDENTIAL BUILDING. For this code, includes detached one- and two-family dwellings and multiple single-family dwellings (townhouses) and ~~*Group R-2, R-3*~~ and *R-4* buildings three stories or less in height above grade plane.

Proposal # 5652

CE28-19 Part I

CE28-19 Part II

IECC: R202 (IRC N1101.6)

Proponent: Eric Makela, representing Northwest Energy Codes Group (ericM@newbuildings.org)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Revise as follows:

RESIDENTIAL BUILDING. For this code, includes detached one- and two-family dwellings and multiple single-family dwellings (townhouses) and *Group R-2, R-3* and R-4 buildings three stories or less in height above grade plane.

Reason: Multifamily poses a conundrum for energy regulation. Generally, these buildings are constructed and renovated like commercial buildings, but used like residential buildings. As a result, the regulation of multifamily buildings has been split between the residential and the commercial codes. Multifamily buildings that are four stories and higher are considered high-rise and regulated by the commercial chapter of the International Energy Conservation Code (IECC). However, with their residential usage patterns and loads, they don't truly fit a commercial code with its focus on commercial loads and usage patterns. Multifamily buildings that are three stories or lower are regulated by the residential chapter of the IECC. However, with their larger size and higher occupant density, these low-rise multifamily buildings don't truly fit in a residential energy code with its focus on single family homes.

The result is energy regulation that does not adequately serve the multifamily market:

- Regulation by two different energy codes complicates both code compliance and code enforcement.
- Neither the Commercial nor the Residential code was crafted to address the unique characteristics of the multifamily building type.
- Advancing the energy code for multifamily is hindered by the necessity of pursuing changes simultaneously in two different codes, both of which are dominated by issues of building types other than multifamily.
- The presence of two different code baselines has made it very difficult to create above-code energy standards and efficiency programs that apply to all multifamily buildings.
- The IECC is delivering different energy outcomes for low-rise and high-rise multifamily buildings, even those that are very similar.

This proposal will solve these problems by simply placing all R-2 buildings (the occupancy that covers what is traditionally considered multifamily), regardless of height, under the commercial section of the code. Many small commercial buildings are constructed using the same construction methods, materials and equipment that are common in low-rise multifamily, so buildings like low-rise multifamily are already subject to the commercial requirements. This is the solution that has been chosen in Boulder, CO to solve this issue. A more comprehensive proposal that would have minimized the stringency impact of unifying high-rise and low-rise multifamily under one set of requirements was attempted in the 2018 code cycle, but ultimately was disapproved due to its complexity. This solution is far simpler and more straightforward, while still solving all the issues identified above.

If this proposal is adopted, the IECC will be improved substantially for its use with multifamily buildings:

- Both code compliance and code enforcement will be less complicated and therefore less costly
- The energy code will more directly address multifamily buildings
- A single code baseline will make it easier to create an above-code standard for Green standards, utility programs and recognition programs above-code standards, Green Standards, utility incentive programs, and other recognition efforts
- Multifamily code issues will no longer complicate the development of the Residential and Commercial codes*

* The entire process was informed by an energy analysis performed by the Pacific Northwest National Lab. Part of this analysis included comparing a 3-story building under the residential requirements to an otherwise identical 4-story building under the commercial requirements. The 3-story building had an EUI 7-10% higher than its 4-story counterpart. This result shows that the two sets of energy requirements in the code result in significantly different energy outcomes in multifamily buildings. This fact emphasizes the importance of this effort to bring coherence to the multifamily market.

Cost Impact: The code change proposal will increase the cost of construction. This proposal may increase the cost of construction since it will require low-rise MF buildings to meet commercial provisions of the code.

Proposal # 5785

CE28-19 Part II

CE29-19 Part I

PART I — IECC: Part I: C202

IECC: Part II: R202 (IRC N1101.6), R303.3 (IRC N1101.12), R403.5.1 (IRC N1103.5.1), R403.10.1 (IRC N1103.10.1)

PART II — IECC: R202 (IRC N1101.6), R303.3 (IRC N1101.12), R403.5.1 (IRC N1103.5.1), R403.10.1 (IRC N1103.10.1)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Revise as follows:

NETWORKED GUESTROOM CONTROL SYSTEM. A control system, ~~accessible~~ with access from the front desk or other central location associated with a Group R-1 building, that is capable of identifying the occupancy status of each guestroom according to a timed schedule, and is capable of controlling HVAC in each hotel and motel guestroom separately.

Proposal # 4072

CE29-19 Part I

CE29-19 Part II

IECC: R202 (IRC N1101.6), R303.3 (IRC N1101.12), R403.5.1 (IRC N1103.5.1), R403.10.1 (IRC N1103.10.1)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Revise as follows:

~~**ACCESSIBLE.** Admitting close approach as a result of not being guarded by locked doors, elevation or other effective means (see “Readily accessible”).~~

~~**READILY ACCESSIBLE.** Capable of being reached quickly for operation, renewal or inspection without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders or access equipment (see “Accessible”).~~

READY ACCESS (TO) That which enables a device, appliance or equipment to be directly reached, without requiring the removal or movement of any panel, or similar obstruction.

ACCESS (TO) That which enables a device, appliance or equipment to be reached by ready access or by a means that first requires the removal or movement of a panel, or similar obstruction.

R303.3 (IRC N1101.12) Maintenance information. Maintenance instructions shall be furnished for equipment and systems that require preventive maintenance. Required regular maintenance actions shall be clearly stated and incorporated on a readily ~~accessible~~ visible label. The label shall include the title or publication number for the operation and maintenance manual for that particular model and type of product.

R403.5.1 (IRC N1103.5.1) Heated water circulation and temperature maintenance systems (Mandatory). Heated water circulation systems shall be in accordance with Section R403.5.1.1. Heat trace temperature maintenance systems shall be in accordance with Section R403.5.1.2. Automatic controls, temperature sensors and pumps shall be ~~accessible~~ in a location with access. Manual controls shall be ~~readily accessible~~ in a location with ready access.

R403.10.1 (IRC N1103.10.1) Heaters. The electric power to heaters shall be controlled by ~~a readily accessible~~ an on-off switch that is an integral part of the heater mounted on the exterior of the heater, or external to and within 3 feet (914 mm) of the ~~heater~~ heater in a location with ready access. Operation of such switch shall not change the setting of the heater thermostat. Such switches shall be in addition to a circuit breaker for the power to the heater. Gas-fired heaters shall not be equipped with continuously burning ignition pilots.

Reason: The reason for this change is that “accessible” is typically understood to be reachable by a person using a wheelchair. This is not the case in the sections shown to be revised. The revised language will clarify where the requirement is intended for inspection or repair.

Last cycle, CE137-16 Part 1 was approved by the commercial energy and disapproved by the residential energy. The IECC residential committee’s reason was “These terms are going to be too difficult to explain to contractors.”

The term 'accessible' is defined in the IBC and relates to elements and facilities that serve or have special accommodations for persons with mobility impairments. The IPC and IMC use the term "Access (to)" or "Ready

Access" for access to equipment which is proposed here for the IECC. A similar proposal was approved for the all the other codes.

One new definition in the Commercial Energy picked up "accessible". That should be revised.

This proposal is submitted by the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is an editorial issue with no code changes.

Proposal # 5784

CE29-19 Part II

CE30-19 Part I

PART I — IECC: Part I: C202 (New)

IECC: Part II: R202(N1101.6) (New)

PART II — IECC: SECTION R202, (New)

Proponent: Hope Medina, representing Self (hmedina@coloradocode.net)

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Add new definition as follows:

REMODEL. A change in a building's interior or exterior from the original construction

Proposal # 5496

CE30-19 Part I

CE30-19 Part II

IECC: SECTION R202, (New)

Proponent: Hope Medina, representing Self (hmedina@coloradocode.net)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Add new definition as follows:

REMODEL. A change in a building's interior or exterior from the original construction

Staff Analysis: The purpose of providing definitions in I=Codes is to define terms using in that specific I-code. The term 'remodel' is not used in the IECC.

Proposal # 5813

CE30-19 Part II

CE31-19 Part I

PART I — IECC Part I: C202, C202(New)
IECC Part II R202(N1101.6)(New)

PART II — IECC: R202 (IRC N1101.6)

Proponent: jim edelson, New Buildings Institute, representing New Buildings Institute (jim@newbuildings.org)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE.
PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER
FOR THESE COMMITTEES.

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Revise as follows:

ON-SITE RENEWABLE ENERGY. ~~Energy derived from solar radiation, wind, waves, tides, landfill gas, biogas, biomass or the internal heat of the earth. The energy system providing on-site renewable energy shall be located on the project site.~~ renewable energy resources harvested at the building site.

Add new text as follows:

RENEWABLE ENERGY RESOURCES. Energy derived from solar radiation, wind, waves, tides, landfill gas, biogas, biomass or extracted from hot fluid or steam heated within the earth.

Proposal # 4970

CE31-19 Part I

CE31-19 Part II

IECC: R202 (IRC N1101.6)

Proponent: jim edelson, representing New Buildings Institute (jim@newbuildings.org)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Add new definition as follows:

ON-SITE RENEWABLE ENERGY. Energy from renewable energy resources harvested at the building site.

RENEWABLE ENERGY RESOURCES. Energy derived from solar radiation, wind, waves, tides, landfill gas, biogas, biomass or extracted from hot fluid or steam heated within the earth.

Reason: There has been a definition of "onsite renewable energy" since 2012 in the commercial IECC. The term was first used in the IECC residential code in 2018, but no definition was included at that time. This proposal adds an updated version of that definition that is simultaneously being proposed for the commercial IECC. Some of the modifications are based on language that has been deliberated by an ASHRAE workgroup for over six months and is pending at ASHRAE 90.1 (at the time of this submittal). This proposal could establish consistency between IECC-residential, IECC-commercial, and ASHRAE 90.1, thereby simplifying compliance and enforcement for onsite renewable energy installations.

The listed energy resources in the definition are similar to those found in the current IECC definition with the exception of "extracted from hot fluid or steam heated within the earth". That proposed revision from the current definition makes the distinction between geothermal energy sources and geothermal heat pumps.

When these are accepted as definitions into this portion of the code, staff will be able to italicize the use of the terms such as in the definitions and the Footnote a to Table R406.4.

Bibliography: Addendum *by* to Standard 90.1-2016, Energy Standard for Buildings Except Low-Rise Residential Buildings; ASHRAE, January 2018. (pending at the time of submittal)

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal is a definition of renewable energy that will not have an impact on construction costs.

Proposal # 4976

CE31-19 Part II

CE32-19 Part I

PART I — IECC Part I: C202
IECC Part II R202(N1101.6)

PART II — IECC: R202 (IRC N1101.6)

Proponent: Joseph Hill, NYSDOS, representing NYSDOS (Joseph.Hill@dos.ny.gov)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Revise as follows:

STANDARD REFERENCE DESIGN. A version of the proposed design ~~that meets the minimum~~ which has been programmed to meet the the minimum prescriptive and mandatory requirements of this code. The proposed design is measured against the standard reference design and is used to determine the maximum annual energy use requirement for compliance based on total building performance.

Proposal # 4892

CE32-19 Part I

CE32-19 Part II

IECC: R202 (IRC N1101.6)

Proponent: Joseph Hill, NYSDOS, representing NYSDOS (Joseph.Hill@dos.ny.gov)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

STANDARD REFERENCE DESIGN. A version of the proposed design ~~that meets the minimum~~ which has been programmed to meet the the minimum prescriptive and mandatory requirements of this code code. The proposed design is measured against the standard reference design, and is used to determine the maximum annual energy use requirement for compliance based on total building performance.

Reason: There has been some degree of confusion in the meaning of a "Standard Reference Design". The revised definition may serve to clarify its' intended meaning and its' use.

Bibliography: IECC 2018

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is a clarification which does not impact the current code requirement, nor its operation.

Proposal # 5759

CE32-19 Part II

CE33-19

IECC C202(New)

Proponent: Hope Medina, representing Self (hmedina@coloradocode.net)

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Add new definition as follows:

TENANT FINISH. The first time a building or space that is completed for a specific use. This shall include but is not limited to the interior wall locations, wall coverings, flooring, plumbing fixtures, electrical fixtures, and mechanical installation.

Reason: The definition is to clarify when a project should be referred to as a tenant finish and when it should be referred to as a remodel. This will also clarify when certain requirements are required for each type of project.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
New definition

Staff Analysis: The purpose of providing definitions in I-codes is to define terms used in that specific I-code. The term “tenant finish” is not used in the IECC.

Proposal # 5490

CE33-19

CE34-19 Part I

PART I — IECC: Part I: C202
IECC: Part II: R202 (N1101.6)

PART II — IECC: R202 (IRC N1101.6)

Proponent: Donald Sivigny, representing State of MN and Association of Minnesota Building Officials
(don.sivigny@state.mn.us)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE.
PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER
FOR THESE COMMITTEES.

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Revise as follows:

U-FACTOR (THERMAL TRANSMITTANCE). The coefficient of heat transmission (air to air) through a building component or assembly, inclusive of the inside and outside air films, equal to the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films of the building component or assembly (Btu/h • ft² • °F)[W/(m² • K)].

Proposal # 5353

CE34-19 Part I

CE34-19 Part II

IECC: R202 (IRC N1101.6)

Proponent: Donald Sivigny, representing State of MN and Association of Minnesota Building Officials
(don.sivigny@state.mn.us)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

U-FACTOR (THERMAL TRANSMITTANCE). The coefficient of heat transmission (air to air) through a building component or assembly, inclusive of the inside and outside air films, equal to the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films of the building component or assembly (Btu/h • ft² • °F) [W/(m² • K)].

Reason: 1. Why is the proposed code change needed?

The definition as presented in the IECC is not correct or could be miss-interpreted. The U-Factor includes the inside and outside air films. Not including the results in an erroneous value.

2. Why is the proposed code change a reasonable solution?

It corrects or clarifies the definition of the U factor.

The U factor is a value that is used to show compliance with the insulation requirements, or used in calculations to show that building system perform in compliance with the code requirements. Not calculating it correctly could have an impact on verifying compliance with the code requirements.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

There will be no added or saved costs by clarifying the definition of U-factor. It is simply clarifying a definition that was not complete in the current Code.

Proposal # 5764

CE34-19 Part II

CE35-19

IECC: C202

Proponent: Eric Makela, New Buildings Institute, representing Northwest Energy Codes Group
(ericM@newbuildings.org)

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Revise as follows:

WALL, ABOVE-GRADE. A wall associated with the *building thermal envelope* that is more than 15 percent above grade and is on the exterior of the building or any wall that is associated with the *building thermal envelope* that is not on the exterior of the building. This includes, but is not limited to, between-floor spandrels, peripheral edges of floors, roof and basement knee walls, dormer walls, gable end walls, walls enclosing a mansard roof and skylight shafts.

Reason: The current definition of above-grade wall is general and vague and allows for an interpretation that ignores the thermal performance of important building elements. For example, the existing definition is not clear that exposed floor edges are part of the above-grade wall. Depending on how the code is interpreted/enforced, this could leave this building element unregulated.

This change to the definition clarifies it and closes this potential loophole. It is explicitly clear that the critical elements of a building that function as part of the wall component of the thermal envelope, even though they may not be thought of as walls, are regulated as walls. These elements will need to be either insulated to meet the above-grade wall requirements or be incorporated into weighted averages for the performance of the above-grade wall.

The language was drawn from the definition currently used in the WA state energy code.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This modification clarifies the code and should not increase the cost of construction.

Proposal # 5034

CE35-19

CE36-19 Part I

PART I — IECC: FIGURE C301.1, TABLE C301.1, C301.3, TABLE C301.3(1), TABLE C301.3(2)

PART II — IECC: FIGURE R301.1 (IRC N1101.7), TABLE R301.1 (IRC N1101.7), R301.3 (IRC N1101.7.2), TABLE R301.3(1) [IRC N1101.7.2(1)], TABLE R301.3(2) [IRC N1101.7.2(2)]

Proponent: David Collins, representing SEHPCAC (SEHPCAC@iccsafe.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

SECTION C301 CLIMATE ZONES

C301.1 General. *Climate zones* from Figure C301.1 or Table C301.1 shall be used for determining the applicable requirements from Chapter 4. Locations not indicated in Table C301.1 shall be assigned a *climate zone* in accordance with Section C301.3.

Revise as follows:

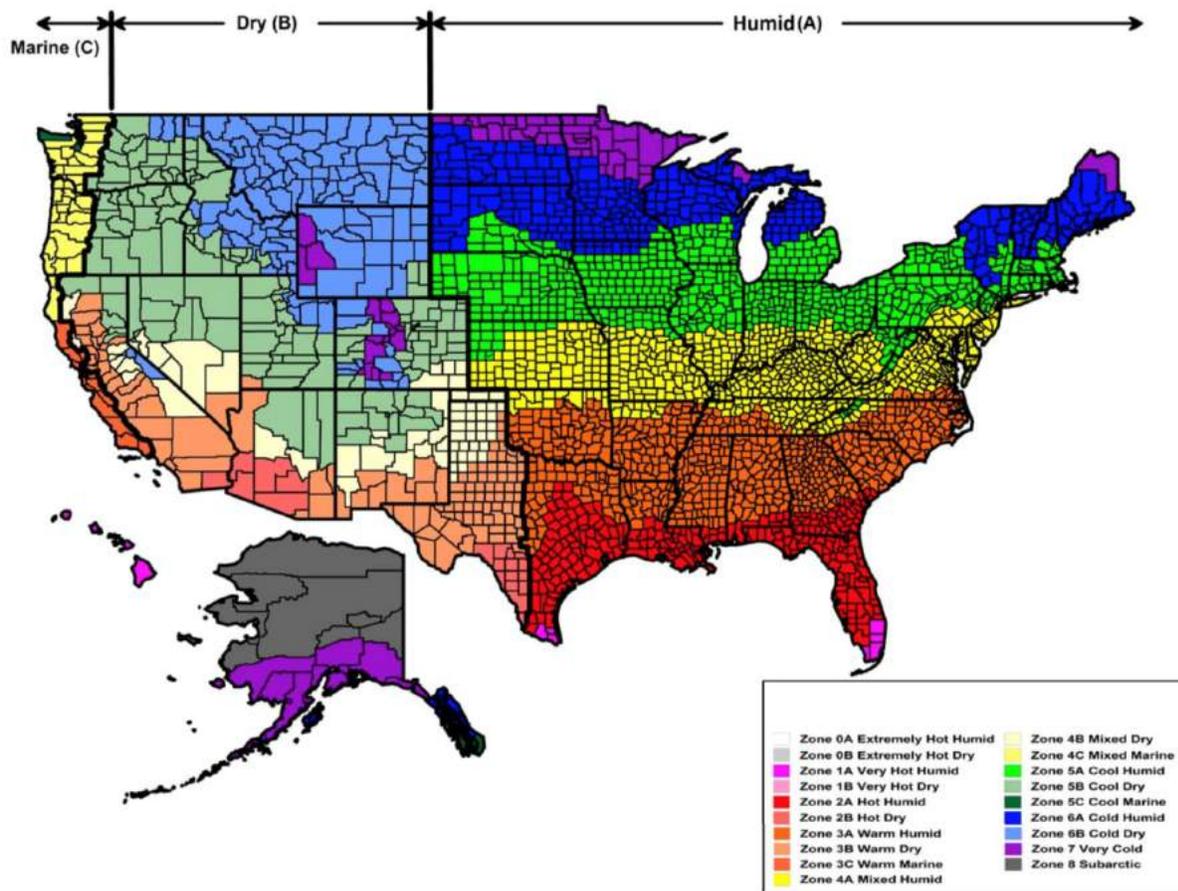
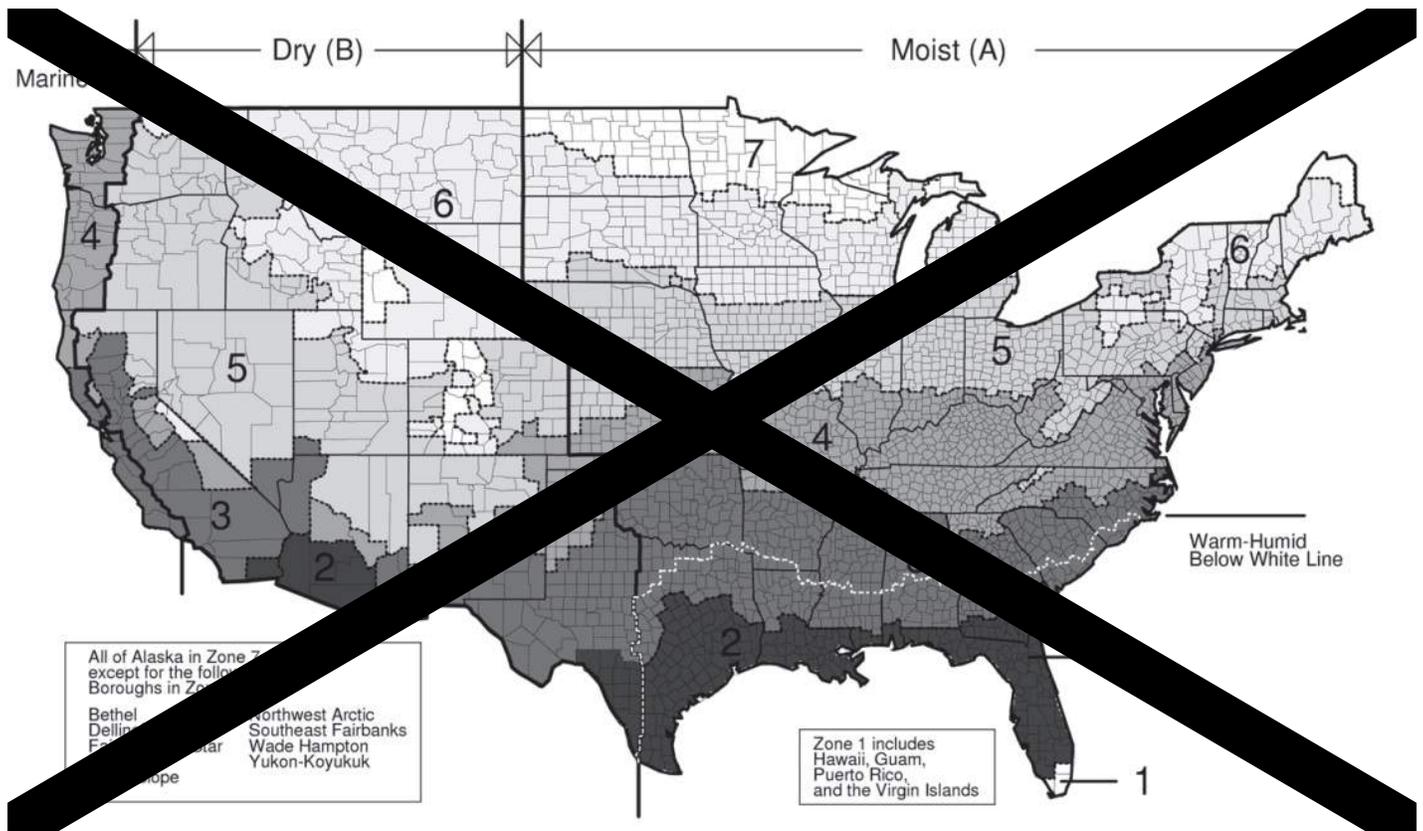


FIGURE C301.1

CLIMATE ZONES

TABLE C301.1

CLIMATE ZONES, MOISTURE REGIMES, AND WARM-HUMID DESIGNATIONS BY STATE, COUNTY AND TERRITORY

Portions of table not shown remain unchanged.

ALABAMA	<u>5A6A</u> Webster	<u>3A4A</u> Vance	<u>2A3A</u> Tarrant*
<u>2A3A</u> Coffee*	<u>5A6A</u> Winneshiek	<u>3A4A</u> Wake	<u>1A2A</u> Willacy*
<u>2A3A</u> Covington*	<u>5A6A</u> Wright	<u>3A4A</u> Warren	UTAH
<u>2A3A</u> Dale*	KANSAS	<u>5A4A</u> Wilkes	<u>5B6B</u> Box Elder
<u>2A3A</u> Escambia*	<u>4A5A</u> Cloud	NORTH DAKOTA	<u>5B6B</u> Cache
<u>2A3A</u> Geneva*	<u>4A5A</u> Ellis	<u>6A7</u> Barnes	<u>5B6B</u> Carbon
<u>2A3A</u> Henry*	<u>4A5A</u> Graham	<u>6A7</u> Cass	VERMONT
<u>2A3A</u> Houston*	<u>4A5A</u> Hamilton	<u>6A7</u> Eddy	VIRGINIA
ALASKA	<u>4A5A</u> Lane	<u>6A7</u> Foster	4A (all <u>except</u> as follows:)
<u>78</u> Bethel	<u>4A5A</u> Mitchell	<u>6A7</u> Griggs	<u>5A</u> Alleghany
<u>87</u> Denali	<u>4A5A</u> Ness	<u>6A7</u> Kidder	<u>5A</u> Bath
<u>78</u> Dillingham	<u>4A5A</u> Osborne	<u>6A7</u> McLean	<u>3A</u> Brunswick
<u>6A7</u> Haines	<u>4A5A</u> Rooks	<u>6A7</u> Mountrail	<u>3A</u> Chesapeake city
<u>6A7</u> Juneau	<u>4A5A</u> Trego	<u>6A7</u> Sheridan	<u>5A</u> Clifton Forge city
<u>5C7</u> Ketchikan Gateway	KENTUCKY	<u>6A7</u> Steele	<u>5A</u> Covington city
<u>6A7</u> Kodiak Island	LOUISIANA	<u>6A7</u> Stutsman	<u>3A</u> Emporia city
<u>5C7</u> Prince of Wales Outer Ketchikan	MAINE	<u>6A7</u> Traill	<u>3A</u> Franklin city
<u>5C7</u> Sitka	MARYLAND	<u>6A7</u> Wells	<u>3A</u> Greensville
<u>6A7</u> Skagway-Hoonah-Angoon	<u>5A4A</u> Allegany	<u>6A7</u> Williams	<u>3A</u> Halifax
<u>6A7</u> Wrangell-Petersburg	MASSACHSETTS	OHIO	<u>3A</u> Hampton city
ARIZONA	MICHIGAN	<u>4A5A</u> Athens	<u>5A</u> Highland
ARKANSAS	<u>6A7</u> Baraga	<u>4A5A</u> Butler	<u>3A</u> Isle of Wight
CALIFORNIA	<u>6A7</u> Chippewa	<u>4A5A</u> Clinton	<u>3A</u> Mecklenburg
COLORADO	<u>6A7</u> Gogebic	<u>4A5A</u> Fayette	<u>3A</u> Newport News city
<u>4B5B</u> Bent	<u>6A7</u> Houghton	<u>4A5A</u> Franklin	<u>3A</u> Norfolk city
<u>5B6B</u> Custer	<u>5A6A</u> Huron	<u>4A5A</u> Greene	<u>3A</u> Pittsylvania
<u>4B5B</u> Prowers	<u>6A7</u> Iron	<u>4A5A</u> Highland	<u>3A</u> Portsmouth city
CONNECTICUT	<u>6A7</u> Luce	<u>4A5A</u> Hocking	<u>3A</u> South Boston
DELAWARE	<u>6A7</u> Mackinac	<u>4A5A</u> Jackson	<u>3A</u> Southampton
DISTRICT OF COLUMBIA	<u>76A</u> Marquette	<u>4A5A</u> Madison	<u>3A</u> Suffolk city
FLORIDA	<u>6A7</u> Ontonagon	<u>4A5A</u> Meigs	<u>3A</u> Surry
<u>1A2A</u> Palm Beach*	<u>5A6A</u> Sanilac	<u>4A5A</u> Pickaway	<u>3A</u> Sussex
GEORGIA	<u>6A7</u> Schoolcraft	<u>4A5A</u> Ross	<u>3A</u> Virginia Beach city
<u>3A4A</u> Banks	MINNESOTA	<u>4A5A</u> Vinton	WASHINGTON

<u>2A3A</u> Calhoun*	<u>6A7</u> Becker	<u>4A5A</u> Warren	<u>5C4G</u> Clallam
<u>3A4A</u> Catoosa	<u>6A7</u> Clay	OKLAHOMA	<u>5C4G</u> Island
<u>3A4A</u> Chattooga	<u>5A6A</u> Fillmore	<u>4A3A</u> Alfalfa	<u>5C4G</u> Kitsap
<u>2A3A</u> Coffee*	<u>6A7</u> Grant	<u>4A3A</u> Craig	<u>5B6B</u> Okanogan
<u>3A4A</u> Dade	<u>5A6A</u> Houston	<u>4A3A</u> Delaware	<u>5C4G</u> San Juan
<u>3A4A</u> Dawson	<u>6A7</u> Kanabec	<u>4A3A</u> Ellis	WEST VIRGINIA
<u>2A3A</u> Dougherty*	<u>6A7</u> Mille Lacs	<u>4A3A</u> Garfield	<u>4A5A</u> Doddridge
<u>2A3A</u> Early*	<u>6A7</u> Otter Tail	<u>4A3A</u> Grant	<u>4A5A</u> Fayette
<u>3A4A</u> Fannin	<u>6A7</u> Wilkin	<u>4A3A</u> Harper	<u>4A5A</u> Greenbrier
<u>3A4A</u> Floyd	<u>5A6A</u> Winona	<u>4A3A</u> Kay	<u>4A5A</u> Lewis
<u>3A4A</u> Franklin	MISSISSIPPI	<u>4A3A</u> Major	<u>4A5A</u> Nicholas
<u>3A4A</u> Gilmer	<u>2A3A</u> George*	<u>4A3A</u> Nowata	<u>4A5A</u> Raleigh
<u>3A4A</u> Gordon	MISSOURI	<u>4A3A</u> Osage	<u>4A5A</u> Summers
<u>3A4A</u> Habersham	<u>4A5A</u> Buchanan	<u>4A3A</u> Ottawa	<u>4A5A</u> Upshur
<u>3A4A</u> Hall	<u>4A5A</u> Caldwell	<u>4A3A</u> Washington	<u>4A5A</u> Webster
<u>3A4A</u> Lumpkin	<u>4A5A</u> Chariton	<u>4A3A</u> Woods	WISCONSIN
<u>3A4A</u> Murray	<u>4A5A</u> Clinton	<u>4A3A</u> Woodward	<u>5A6A</u> Adams
<u>3A4A</u> Pickens	<u>3A4A</u> Dunklin	OREGON	<u>6A7</u> Ashland
<u>3A4A</u> Rabun	<u>3A4A</u> Pemiscot	PENNSYLVANIA	<u>6A7</u> Bayfield
<u>3A4A</u> Stephens	MONTANA	<u>4A5A</u> Adams	<u>6A7</u> Burnett
<u>2A3A</u> Tift*	NEBRASKA	<u>4A5A</u> Berks	<u>5A6A</u> Calumet
<u>3A4A</u> Towns	NEVADA	<u>5A6A</u> Cameron	<u>5A6A</u> Columbia
<u>3A4A</u> Union	<u>4B5B</u> Carson City (city)	<u>5A6A</u> Clearfield	<u>5A6A</u> Crawford
<u>3A4A</u> Walker	<u>4B5B</u> Douglas	<u>4A5A</u> Cumberland	<u>5A6A</u> Dane
<u>3A4A</u> White	<u>4B5B</u> Esmeralda	<u>4A5A</u> Dauphin	<u>5A6A</u> Dodge
<u>3A4A</u> Whitfield	<u>4B5B</u> Lincoln	<u>5A6A</u> Elk	<u>6A7</u> Douglas
<u>2A3A</u> Worth*	<u>4B5B</u> Lyon	<u>4A5A</u> Franklin	<u>6A7</u> Florence
HAWAII	<u>4B5B</u> Mineral	<u>4A5A</u> Lancaster	<u>5A6A</u> Fond du Lac
IDAHO	<u>4B5B</u> Nye	<u>4A5A</u> Lebanon	<u>6A7</u> Forest
ILLINOIS	NEW HAMPSHIRE	<u>5A6A</u> McKean	<u>5A6A</u> Grant
<u>4A5A</u> Calhoun	<u>5A6A</u> Merrimack	<u>4A5A</u> Perry	<u>5A6A</u> Green
<u>4A5A</u> Clark	NEW JERSEY	<u>5A6A</u> Potter	<u>5A6A</u> Green Lake
<u>4A5A</u> Coles	<u>4A5A</u> Mercer	<u>5A6A</u> Susquehanna	<u>5A6A</u> Iowa
<u>4A5A</u> Cumberland	NEW MEXICO	<u>5A6A</u> Tioga	<u>6A7</u> Iron
<u>4A5A</u> Greene	<u>4B5B</u> Catron	<u>5A6A</u> Wayne	<u>5A6A</u> Jefferson
<u>4A5A</u> Jersey	<u>3B4B</u> Sierra	RHODE ISLAND	<u>5A6A</u> Juneau
INDIANA	<u>5A6A</u> Allegany	SOUTH CAROLINA	<u>5A6A</u> Kenosha
<u>4A5A</u> Bartholomew	<u>5A6A</u> Broome	<u>2A3A</u> Beaufort*	<u>5A6A</u> La Crosse

4A5A Clay	5A6A Cattaraugus	2A3A Jasper*	5A6A Lafayette
4A5A Decatur	5A6A Schoharie	SOUTH DAKOTA	6A7 Langlade
4A5A Fayette	5A6A Schuyler	5A6A Brule	6A7 Lincoln
4A5A Franklin	5A6A Steuben	5A6A Haakon	5A6A Milwaukee
4A5A Hendricks	5A6A Tompkins	5A6A Jones	5A6A Monroe
4A5A Johnson	5A6A Wyoming	5A6A Lyman	6A7 Oneida
4A5A Marion	NORTH CAROLINA	5A6A Stanley	5A6A Outagamie
4A5A Morgan	3A4A Alamance	TENNESSEE	5A6A Ozaukee
4A5A Owen	3A4A Alexander	3A4A Bedford	6A7 Price
4A5A Putnam	3A4A Bertie	3A4A Coffee	5A6A Racine
4A5A Rush	3A4A Caswell	3A4A Davidson	5A6A Richland
4A5A Shelby	3A4A Catawba	3A4A Decatur	5A6A Rock
4A5A Union	3A4A Chatham	3A4A Franklin	5A6A Sauk
4A5A Vigo	3A4A Cherokee	3A4A Gibson	6A7 Sawyer
IOWA	3A4A Clay	3A4A Giles	6A7 Taylor
5A6A Allamakee	3A4A Cleveland	3A4A Grundy	5A6A Vernon
5A6A Bremer	3A4A Davie	3A4A Hamilton	6A7 Vilas
5A6A Buchanan	3A4A Durham	3A4A Hickman	5A6A Walworth
5A6A Buena Vista	3A4A Forsyth	4A3A Lake	6A7 Washburn
5A6A Butler	3A4A Franklin	3A4A Lawrence	5A6A Washington
5A6A Calhoun	3A4A Gates	3A4A Lewis	5A6A Waukesha
5A6A Cherokee	3A4A Granville	3A4A Lincoln	5A6A Waushara
5A6A Chickasaw	3A4A Guilford	3A4A Marion	5A6A Winnebago
5A6A Clayton	3A4A Halifax	3A4A Marshall	WYOMING
5A6A Delaware	3A4A Harnett	3A4A Maury	5B6B Laramie
5A6A Fayette	3A4A Hertford	3A4A Moore	US TERRITORIES
5A6A Floyd	3A4A Iredell	3A4A Perry	AMERICAN SAMOA
5A6A Franklin	3A4A Lee	3A4A Rutherford	GUAM
5A6A Grundy	3A4A Lincoln	3A4A Wayne	NORTHERN MARIANA ISLANDS
5A6A Hamilton	4A5A Mitchell	3A4A Williamson	PUERTO RICO
5A6A Hardin	3A4A Nash	TEXAS	1A (all except as follows:)*
5A6A Howard	3A4A Northampton	1A2A Cameron*	2B Barraquitas
5A6A Humboldt	3A4A Orange	2A3A Dallas*	2B Cayey
5A6A Ida	3A4A Person	2A3A Ellis*	VIRGIN ISLANDS
5A6A Plymouth	3A4A Polk	1A2A Hidalgo*	
5A6A Pocahontas	3A4A Rockingham	2A3A Johnson*	
5A6A Sac	3A4A Rutherford	2A3A Navarro*	

C301.3 International climate zones. Climate Zone Definitions The *climate zone* for any location outside the

United States shall be determined by applying Table C301.3(1) and then Table C301.3(2).

To determine the climate zones for locations not listed in this code, use the following information to determine climate zone numbers and letters.

Determine the thermal climate zone, 0–8, from Table C301.3(1) using the heating and cooling degree-days for the location. Determine the moisture zone (Marine, Dry or Humid):

a. If monthly average temperature and precipitation data are available, use the Marine, Dry, and Humid definitions below to determine the moisture zone (C, B, or A).

b. If annual average temperature information (including degree-days) and annual precipitation (i.e. annual mean) are available, use the following to determine the moisture zone:

1. If thermal climate zone is 3 and $CDD_{50^{\circ}F} \leq 4500$ ($CDD_{10^{\circ}C} \leq 2500$), climate zone is Marine (3C).

2. If thermal climate zone is 4 and $CDD_{50^{\circ}F} \leq 2700$ ($CDD_{10^{\circ}C} \leq 1500$), climate zone is Marine (4C).

3. If thermal climate zone is 5 and $CDD_{50^{\circ}F} \leq 1800$ ($CDD_{10^{\circ}C} \leq 1000$), climate zone is Marine (5C).

Use the third criteria below for determining the Dry/Humid threshold if not Marine (C).

c. If only degree-day information is available, use the following to determine the moisture zone:

1. If thermal climate zone is 3 and $CDD_{50^{\circ}F} \leq 4500$ ($CDD_{10^{\circ}C} \leq 2500$), climate zone is Marine (3C).

2. If thermal climate zone is 4 and $CDD_{50^{\circ}F} \leq 2700$ ($CDD_{10^{\circ}C} \leq 1500$), climate zone is Marine (4C).

3. If thermal climate zone is 5 and $CDD_{50^{\circ}F} \leq 1800$ ($CDD_{10^{\circ}C} \leq 1000$), climate zone is Marine (5C).

It is not possible to assign Dry/Humid splits in this case. Marine (C) Zone Definition—Locations meeting all four of the following criteria:

a. Mean temperature of coldest month between $27^{\circ}F$ ($-3^{\circ}C$) and $65^{\circ}F$ ($18^{\circ}C$)

b. Warmest month mean $< 72^{\circ}F$ ($22^{\circ}C$)

c. At least four months with mean temperatures over $50^{\circ}F$ ($10^{\circ}C$)

d. Dry season in summer. The month with the heaviest precipitation in the cold season has at least three times as much precipitation as the month with the least precipitation in the rest of the year. The cold season is October through March in the Northern Hemisphere and April through September in the Southern Hemisphere.

Dry (B) Definition—Locations meeting the following criteria:

a. Not Marine (C)

b. If 70% or more of the precipitation, P, occurs during the high sun period, then the dry/humid threshold is: $P < 0.44 \times (T - 7)$ (I-P) $P < 20.0 \times (T + 14)$ (SI)

c. If between 30% and 70% of the precipitation, P, occurs during the high sun period, then the dry/humid threshold is: $P < 0.44 \times (T - 19.5)$ (I-P) $P < 20.0 \times (T + 7)$ (SI)

d. If 30% or less of the precipitation, P, occurs during the high sun period, then the dry/humid threshold is: $P < 0.44 \times (T - 32)$ (I-P) $P < 20 \times T$ (SI) where: P = annual precipitation, in. (mm). T = annual mean temperature, °F (°C). Summer or = April through September in the high sun Northern Hemisphere and October period through March in the Southern Hemisphere. Winter or = October through March in the Northern cold season Hemisphere and April through September in the Southern Hemisphere. Humid (A) Definition—Locations that are not Marine (C) and not Dry (B)

Delete without substitution:

TABLE C301.3(1)
INTERNATIONAL CLIMATE ZONE DEFINITIONS

MAJOR CLIMATE TYPE DEFINITIONS	
<p>Marine (C) Definition—Locations meeting all four criteria:</p> <ol style="list-style-type: none"> 1. Mean temperature of coldest month between -3°C (27°F) and 18°C (65°F). 2. Warmest month mean $< 22^{\circ}\text{C}$ (72°F). 3. At least four months with mean temperatures over 10°C (50°F). 4. Dry season in summer. The month with the heaviest precipitation in the cold season has at least three times as much precipitation as the month with the least precipitation in the rest of the year. The cold season is October through March in the Northern Hemisphere and April through September in the Southern Hemisphere. 	
<p>Dry (B) Definition—Locations meeting the following criteria: Not marine and $P_{inf} < 0.44 \times (TF - 19.5)$ [$P_{em} < 2.0 \times (TC + 7)$ in SI units]</p> <p>where:</p> <p>P_{inf} = Annual precipitation in inches (cm) T = Annual mean temperature in °F (°C)</p>	
<p>Moist (A) Definition—Locations that are not marine and not dry.</p>	
<p>Warm-humid Definition—Moist (A) locations where either of the following wet-bulb temperature conditions shall occur during the warmest six consecutive months of the year:</p> <ol style="list-style-type: none"> 1. 67°F (19.4°C) or higher for 3,000 or more hours; or 2. 73°F (22.8°C) or higher for 1,500 or more hours. 	

For SI: $^{\circ}\text{C} = [(^{\circ}\text{F}) - 32] / 1.8$, 1 inch = 2.54 cm.

TABLE C301.3(2 1)
INTERNATIONAL CLIMATE ZONE DEFINITIONS

ZONE NUMBER	THERMAL CRITERIA	
	IP Units	SI Units
0	$10,800 < \text{CDD}50^{\circ}\text{F}$	$6000 < \text{CDD}10^{\circ}\text{C}$
1	$9000 < \text{CDD}50^{\circ}\text{F} < 10,800$	$5000 < \text{CDD}10^{\circ}\text{C} < 6000$

2	6300 < CDD50°F ≤ 9000	3500 < CDD10°C ≤ 5000
3A and 3B	4500 < CDD50°F ≤ 6300 AND HDD65°F ≤ 3600 5400	2500 < CDD10°C ≤ 3500 AND HDD18°C ≤ 2000 3000
4A and 4B	CDD50°F ≤ 4500 <u>6300</u> AND <u>3600 < HDD65°F ≤ 5400</u>	CDD10°C ≤ <u>3500</u> 2500 AND HDD18°C ≤ 3000
3G	HDD65°F ≤ 3600	HDD18°C ≤ 2000
4G	3600 < HDD65°F ≤ 5400	2000 < HDD18°C ≤ 3000
5	<u>CDD50°F < 6300 and 5400 < HDD65°F ≤ 7200</u>	<u>CDD10°C < 3500 and 3000 < HDD18°C ≤ 4000</u>
6	7200 < HDD65°F ≤ 9000	4000 < HDD18°C ≤ 5000
7	9000 < HDD65°F ≤ 12600	5000 < HDD18°C ≤ 7000
8	12600 < HDD65°F	7000 < HDD18°C

For SI: °C = [(°F)-32]/1.8.

C301.4 Tropical climate zone. The tropical *climate zone* shall be defined as:

1. Hawaii, Puerto Rico, Guam, American Samoa, U.S. Virgin Islands, Commonwealth of Northern Mariana Islands; and
2. Islands in the area between the Tropic of Cancer and the Tropic of Capricorn.

Proposal # 4881

CE36-19 Part I

CE36-19 Part II

IECC: FIGURE R301.1 (IRC N1101.7), TABLE R301.1 (IRC N1101.7), R301.3 (IRC N1101.7.2), TABLE R301.3(1) [IRC N1101.7.2(1)], TABLE R301.3(2) [IRC N1101.7.2(2)]

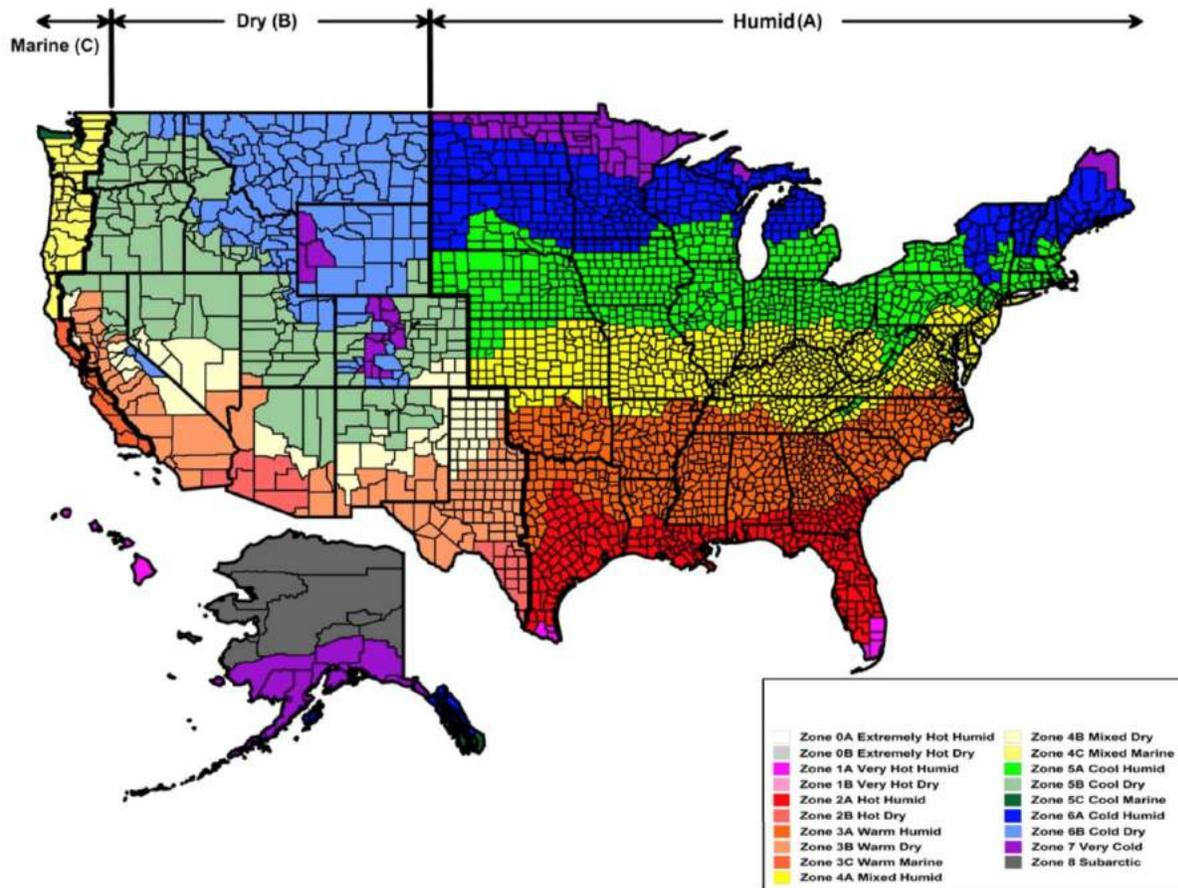
Proponent: David Collins, representing SEHPCAC (SEHPCAC@iccsafe.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Energy Conservation Code

SECTION R301 CLIMATE ZONES

R301.1 (IRC N1101.7) General. *Climate zones* from Figure R301.1 or Table R301.1 shall be used for determining the applicable requirements from Chapter 4. Locations not indicated in Table R301.1 shall be assigned a *climate zone* in accordance with Section R301.3.

Revise as follows:



**FIGURE R301.1 (IRC N1101.7)
CLIMATE ZONES**

**TABLE R301.1 (IRC N1101.7)
CLIMATE ZONES, MOISTURE REGIMES, AND WARM-HUMID DESIGNATIONS BY STATE, COUNTY AND TERRITORY**

Portions of table not shown remain unchanged.

ALABAMA	<u>5A6A</u> Webster	<u>3A4A</u> Vance	<u>2A3A</u> Tarrant*
<u>2A3A</u> Coffee*	<u>5A6A</u> Winneshiek	<u>3A4A</u> Wake	<u>1A2A</u> Willacy*
<u>2A3A</u> Covington*	<u>5A6A</u> Wright	<u>3A4A</u> Warren	UTAH
<u>2A3A</u> Dale*	KANSAS	<u>5A4A</u> Wilkes	<u>5B6B</u> Box Elder
<u>2A3A</u> Escambia*	<u>4A5A</u> Cloud	NORTH DAKOTA	<u>5B6B</u> Cache
<u>2A3A</u> Geneva*	<u>4A5A</u> Ellis	<u>6A7</u> Barnes	<u>5B6B</u> Carbon
<u>2A3A</u> Henry*	<u>4A5A</u> Graham	<u>6A7</u> Cass	VERMONT
<u>2A3A</u> Houston*	<u>4A5A</u> Hamilton	<u>6A7</u> Eddy	VIRGINIA
ALASKA	<u>4A5A</u> Lane	<u>6A7</u> Foster	4A (all <u>except</u> as follows:)
<u>78</u> Bethel	<u>4A5A</u> Mitchell	<u>6A7</u> Griggs	<u>5A</u> Alleghany
<u>87</u> Denali	<u>4A5A</u> Ness	<u>6A7</u> Kidder	<u>5A</u> Bath
<u>78</u> Dillingham	<u>4A5A</u> Osborne	<u>6A7</u> McLean	<u>3A</u> Brunswick
<u>6A7</u> Haines	<u>4A5A</u> Rooks	<u>6A7</u> Mountrail	<u>3A</u> Chesapeake city

<u>6A7</u> Juneau	<u>4A5A</u> Trego	<u>6A7</u> Sheridan	<u>5A</u> Clifton Forge city
<u>5C7</u> Ketchikan Gateway	KENTUCKY	<u>6A7</u> Steele	<u>5A</u> Covington city
<u>6A7</u> Kodiak Island	LOUISIANA	<u>6A7</u> Stutsman	<u>3A</u> Emporia city
<u>5C7</u> Prince of Wales Outer Ketchikan	MAINE	<u>6A7</u> Traill	<u>3A</u> Franklin city
<u>5C7</u> Sitka	MARYLAND	<u>6A7</u> Wells	<u>3A</u> Greenville
<u>6A7</u> Skagway-Hoonah-Angoon	<u>5A4A</u> Allegany	<u>6A7</u> Williams	<u>3A</u> Halifax
<u>6A7</u> Wrangell-Petersburg	MASSACHUSETTS	OHIO	<u>3A</u> Hampton city
ARIZONA	MICHIGAN	<u>4A5A</u> Athens	<u>5A</u> Highland
ARKANSAS	<u>6A7</u> Baraga	<u>4A5A</u> Butler	<u>3A</u> Isle of Wight
CALIFORNIA	<u>6A7</u> Chippewa	<u>4A5A</u> Clinton	<u>3A</u> Mecklenburg
COLORADO	<u>6A7</u> Gogebic	<u>4A5A</u> Fayette	<u>3A</u> Newport News city
<u>4B5B</u> Bent	<u>6A7</u> Houghton	<u>4A5A</u> Franklin	<u>3A</u> Norfolk city
<u>5B6B</u> Custer	<u>5A6A</u> Huron	<u>4A5A</u> Greene	<u>3A</u> Pittsylvania
<u>4B5B</u> Prowers	<u>6A7</u> Iron	<u>4A5A</u> Highland	<u>3A</u> Portsmouth city
CONNECTICUT	<u>6A7</u> Luce	<u>4A5A</u> Hocking	<u>3A</u> South Boston
DELAWARE	<u>6A7</u> Mackinac	<u>4A5A</u> Jackson	<u>3A</u> Southampton
DISTRICT OF COLUMBIA	<u>76A</u> Marquette	<u>4A5A</u> Madison	<u>3A</u> Suffolk city
FLORIDA	<u>6A7</u> Ontonagon	<u>4A5A</u> Meigs	<u>3A</u> Surry
<u>1A2A</u> Palm Beach*	<u>5A6A</u> Sanilac	<u>4A5A</u> Pickaway	<u>3A</u> Sussex
GEORGIA	<u>6A7</u> Schoolcraft	<u>4A5A</u> Ross	<u>3A</u> Virginia Beach city
<u>3A4A</u> Banks	MINNESOTA	<u>4A5A</u> Vinton	WASHINGTON
<u>2A3A</u> Calhoun*	<u>6A7</u> Becker	<u>4A5A</u> Warren	<u>5C4G</u> Clallam
<u>3A4A</u> Catoosa	<u>6A7</u> Clay	OKLAHOMA	<u>5C4G</u> Island
<u>3A4A</u> Chattooga	<u>5A6A</u> Fillmore	<u>4A3A</u> Alfalfa	<u>5C4G</u> Kitsap
<u>2A3A</u> Coffee*	<u>6A7</u> Grant	<u>4A3A</u> Craig	<u>5B6B</u> Okanogan
<u>3A4A</u> Dade	<u>5A6A</u> Houston	<u>4A3A</u> Delaware	<u>5C4G</u> San Juan
<u>3A4A</u> Dawson	<u>6A7</u> Kanabec	<u>4A3A</u> Ellis	WEST VIRGINIA
<u>2A3A</u> Dougherty*	<u>6A7</u> Mille Lacs	<u>4A3A</u> Garfield	<u>4A5A</u> Doddridge
<u>2A3A</u> Early*	<u>6A7</u> Otter Tail	<u>4A3A</u> Grant	<u>4A5A</u> Fayette
<u>3A4A</u> Fannin	<u>6A7</u> Wilkin	<u>4A3A</u> Harper	<u>4A5A</u> Greenbrier
<u>3A4A</u> Floyd	<u>5A6A</u> Winona	<u>4A3A</u> Kay	<u>4A5A</u> Lewis
<u>3A4A</u> Franklin	MISSISSIPPI	<u>4A3A</u> Major	<u>4A5A</u> Nicholas
<u>3A4A</u> Gilmer	<u>2A3A</u> George*	<u>4A3A</u> Nowata	<u>4A5A</u> Raleigh
<u>3A4A</u> Gordon	MISSOURI	<u>4A3A</u> Osage	<u>4A5A</u> Summers
<u>3A4A</u> Habersham	<u>4A5A</u> Buchanan	<u>4A3A</u> Ottawa	<u>4A5A</u> Upshur
<u>3A4A</u> Hall	<u>4A5A</u> Caldwell	<u>4A3A</u> Washington	<u>4A5A</u> Webster
<u>3A4A</u> Lumpkin	<u>4A5A</u> Chariton	<u>4A3A</u> Woods	WISCONSIN
<u>3A4A</u> Murray	<u>4A5A</u> Clinton	<u>4A3A</u> Woodward	<u>5A6A</u> Adams
<u>3A4A</u> Pickens	<u>3A4A</u> Dunklin	OREGON	<u>6A7</u> Ashland

<u>3A4A</u> Rabun	<u>3A4A</u> Pemiscot	PENNSYLVANIA	<u>6A7</u> Bayfield
<u>3A4A</u> Stephens	MONTANA	<u>4A5A</u> Adams	<u>6A7</u> Burnett
<u>2A3A</u> Tift*	NEBRASKA	<u>4A5A</u> Berks	<u>5A6A</u> Calumet
<u>3A4A</u> Towns	NEVADA	<u>5A6A</u> Cameron	<u>5A6A</u> Columbia
<u>3A4A</u> Union	<u>4B5B</u> Carson City (city)	<u>5A6A</u> Clearfield	<u>5A6A</u> Crawford
<u>3A4A</u> Walker	<u>4B5B</u> Douglas	<u>4A5A</u> Cumberland	<u>5A6A</u> Dane
<u>3A4A</u> White	<u>4B5B</u> Esmeralda	<u>4A5A</u> Dauphin	<u>5A6A</u> Dodge
<u>3A4A</u> Whitfield	<u>4B5B</u> Lincoln	<u>5A6A</u> Elk	<u>6A7</u> Douglas
<u>2A3A</u> Worth*	<u>4B5B</u> Lyon	<u>4A5A</u> Franklin	<u>6A7</u> Florence
HAWAII	<u>4B5B</u> Mineral	<u>4A5A</u> Lancaster	<u>5A6A</u> Fond du Lac
IDAHO	<u>4B5B</u> Nye	<u>4A5A</u> Lebanon	<u>6A7</u> Forest
ILLINOIS	NEW HAMPSHIRE	<u>5A6A</u> McKean	<u>5A6A</u> Grant
<u>4A5A</u> Calhoun	<u>5A6A</u> Merrimack	<u>4A5A</u> Perry	<u>5A6A</u> Green
<u>4A5A</u> Clark	NEW JERSEY	<u>5A6A</u> Potter	<u>5A6A</u> Green Lake
<u>4A5A</u> Coles	<u>4A5A</u> Mercer	<u>5A6A</u> Susquehanna	<u>5A6A</u> Iowa
<u>4A5A</u> Cumberland	NEW MEXICO	<u>5A6A</u> Tioga	<u>6A7</u> Iron
<u>4A5A</u> Greene	<u>4B5B</u> Catron	<u>5A6A</u> Wayne	<u>5A6A</u> Jefferson
<u>4A5A</u> Jersey	<u>3B4B</u> Sierra	RHODE ISLAND	<u>5A6A</u> Juneau
INDIANA	<u>5A6A</u> Allegany	SOUTH CAROLINA	<u>5A6A</u> Kenosha
<u>4A5A</u> Bartholomew	<u>5A6A</u> Broome	<u>2A3A</u> Beaufort*	<u>5A6A</u> La Crosse
<u>4A5A</u> Clay	<u>5A6A</u> Cattaraugus	<u>2A3A</u> Jasper*	<u>5A6A</u> Lafayette
<u>4A5A</u> Decatur	<u>5A6A</u> Schoharie	SOUTH DAKOTA	<u>6A7</u> Langlade
<u>4A5A</u> Fayette	<u>5A6A</u> Schuyler	<u>5A6A</u> Brule	<u>6A7</u> Lincoln
<u>4A5A</u> Franklin	<u>5A6A</u> Steuben	<u>5A6A</u> Haakon	<u>5A6A</u> Milwaukee
<u>4A5A</u> Hendricks	<u>5A6A</u> Tompkins	<u>5A6A</u> Jones	<u>5A6A</u> Monroe
<u>4A5A</u> Johnson	<u>5A6A</u> Wyoming	<u>5A6A</u> Lyman	<u>6A7</u> Oneida
<u>4A5A</u> Marion	NORTH CAROLINA	<u>5A6A</u> Stanley	<u>5A6A</u> Outagamie
<u>4A5A</u> Morgan	<u>3A4A</u> Alamance	TENNESSEE	<u>5A6A</u> Ozaukee
<u>4A5A</u> Owen	<u>3A4A</u> Alexander	<u>3A4A</u> Bedford	<u>6A7</u> Price
<u>4A5A</u> Putnam	<u>3A4A</u> Bertie	<u>3A4A</u> Coffee	<u>5A6A</u> Racine
<u>4A5A</u> Rush	<u>3A4A</u> Caswell	<u>3A4A</u> Davidson	<u>5A6A</u> Richland
<u>4A5A</u> Shelby	<u>3A4A</u> Catawba	<u>3A4A</u> Decatur	<u>5A6A</u> Rock
<u>4A5A</u> Union	<u>3A4A</u> Chatham	<u>3A4A</u> Franklin	<u>5A6A</u> Sauk
<u>4A5A</u> Vigo	<u>3A4A</u> Cherokee	<u>3A4A</u> Gibson	<u>6A7</u> Sawyer
IOWA	<u>3A4A</u> Clay	<u>3A4A</u> Giles	<u>6A7</u> Taylor
<u>5A6A</u> Allamakee	<u>3A4A</u> Cleveland	<u>3A4A</u> Grundy	<u>5A6A</u> Vernon
<u>5A6A</u> Bremer	<u>3A4A</u> Davie	<u>3A4A</u> Hamilton	<u>6A7</u> Vilas
<u>5A6A</u> Buchanan	<u>3A4A</u> Durham	<u>3A4A</u> Hickman	<u>5A6A</u> Walworth

5A6A Buena Vista	3A4A Forsyth	4A3A Lake	6A7 Washburn
5A6A Butler	3A4A Franklin	3A4A Lawrence	5A6A Washington
5A6A Calhoun	3A4A Gates	3A4A Lewis	5A6A Waukesha
5A6A Cherokee	3A4A Granville	3A4A Lincoln	5A6A Waushara
5A6A Chickasaw	3A4A Guilford	3A4A Marion	5A6A Winnebago
5A6A Clayton	3A4A Halifax	3A4A Marshall	WYOMING
5A6A Delaware	3A4A Harnett	3A4A Maury	5B6B Laramie
5A6A Fayette	3A4A Hertford	3A4A Moore	US TERRITORIES
5A6A Floyd	3A4A Iredell	3A4A Perry	AMERICAN SAMOA
5A6A Franklin	3A4A Lee	3A4A Rutherford	GUAM
5A6A Grundy	3A4A Lincoln	3A4A Wayne	NORTHERN MARIANA ISLANDS
5A6A Hamilton	4A5A Mitchell	3A4A Williamson	PUERTO RICO
5A6A Hardin	3A4A Nash	TEXAS	1A (all <u>except as follows:</u>)*
5A6A Howard	3A4A Northampton	1A2A Cameron*	2B Barraquitas
5A6A Humboldt	3A4A Orange	2A3A Dallas*	2B Cayey
5A6A Ida	3A4A Person	2A3A Ellis*	VIRGIN ISLANDS
5A6A Plymouth	3A4A Polk	1A2A Hidalgo*	
5A6A Pocahontas	3A4A Rockingham	2A3A Johnson*	
5A6A Sac	3A4A Rutherford	2A3A Navarro*	

R301.3 (IRC N1101.7.2) International climate zones. Climate zone definitions. ~~The climate zone for any location outside the United States shall be determined by applying Table R301.3(1) and then Table R301.3(2).~~ To determine the climate zones for locations not listed in this code, use the following information to determine climate zone numbers and letters.

Determine the thermal climate zone, 0–8, from Table R301.3(1) using the heating and cooling degree-days for the location. Determine the moisture zone (Marine, Dry or Humid):

a. If monthly average temperature and precipitation data are available, use the Marine, Dry, and Humid definitions below to determine the moisture zone (C, B, or A).

b. If annual average temperature information (including degree-days) and annual precipitation (i.e. annual mean) are available, use the following to determine the moisture zone:

1. If thermal climate zone is 3 and $CDD_{50^{\circ}F} \leq 4500$ ($CDD_{10^{\circ}C} \leq 2500$), climate zone is Marine (3C).

2. If thermal climate zone is 4 and $CDD_{50^{\circ}F} \leq 2700$ ($CDD_{10^{\circ}C} \leq 1500$), climate zone is Marine (4C).

3. If thermal climate zone is 5 and $CDD_{50^{\circ}F} \leq 1800$ ($CDD_{10^{\circ}C} \leq 1000$), climate zone is Marine (5C).

Use the third criteria below for determining the Dry/Humid threshold if not Marine (C).

c. If only degree-day information is available, use the following to determine the moisture zone:

1. If thermal climate zone is 3 and $CDD_{50^{\circ}F} \leq 4500$ ($CDD_{10^{\circ}C} \leq 2500$), climate zone is Marine (3C).

2. If thermal climate zone is 4 and $CDD_{50^{\circ}F} \leq 2700$ ($CDD_{10^{\circ}C} \leq 1500$), climate zone is Marine (4C).
3. If thermal climate zone is 5 and $CDD_{50^{\circ}F} \leq 1800$ ($CDD_{10^{\circ}C} \leq 1000$), climate zone is Marine (5C).

It is not possible to assign Dry/Humid splits in this case. Marine (C) Zone Definition—Locations meeting all four of the following criteria:

a. Mean temperature of coldest month between $27^{\circ}F$ ($-3^{\circ}C$) and $65^{\circ}F$ ($18^{\circ}C$)

b. Warmest month mean $< 72^{\circ}F$ ($22^{\circ}C$)

c. At least four months with mean temperatures over $50^{\circ}F$ ($10^{\circ}C$)

d. Dry season in summer. The month with the heaviest precipitation in the cold season has at least three times as much precipitation as the month with the least precipitation in the rest of the year. The cold season is October through March in the Northern Hemisphere and April through September in the Southern Hemisphere.

Dry (B) Definition—Locations meeting the following criteria:

a. Not Marine (C)

b. If 70% or more of the precipitation, P, occurs during the high sun period, then the dry/humid threshold is: $P < 0.44 \times (T - 7)$ (I-P) $P < 20.0 \times (T + 14)$ (SI)

c. If between 30% and 70% of the precipitation, P, occurs during the high sun period, then the dry/humid threshold is: $P < 0.44 \times (T - 19.5)$ (I-P) $P < 20.0 \times (T + 7)$ (SI)

d. If 30% or less of the precipitation, P, occurs during the high sun period, then the dry/humid threshold is: $P < 0.44 \times (T - 32)$ (I-P) $P < 20 \times T$ (SI) where: P = annual precipitation, in. (mm). T = annual mean temperature, $^{\circ}F$ ($^{\circ}C$). Summer or = April through September in the high sun Northern Hemisphere and October period through March in the Southern Hemisphere. Winter or = October through March in the Northern cold season Hemisphere and April through September in the Southern Hemisphere. Humid (A) Definition—Locations that are not Marine (C) and not Dry

Revise as follows:

**TABLE R301.3(1) [IRC N1101.7.2(1)]
INTERNATIONAL CLIMATE ZONE DEFINITIONS**

MAJOR CLIMATE TYPE DEFINITIONS

<p>Marine (G) Definition—Locations meeting all four criteria:</p> <ol style="list-style-type: none"> 1. Mean temperature of coldest month between -3°C (27°F) and 18°C (65°F). 2. Warmest month mean $< 22^{\circ}\text{C}$ (72°F). 3. Not fewer than four months with mean temperatures over 10°C (50°F). 4. Dry season in summer. The month with the heaviest precipitation in the cold season has not less than three times as much precipitation as the month with the least precipitation in the rest of the year. The cold season is October through March in the Northern Hemisphere and April through September in the Southern Hemisphere.
<p>Dry (B) Definition—Locations meeting the following criteria: Not marine and $P_{if} < 0.44 \times (TF - 19.5)$ [$P_{em} < 2.0 \times (TC + 7)$ in SI units]</p> <p>where: P_{if} = Annual precipitation in inches (cm) T = Annual mean temperature in $^{\circ}\text{F}$ ($^{\circ}\text{C}$)</p>
<p>Moist (A) Definition—Locations that are not marine and not dry.</p>
<p>Warm humid Definition—Moist (A) locations where either of the following wet bulb temperature conditions shall occur during the warmest six consecutive months of the year:</p> <ol style="list-style-type: none"> 1. 67°F (19.4°C) or higher for 3,000 or more hours. 2. 73°F (22.8°C) or higher for 1,500 or more hours.

For SI: $^{\circ}\text{C} = [(^{\circ}\text{F}) - 32]/1.8$, 1 inch = 2.54 cm.

**TABLE R301.3(2.1) [IRC N1101.7.2(2.1)]
INTERNATIONAL CLIMATE ZONE DEFINITIONS**

ZONE NUMBER	THERMAL CRITERIA	
	IP Units	SI Units
1	$9000 < \text{CDD}50^{\circ}\text{F}$	$5000 < \text{CDD}10^{\circ}\text{C}$
2	$6300 < \text{CDD}50^{\circ}\text{F} \leq 9000$	$3500 < \text{CDD}10^{\circ}\text{C} \leq \del{5000} \underline{6000}$
3A and 3B	$4500 < \text{CDD}50^{\circ}\text{F} \leq 6300$ AND $\text{HDD}65^{\circ}\text{F} \leq \del{5400} \underline{3600}$	$2500 < \text{CDD}10^{\circ}\text{C} \leq 3500$ AND $\text{HDD}18^{\circ}\text{C} \leq \del{3000} \underline{2000}$
4A and 4B	$\text{CDD}50^{\circ}\text{F} \leq \del{4500} \underline{6300}$ AND $3600 < \text{HDD}65^{\circ}\text{F} \leq 5400$	$\text{CDD}10^{\circ}\text{C} \leq \del{2500} \underline{3500}$ AND $\text{HDD}18^{\circ}\text{C} \leq 3000$
3G	$\text{HDD}65^{\circ}\text{F} \leq 3600$	$\text{HDD}18^{\circ}\text{C} \leq 2000$
4G	$3600 < \text{HDD}65^{\circ}\text{F} \leq 5400$	$2000 < \text{HDD}18^{\circ}\text{C} \leq 3000$
5	$\text{CDD}50^{\circ}\text{F} < 6300$ AND $5400 < \text{HDD}65^{\circ}\text{F} \leq 7200$	$\text{CDD}10^{\circ}\text{C} < 3500$ AND $3000 < \text{HDD}18^{\circ}\text{C} \leq 4000$
6	$7200 < \text{HDD}65^{\circ}\text{F} \leq 9000$	$4000 < \text{HDD}18^{\circ}\text{C} \leq 5000$
7	$9000 < \text{HDD}65^{\circ}\text{F} \leq 12600$	$5000 < \text{HDD}18^{\circ}\text{C} \leq 7000$
8	$12600 < \text{HDD}65^{\circ}\text{F}$	$7000 < \text{HDD}18^{\circ}\text{C}$

For SI: $^{\circ}\text{C} = [(^{\circ}\text{F}) - 32]/1.8$.

R301.4 (IRC N1101.8) Tropical climate zone. The tropical *climate zone* shall be defined as:

1. Hawaii, Puerto Rico, Guam, American Samoa, U.S. Virgin Islands, Commonwealth of Northern Mariana Islands; and
2. Islands in the area between the Tropic of Cancer and the Tropic of Capricorn.

Reason:

Reason:

Currently approximately 10% of the counties across the US have different different climate zones under the IECC and ASHRAE 90.1, ASHRAE 90.2, and the IgCC. This proposal updates the climate zones to correspond with the release of ASHRAE Standard 169-2013, which is referenced in both the 2018 IgCC and ASHRAE 90.1 and ASHRAE 90.2 Approximately 10% of the counties in the United States have a change in Climate Zone designation due to this change. ICC has a licensing agreement with ASHRAE to include the climate zone map, definitions and tables for consistency with ASHRAE Standard 169-2013.

This modification includes:

- The U.S. map as Figure R301.1 and U.S. county tables as Table R301.1 to be used in determining the climate zone for locations within the U.S.
- Updating county climate zone designations in Tables C301.1 and R301.1
- Updating the information in Tables C301.3(1) and R301.3(1) with an updated Climate Zone Definition, replacing these tables with text in Sections C301.3 and R301.3.
- Updating Tables C301.3(2) and R301.3(2) to include Climate Zone 0, and modify climate zones 1-4 for consistency across the IECC, IgCC and ASHRAE 90.1

Climate Zone 0 is a subset of the previous Climate Zone 1. Whereas the previous CZ 1 was all locations with more than 9,000 Cooling Degree Days, Climate Zone 1 now "tops out" at 10,800 Cooling Degree Days, and Climate Zone 0 is for those locations with more than 10,800 Cooling Degree Days. Cities in Climate Zone 0 include very hot locations such as Mumbai (Bombay), Jakarta and Abu Dhabi. There are no cities in the United States in Climate Zone 0; Miami and the islands of Hawaii are in Climate Zone 1.

The separation of Climate Zones 0 and 1 allows separate criteria for IECC to be developed that are more specific to the very hot regions with Climate Zone 0.

Because Climate Zone 0 is a subset of the previous Climate Zone 1, and the code does not currently have any criteria specific to climate zone 0, the following are typical editorial change that will result from the addition of Climate Zone 0.

Section or Table	Current Language	Proposed addition of Zero
TABLE R402.1.2 INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT _a	1	0-1
TABLE R402.1.2 INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT _a footnote b	Exception: In Climate Zones 1 through 3,	Exception: In Climate Zones 0 through 3,
R403.3.6 (3) Ducts buried within ceiling insulation.	In Climate Zones 1A, 2A and 3A, the	In Climate Zones 0A, 1A, 2A and 3A, the supply ducts

This proposal is submitted by the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at:
<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>
(<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>)

Proposal # 5824

CE36-19 Part II

CE37-19 Part I

PART I — IECC: Part I: C303.1

IECC: Part II: R303.1(N1101.10)

PART II — IECC: R303.1 (IRC N1101.10)

Proponent: donald sivigny, State of MN, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

C303.1 Identification. Materials, systems, and equipment shall be identified in a manner that will allow a determination of compliance with the applicable provisions of this code. Materials used shall be:

1. Listed for the intended use;
2. Installed in accordance with the manufacturer's installation instructions; and
3. Installed by an installer who is certified by a manufacturer to install that specific product, if such certification is required by the product manufacturer.

Proposal # 5762

CE37-19 Part I

CE37-19 Part II

IECC: R303.1 (IRC N1101.10)

Proponent: donald sivigny, State of MN, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Energy Conservation Code

Revise as follows:

R303.1 (IRC N1101.10) Identification. Materials, systems, and equipment shall be identified in a manner that will allow a determination of compliance with the applicable provisions of this code. Materials used shall be:

1. Listed for the intended use.
2. Installed in accordance with the manufacturer's installation instructions, and
3. Installed by an installer who is certified by a manufacturer to install that specific product, if such certification is required by the product manufacturer

Reason: This Section of the code is amended to modify section R303.1 by adding language to make sure that sufficient information exists to ensure that materials and equipment used are designed for that intended use, installed according to the manufacturer's installation instructions, and are installed by an individual certified to install the product as required by the manufacturer, if the certification exists for that particular product. The manufacturer's installation instructions are required because many product manufacturers have specific instructions about how their products must be installed to ensure their performance. Requiring the use of the instructions will help ensure the product performs as the manufacturer intended. Some products require installers to pass a certification test to ensure that the product is installed according to the manufacturer's specifications. Use of a certified installer, if such certification exists for a certain product, will help ensure the product performs as the manufacturer intended. The permit Applicant can submit this information in a number of ways. On the plans, spec sheets, schedules, (such as window schedules and equipment schedules), or any other way deemed acceptable by the code official, as each applies to a specific portion or component of the Building.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal will save money by requiring qualified and trained individuals to install certain products in accordance with manufacturers specs and certifications if required. Doing the job right the first time is a money saver. Not knowing how to do it and doing it wrong will cost money.

Proposal # 5126

CE37-19 Part II

CE38-19

IECC: C303.1.3, TABLE C303.1.3(2)

Proponent: Kurt Roeper, representing Steel Door Institute (kurt.roeper@assaabloy.com)

2018 International Energy Conservation Code

Revise as follows:

C303.1.3 Fenestration product rating. *U*-factors of fenestration products shall be determined as follows:

1. For windows, doors and skylights, *U*-factor ratings shall be determined in accordance with NFRC 100.
2. Where required for garage doors and rolling doors, *U*-factor ratings shall be determined in accordance with either NFRC 100 or ANSI/DASMA 105.

U-factors shall be determined by an accredited, independent laboratory, and labeled and certified by the manufacturer.

Products lacking such a labeled *U*-factor shall be assigned a default *U*-factor from Table C303.1.3(1) or C303.1.3(2). The *solar heat gain coefficient* (SHGC) and *visible transmittance* (VT) of glazed fenestration products (windows, glazed doors and skylights) shall be determined in accordance with NFRC 200 by an accredited, independent laboratory, and *labeled* and certified by the manufacturer. Products lacking such a *labeled* SHGC or VT shall be assigned a default SHGC or VT from Table C303.1.3(3).

TABLE C303.1.3(2)
DEFAULT OPAQUE DOOR *U*-FACTORS

DOOR TYPE	OPAQUE <i>U</i> -FACTOR
Uninsulated Metal	1.20 <u>0.60</u>
Insulated Metal (Rolling)	0.90
Insulated Metal (Other)	0.60 <u>0.42</u>
Wood	0.50
Insulated, nonmetal edge, max 45% glazing, any glazing double pane	0.35

Reason: The existing default values are not reflective of product performance data. The proposed default values are *worst case* values derived from testing 26 specimens manufactured by 11 unique steel door manufacturers. A certified test report from an accredited, independent laboratory is appended to this proposal. Testing was conducted in accordance with:

ASTM C1199-09 *Standard Test Method for Measuring the Steady-State Thermal Transmittance of Fenestration Systems Using Hot Box Methods*

ASTM C1365 – 05 *Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus*

ASTM E1423 – 06 *Standard Practice for Determining Steady State Thermal Transmittance of Fenestration Systems*

Section 303.1.3 unchanged – see table C303.1.3(2) for proposed change to default values

Table C303.1.3(1) – unchanged

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposed change to the default values does not impact the cost of construction, it only provides more accurate - worst case - assigned values.

Proposal # 5483

CE38-19

CE39-19

IECC: SECTION C202(New), C303.1.3, C402.4.2, C402.4.2.2, Chapter 6CE (New)

Proponent: Jennifer Hatfield, representing American Architectural Manufacturers Association
(jen@jhatfieldandassociates.com)

2018 International Energy Conservation Code

Revise as follows:

SECTION C202 GENERAL DEFINITIONS

Add new definition as follows:

VISIBLE TRANSMITTANCE, ANNUAL [VT_{annual}] The ratio of visible light entering the space through the fenestration product assembly to the incident visible light during the course of a year, which includes the effects of glazing material, frame, and light well or tubular conduit, and is expressed as a number between 0 and 1.

Revise as follows:

C303.1.3 Fenestration product rating. *U*-factors of fenestration products shall be determined as follows:

1. For windows, doors and skylights, *U*-factor ratings shall be determined in accordance with NFRC 100.
2. Where required for garage doors and rolling doors, *U*-factor ratings shall be determined in accordance with either NFRC 100 or ANSI/DASMA 105.

U-factors shall be determined by an accredited, independent laboratory, and labeled and certified by the manufacturer.

Products lacking such a labeled *U*-factor shall be assigned a default *U*-factor from Table C303.1.3(1) or C303.1.3(2). The *solar heat gain coefficient* (SHGC) and *visible transmittance* (VT) of glazed fenestration products (windows, glazed doors and skylights) shall be determined in accordance with NFRC 200 by an accredited, independent laboratory, and *labeled* and certified by the manufacturer. Products lacking such a *labeled* SHGC or VT shall be assigned a default SHGC or VT from Table C303.1.3(3). For Tubular Daylighting Devices, VT_{annual} shall be measured and rated in accordance with NFRC 203.

C402.4.2 Minimum skylight fenestration area. In an enclosed space greater than 2,500 square feet (232 m²) in floor area, directly under a roof with not less than 75 percent of the ceiling area with a ceiling height greater than 15 feet (4572 mm), and used as an office, lobby, atrium, concourse, corridor, storage space, gymnasium/exercise center, convention center, automotive service area, space where manufacturing occurs, nonrefrigerated warehouse, retail store, distribution/sorting area, transportation depot or workshop, the total *toplit daylight zone* shall be not less than half the floor area and shall provide one of the following:

1. A minimum skylight area to *toplit daylight zone* of not less than 3 percent where all skylights have a VT of not less than 0.40, or VT_{annual} of not less than 0.26, as determined in accordance with Section C303.1.3.
2. A minimum skylight effective aperture of ~~not less than 1 percent~~, determined in accordance with Equation 4-4 -

$$\text{Skylight Effective Aperture} = \frac{0.85 \times \text{Skylight Area} \times \text{Skylight VT} \times \text{WF}}{\text{Toplit Zone}}$$

of:

1. Not less than 1 percent, using a skylight's VT rating; or
2. Not less than 0.66 percent using a Tubular Daylighting Device's VT_{annual} rating.

(Equation 4-4)

where:

Skylight area = Total fenestration area of skylights.

Skylight VT = Area weighted average visible transmittance of skylights.

WF = Area weighted average well factor, where well factor is 0.9 if light well depth is less than 2 feet (610 mm), or 0.7 if light well depth is 2 feet (610 mm) or greater, or 1.0 for Tubular Daylighting Devices with VT_{annual} ratings.

Light well depth = Measure vertically from the underside of the lowest point of the skylight glazing to the ceiling plane under the skylight.

Exception: Skylights above *daylight zones* of enclosed spaces are not required in:

1. Buildings in *Climate Zones* 6 through 8.
2. Spaces where the designed *general lighting* power densities are less than 0.5 W/ft² (5.4 W/m²).
3. Areas where it is documented that existing structures or natural objects block direct beam sunlight on not less than half of the roof over the enclosed area for more than 1,500 daytime hours per year between 8 a.m. and 4 p.m.
4. Spaces where the *daylight zone* under rooftop monitors is greater than 50 percent of the enclosed space floor area.
5. Spaces where the total area minus the area of sidelight *daylight zones* is less than 2,500 square feet (232 m²), and where the lighting is controlled in accordance with Section C405.2.3.

C402.4.2.2 Haze factor. Skylights in office, storage, automotive service, manufacturing, nonrefrigerated warehouse, retail store and distribution/sorting area spaces shall have a glazing material or diffuser with a haze factor greater than 90 percent when tested in accordance with ASTM D1003.

Exception: Skylights and tubular daylighting devices designed and installed to exclude direct sunlight entering the occupied space by the use of fixed or automated baffles or the geometry of skylight and light well, or the use of optical diffuser components.

Add new standard(s) as follows:

NFRC

National Fenestration Rating
Council, Inc.
6305 Ivy Lane, Suite 140
Greenbelt MD 20770

203--2017: Procedure for Determining Translucent Fenestration Product Visible Transmittance at Normal Incidence

Reason: The IECC code changes contained in the “IECC C402 Updates to Incorporate NFRC203 VT_{annual} Equivalencies for Tubular Daylighting Devices (TDDs)” document provides recommended additions and edits that will allow the 2021 code language to remain consistent with new fenestration rating standards. The proposed changes incorporate industry-vetted code and Visible Transmittance (VT) rating protocol language that applies necessary equivalency factors for the National Fenestration Rating Council’s new NFRC 203 VT_{annual} Rating Protocol for Tubular Daylighting Devices (TDDs) as an alternative code-compliance option to the NFRC 200/202 VT (VT_{normal}) rating that is currently used for determining Minimum Skylight Fenestration Area requirements for conventional skylight products.

The traditional NFRC 200/202 Visible Transmittance rating procedure, rates the Visible Transmittance of conventional skylights using a single, direct-normal incidence angle condition, and represents a skylight’s VT for light that is “normal” (i.e. perpendicular) to the skylight’s surface. As a result, it does not account for the skylight’s effective system transmittance under the wide range of lower, incident sunlight angles that actually strike the skylight’s dome surface over the course of a year. To address this, the new NFRC 203 protocol applies enhanced physical Visible Transmittance testing of a TDD/skylight product using 18 precisely-controlled incidence angles, and measures/rates a TDD/skylight product’s functional, annualized visible light transmittance characteristics accounting for the product’s roof-top dome optics, light shaft (or “well” as defined in Code Section C402.4.2), and interior ceiling diffuser and/or aperture elements. It is also important to note that NFRC 203 is the only rating standard that is used for measuring and rating the Visible Transmittance of the TDD fenestration product category.

The code language additions contained in this code proposal, provide the necessary definitions and applicable VT conversion factors that relate a conventional skylight’s NFRC 202 direct-normal (VT_{normal}) rating to the functional VT_{annual} performance as determined using the NFRC 203 rating protocol, and enable the new NFRC 203 ratings to be used when determining a TDD’s Skylight Effective Aperture value using Equation 4-4 in code section C402.4.2. Also, since the NFRC 203 Rating Protocol tests the TDD/Skylight in its entirety, including a default 3-foot long tube run (or “well”), all resulting NFRC 203 VT_{annual} Ratings include the TDD’s well factor in the Product’s Visible Transmittance Data and Rating. As such, no further Well Factor (WF) adjustment is warranted, and a well factor of 1.0 should be applied in Equation 4-4.

The intent of applying the TDDs to the exception in code section C402.4.2.2, when optical diffuser components are present, is based on the defined scope of ASTM D1003.

Bibliography: NFRC 203-2017 [E0A1] Procedure for Determining Visible Transmittance of Tubular Daylighting Devices

NFRC 202-2017 [E0A0] Procedure for Determining Translucent Fenestration Product Visible Transmittance at Normal Incidence

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposed code edits/additions represent a cost-neutral change to the IECC. They merely provide the necessary definitions and conversion factors that allow the new, more rigorous NFRC 203 product ratings to be applied to Code Section C402.4.2 with equivalency to the existing conventional NFRC 200/202 skylight ratings, and are expected to increase the overall usability of the standard. The proposed code changes do not change the stringency of the standard, and as such, they do not impact the resulting energy savings or the associated cost of compliance.

Staff Analysis: A review of the standard proposed for inclusion in the code, NFRC 203-2017, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Analysis: A review of the standard proposed for inclusion in the code, NFRC 203, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

CE40-19 Part I

PART I — IECC: Part I: C303.1.2

IECC: Part II: R303.1.2.

PART II — IECC: R303.1.2 (IRC N1101.10.2)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

SECTION C303 MATERIALS, SYSTEMS AND EQUIPMENT

C303.1.2 Insulation mark installation. Insulating materials shall be installed such that the manufacturer's *R*-value mark is readily observable upon inspection. For insulation materials that are installed without an observable manufacturer's R-value mark, such as blown or draped products, an insulation certificate complying with Section C303.1.1 shall be left immediately after installation by the installer, in a conspicuous location within the building, to certify the installed R-value of the insulation material.

Proposal # 4802

CE40-19 Part I

CE40-19 Part II

IECC: R303.1.2 (IRC N1101.10.2)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

R303.1.2 (IRC N1101.10.2) Insulation mark installation. Insulating materials shall be installed such that the manufacturer's R-value mark is readily observable at inspection. For insulation materials that are installed without an observable manufacturer's R-value mark, such as blown or draped products, an insulation certificate complying with Section R303.1.1 shall be left immediately after installation by the installer, in a conspicuous location within the building, to certify the installed R-value of the insulation material.

Reason: More and more insulation products are being developed and installed that do not come with a manufacturer's R-value marking. Primarily these are blown insulation materials that are dependent on the density of the blown product installation to ensure proper R-value of the material. Many materials can be blown at different densities to achieve different R-values and there is no visible way to verify if the required or specified R-value has been achieved. In lieu of mandating density quality assurance checks on the installation of blown insulation material, a requirement that the installer of the material certify the R-value of the installation will allow the Code Official, Energy Rater, third party inspection agency, HVAC contractor, and others who must use the R-value for calculations or verification of the code, to be satisfied that what is installed actually meets the R-value requirements.

Being able to rely on a document that certifies the R-value of the installed material that is not labeled will take pressure of the code official to document that the R-value installed matches the submitted and approved documentation for obtaining the building permit. Required Manual J and S HVAC design reports are an example of document that fundamentally rely on the proper installation of the R-values that have been specified for the dwelling. If the R-value is less or more than that used in the HVAC design the mechanical heating and cooling equipment could be over or undersized impacting the energy performance of the home. Lastly, a certified document helps code officials have confidence that others that are using the R-value of the home to demonstrate compliance are accurately representing R-values that are installed in the home.

Other insulation materials that often are installed without observable R-value Marks include vinyl draped fiberglass blankets or fiberglass batt material that is marked with a color that blends into the color of the fiberglass. In addition, most batt material is marked in one location and or one side of the material so when it is cut to fit in a rim joist, for example, it is not visible to the inspector.

In order to right size HVAC systems, create an accurate computer model for the EIR or simulated performance path, and/or properly verify code required R-values, "observable" should be enforced consistently and inspectors should not have to search for or question what they are looking at. A certificate that certifies the installed materials R-value per component left at the time of the install rather than just at final will solve this issue.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Cost of construction should not increase as documentation of the installation is already required. This proposal clarifies that the document must be left at the time of the installation (rough stage of construction) as well as when attic blow or other secondary trips are made or needed.

Proposal # 5799

CE40-19 Part II

CE41-19

IECC: C401.2, C401.2.1 (New), C401.2.2 (New), C402.1, C407.2, C407.3

Proponent: David Collins, representing SEHPCAC (SEHPCAC@iccsafe.org); David Collins, The Preview Group, Inc., representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Energy Conservation Code

Revise as follows:

C401.2 Application. Commercial buildings shall comply with C401.2.1 or C401.2.2. ~~one of the following:~~

- ~~1. The requirements of ANSI/ASHRAE/IESNA 90.1.~~
- ~~2. The requirements of Sections C402 through C405 and C408. In addition, commercial buildings shall comply with Section C406 and tenant spaces shall comply with Section C406.1.1.~~
- ~~3. The requirements of Sections C402.5, C403.2, C403.3 through C403.3.2, C403.4 through C403.4.2.3, C403.5.5, C403.7, C403.8.1 through C403.8.4, C403.10.1 through C403.10.3, C403.11, C403.12, C404, C405, C407 and C408. The building energy cost shall be equal to or less than 85 percent of the standard reference design building.~~

Add new text as follows:

C401.2.1 International Energy Conservation Code. Commercial buildings shall comply with one of the following:

1. Prescriptive Compliance. The Prescriptive Compliance Option requires compliance with Sections C402 through C406, and C408
2. Total Building Performance. The Total Building Performance Option requires compliance with Section C407.

Exception: Additions, alterations, repairs and changes of occupancy to existing buildings complying with Chapter 5.

C401.2.2 ASHRAE 90.1. Commercial buildings shall comply with the requirements of ANSI/ASHRAE/IESNA 90.1.

Revise as follows:

C402.1 General (Prescriptive). Building thermal envelope assemblies for buildings that are intended to comply with the code on a prescriptive basis in accordance with the compliance path described in Item ~~2 of 1 of~~ Section ~~C401.2~~ C401.2.1, shall comply with the following:

1. The opaque portions of the building thermal envelope shall comply with the specific insulation requirements of Section C402.2 and the thermal requirements of either the *R*-value-based method of Section C402.1.3; the *U*-, *C*- and *F*-factor-based method of Section C402.1.4; or the component performance alternative of Section C402.1.5.
2. Roof solar reflectance and thermal emittance shall comply with Section C402.3.
3. Fenestration in building envelope assemblies shall comply with Section C402.4.
4. Air leakage of building envelope assemblies shall comply with Section C402.5.

Alternatively, where buildings have a vertical fenestration area or skylight area exceeding that allowed in Section C402.4, the building and building thermal envelope shall comply with Section C401.2, Item 1 or Section C401.2, Item 3.

Walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with Section C403.10.1 or C403.10.2.

C407.2 Mandatory requirements. Compliance with this section requires compliance with Sections C402.5, C403.2, C403.3 through C403.3.2, C403.4 through C403.4.2.3, C403.5.5, C403.7, C403.8.1 through C403.8.4, C403.10.1 through C403.10.3, C403.11, C403.12, C404 and C405, C405.1, C405.2, C405.4 through C405.9, and C408.

C407.3 Performance-based compliance. Compliance based on total building performance requires that a proposed building (*proposed design*) be shown to have an annual energy cost that is less than or equal to 85% of the annual energy cost of the *standard reference design*. Energy prices shall be taken from a source approved by the *code official*, such as the Department of Energy, Energy Information Administration's *State Energy Price and Expenditure Report*. *Code officials* shall be permitted to require time-of-use pricing in energy cost calculations. The reduction in energy cost of the proposed design associated with *on-site renewable energy* shall be not more than 5 percent of the total energy cost. The amount of renewable energy purchased from off-site sources shall be the same in the *standard reference design* and the *proposed design*.

Exception: Jurisdictions that require site energy (1 kWh = 3413 Btu) rather than energy cost as the metric of comparison.

Reason: No technical changes are intended. No advantage to any proprietary interests governed by the code is intended. The intent is to strictly make the IECC more understandable and easier to use, as explained below.

Currently mandatory provisions are referenced in Section C401.2 (3) and listed again in a conflicting list within Section C407. Eliminating the C401.2 (3) list leaves mandatory elements singularly listed within C407 which resolves conflicts.

Naming the compliance options (prescriptive, performance) formalizes the way in which the paths are typically identified. Using the word "option" reinforces that it is the designer's choice as to which path is followed.

This change also further clarifies that one cannot combine the IECC and ASHRAE compliance paths on a given project.

In creating the singular list of mandatory requirements in C407, it also clarifies that C405.3 Lighting Power Densities is Prescriptive, and labeled as such, while C405.1, C405.2, C405.4, C405.6 and C405.7 are labeled mandatory. C408 which was listed in C401.2 is now included in C407.

This proposal also relocates the 85 percent requirement from Section C401.2 (3) to Section C407. Making this change puts all of the performance path targets in C407, either directly or by reference.

This proposal is submitted by the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx> (<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>)

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This change does not increase or decrease code provisions nor impact construction methods. It clarifies language and provisions already contained in the code.

Proposal # 4180

CE41-19

CE42-19 Part I

PART I — IECC: C401.2, SECTION C407, C407.1, C407.2, C407.3, Table C407.2 (New), C102.1.1, C402.1, C402.2, C402.4, C402.5, C403.2, C403.2.1, C403.2.2, C403.3, C403.3.1, C403.3.2, C403.3.2.1, C403.4, C403.4.1, C403.4.1.1, C403.4.1.2, C403.4.1.3, C403.4.1.4, C403.4.1.5, C403.4.2, C403.4.2.1, C403.4.2.2, C403.4.2.3, C403.4.3, C403.5, C403.5.5, C403.7.1, C403.7.2, C403.7.3, C403.7.4, C403.7.5, C403.7.6, C403.7.7, C403.8.1, C403.8.2, C403.8.3, C403.8.4, C403.10.1, C403.10.2, C403.10.2.1, C403.10.3, C403.11.1, C403.11.2, C403.11.2.1, C403.11.2.2, C403.11.2.3, C403.11.3, C403.11.3.1, C403.12, SECTION C404, C404.9, C404.10, C405.1, C405.2, C405.3, C405.4, C405.4.3, C405.5, C405.6, C405.7

PART II — IECC: R102.1.1 (IRC N1101.4), R401.3 (IRC N1101.14), R402.1 (IRC N1102.1), R402.2 (IRC N1102.2), R402.3 (IRC N1102.3), R402.4 (IRC N1102.4), R402.5 (IRC N1102.5), R403.1 (IRC N1103.1), R403.1.2 (IRC N1103.1.2), R403.3.1 (IRC N1103.3.1), R403.3.2 (IRC N1103.3.2), R403.3.3 (IRC N1103.3.3), R403.3.4 (IRC N1103.3.4), R403.3.5 (IRC N1103.3.5), R403.4 (IRC N1103.4), R403.5.1 (IRC N1103.5.1), R403.5.3 (IRC N1103.5.3), R403.6 (IRC N1103.6), R403.7 (IRC N1103.7), R403.8 (IRC N1103.8), R403.9 (IRC N1103.9), R403.10 (IRC N1103.10), R403.11 (IRC N1103.11), R404.1 (IRC N1104.1), R404.1.1 (IRC N1104.1.1) R405 (N1105), R405.2 (IRC N1105.2), TABLE R405.2 (IRC N1105.2) (New), R405.3 (IRC N1105.3), R406 (IRC N1106), R406.2 (IRC N1106.2), TABLE R406.2 (IRC N1106.2) (New), R406.3 (IRC N1106.3), R406.3.1 (IRC N1105.3.1), R406.3.2 (IRC N1106.3.2), TABLE R406.4 (IRC N1106.4)

Proponent: David Collins, SEHPCAC, representing SEHPCAC (SEHPCAC@iccsafe.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

Revise as follows:

C401.2 Application. Commercial buildings shall comply with one of the following:

1. The requirements of ANSI/ASHRAE/IESNA 90.1.
2. The requirements of Sections C402 through C405 and C408. In addition, commercial buildings shall comply with Section C406 and tenant spaces shall comply with Section C406.1.1.
3. The requirements of Section C407. ~~Sections C402.5, C403.2, C403.3 through C403.3.2, C403.4 through C403.4.2.3, C403.5.5, C403.7, C403.8.1 through C403.8.4, C403.10.1 through C403.10.3, C403.11, C403.12, C404, C405, C407 and C408. The building energy cost shall be equal to or less than 85 percent of the standard reference design building.~~

SECTION C407 TOTAL BUILDING PERFORMANCE

C407.1 Scope. This section establishes criteria for compliance using total building performance. The following systems and loads shall be included in determining the total building performance: heating systems, cooling systems, service water heating, fan systems, lighting power, receptacle loads and process loads.

Exception: Energy used to recharge or refuel vehicles that are used for on-road and off-site transportation purposes.

Delete without substitution:

~~**C407.2 Mandatory requirements.** Compliance with this section requires compliance with Sections C402.5, C403.2, C403.3 through C403.3.2, C403.4 through C403.4.2.3, C403.5.5, C403.7, C403.8.1 through C403.8.4, C403.10.1 through C403.10.3, C403.11, C403.12, C404 and C405.~~

Revise as follows:

~~**C407.3 C407.2 Performance-based compliance.** Compliance based on total building performance requires that a *proposed building (proposed design)* be shown to have an *design meet all of the following:*~~

- ~~1. The requirements of the sections indicated within Table C407.2~~
- ~~2. An annual energy cost that is less than or equal to 85 percent the annual energy cost of the *standard reference design*. Energy prices shall be taken from a source *approved* by the *code official*, such as the Department of Energy, Energy Information Administration’s *State Energy Price and Expenditure Report*. *Code officials* shall be permitted to require time-of-use pricing in energy cost calculations. The reduction in energy cost of the proposed design associated with *on-site renewable energy* shall be not more than 5 percent of the total energy cost. The amount of renewable energy purchased from off-site sources shall be the same in the *standard reference design* and the *proposed design*.~~

Exception: Jurisdictions that require site energy (1 kWh = 3413 Btu) rather than energy cost as the metric of comparison.

Add new text as follows:

Table C407.2
Requirements for Total Building Performance

Section ^a	Title
<u>Envelope</u>	
C402.5	<u>Air Leakage-Thermal Envelope</u>
<u>Mechanical</u>	
C403.2	<u>System Design</u>
C403.3, except sections C403.3.3 and C403.3.4	<u>Heating and Cooling Equipment Efficiencies</u>
C403.4, except sections C403.4.3, C403.4.4, and C403.4.5	<u>Heating and Cooling System Controls</u>
C403.5.5	<u>Economizer Fault Detection and Diagnostics (FDD)</u>
C403.7	<u>Ventilation and Exhaust Systems</u>
C403.8, except sections C403.8.5 and C403.8.5.1	<u>Fan and Fan Controls</u>
C403.10, except section C403.10.4	<u>Walk-in coolers, Walk-in Freezers, Refrigerated Warehouse Coolers and Refrigerated Warehouse Freezers</u>
C403.11	<u>Construction of HVAC system elements</u>
C403.12	<u>Mechanical systems located outside of the building thermal envelope</u>
C404	<u>Service Water Heating</u>
C405, except section C405.3	<u>Electrical Power and Lighting Systems</u>
C408	<u>System Commissioning</u>

^a Reference to a code section includes all the relative subsections except as indicated in the table.

Revise as follows:

C102.1.1 Above code programs. The *code official* or other authority having jurisdiction shall be permitted to deem a national, state or local energy efficiency program ~~to exceed~~ as exceeding the energy efficiency required by this code. Buildings *approved* in writing by such an energy efficiency program shall be considered to be in compliance with this code. The requirements identified as “mandatory” in ~~Chapter 4 Table C407.2~~ shall be met.

C402.1 General (Prescriptive). Building thermal envelope assemblies for buildings that are intended to comply with the code on a prescriptive basis in accordance with the compliance path described in Item 2 of Section C401.2, shall comply with the following:

1. The opaque portions of the building thermal envelope shall comply with the specific insulation requirements of Section C402.2 and the thermal requirements of either the *R*-value-based method of Section C402.1.3; the *U*-, *C*- and *F*-factor-based method of Section C402.1.4; or the component performance alternative of Section C402.1.5.
2. Roof solar reflectance and thermal emittance shall comply with Section C402.3.
3. Fenestration in building envelope assemblies shall comply with Section C402.4.
4. Air leakage of building envelope assemblies shall comply with Section C402.5.

Alternatively, where buildings have a vertical fenestration area or skylight area exceeding that allowed in Section C402.4, the building and building thermal envelope shall comply with Section C401.2, Item 1 or Section C401.2, Item 3.

Walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with Section C403.10.1 or C403.10.2.

C402.2 Specific building thermal envelope insulation requirements (Prescriptive). Insulation in building thermal envelope opaque assemblies shall comply with Sections C402.2.1 through C402.2.7 and Table C402.1.3.

C402.4 Fenestration (Prescriptive). Fenestration shall comply with Sections C402.4.1 through C402.4.5 and Table C402.4. Daylight responsive controls shall comply with this section and Section C405.2.3.1.

C402.5 Air leakage—thermal envelope (Mandatory). The *thermal envelope* of buildings shall comply with Sections C402.5.1 through C402.5.8, or the building *thermal envelope* shall be tested in accordance with ASTM E 779 at a pressure differential of 0.3 inch water gauge (75 Pa) or an equivalent method approved by the code official and deemed to comply with the provisions of this section when the tested air leakage rate of the building thermal envelope is not greater than 0.40 cfm/ft² (2.0 L/s • m²). Where compliance is based on such testing, the building shall also comply with Sections C402.5.5, C402.5.6 and C402.5.7.

C403.2 System design (Mandatory). Mechanical systems shall be designed to comply with Sections C403.2.1 and C403.2.2. Where elements of a building’s mechanical systems are addressed in Sections C403.3 through C403.12, such elements shall comply with the applicable provisions of those sections.

C403.2.1 Zone isolation required (Mandatory). HVAC systems serving *zones* that are over 25,000 square feet (2323 m²) in floor area or that span more than one floor and are designed to operate or be occupied nonsimultaneously shall be divided into isolation areas. Each isolation area shall be equipped with *isolation devices* and controls configured to automatically shut off the supply of conditioned air and outdoor air to and exhaust air from the isolation area. Each isolation area shall be controlled independently by a device meeting the requirements of Section C403.4.2.2. Central systems and plants shall be provided with controls and devices that will allow system and equipment operation for any length of time while serving only the smallest isolation

area served by the system or plant.

Exceptions:

1. Exhaust air and outdoor air connections to isolation areas where the fan system to which they connect is not greater than 5,000 cfm (2360 L/s).
2. Exhaust airflow from a single isolation area of less than 10 percent of the design airflow of the exhaust system to which it connects.
3. Isolation areas intended to operate continuously or intended to be inoperative only when all other isolation areas in a *zone* are inoperative.

C403.2.2 Ventilation (Mandatory). Ventilation, either natural or mechanical, shall be provided in accordance with Chapter 4 of the International Mechanical Code. Where mechanical ventilation is provided, the system shall provide the capability to reduce the outdoor air supply to the minimum required by Chapter 4 of the International Mechanical Code.

C403.3 Heating and cooling equipment efficiencies (Mandatory). Heating and cooling equipment installed in mechanical systems shall be sized in accordance with Section C403.3.1 and shall be not less efficient in the use of energy than as specified in Section C403.3.2.

C403.3.1 Equipment sizing (Mandatory). The output capacity of heating and cooling equipment shall be not greater than that of the smallest available equipment size that exceeds the loads calculated in accordance with Section C403.1.1. A single piece of equipment providing both heating and cooling shall satisfy this provision for one function with the capacity for the other function as small as possible, within available equipment options.

Exceptions:

1. Required standby equipment and systems provided with controls and devices that allow such systems or equipment to operate automatically only when the primary equipment is not operating.
2. Multiple units of the same equipment type with combined capacities exceeding the design load and provided with controls that are configured to sequence the operation of each unit based on load.

C403.3.2 HVAC equipment performance requirements (Mandatory). Equipment shall meet the minimum efficiency requirements of Tables C403.3.2(1) through C403.3.2(9) when tested and rated in accordance with the applicable test procedure. Plate-type liquid-to-liquid heat exchangers shall meet the minimum requirements of Table C403.3.2(10). The efficiency shall be verified through certification under an approved certification program or, where a certification program does not exist, the equipment efficiency ratings shall be supported by data furnished by the manufacturer. Where multiple rating conditions or performance requirements are provided, the equipment shall satisfy all stated requirements. Where components, such as indoor or outdoor coils, from different manufacturers are used, calculations and supporting data shall be furnished by the designer that demonstrates that the combined efficiency of the specified components meets the requirements herein.

C403.3.2.1 Water-cooled centrifugal chilling packages (Mandatory). Equipment not designed for operation at AHRI Standard 550/590 test conditions of 44°F (7°C) leaving chilled-water temperature and 2.4 gpm/ton evaporator fluid flow and 85°F (29°C) entering condenser water temperature with 3 gpm/ton (0.054 l/s • kW) condenser water flow shall have maximum full-load kW/ton (FL) and part-load ratings requirements adjusted using Equations 4-6 and 4-7.

$FL_{adj} = FL / K_{adj}$

$FL_{adj} = FL / K_{adj}$

(Equation 4-6)

$$PLV_{adj} = IPLV / K_{adj}$$

$$PLV_{adj} = IPLV / K_{adj}$$

(Equation 4-7)

where:

$$K_{adj} = A \times B$$

FL = Full-load kW/ton value as specified in Table C403.3.2(7).

FL_{adj} = Maximum full-load kW/ton rating, adjusted for nonstandard conditions.

$IPLV$ = Value as specified in Table C403.3.2(7).

PLV_{adj} = Maximum $NPLV$ rating, adjusted for nonstandard conditions.

$$A = 0.00000014592 \times (LIFT)^4 + 0.0000346496 \times (LIFT)^3 + 0.00314196 \times (LIFT)^2 - 0.147199 \times (LIFT) + 3.9302$$

$$B = 0.0015 \times L_{vg}E_{vap} + 0.934$$

$$LIFT = L_{vg}Cond - L_{vg}E_{vap}$$

$L_{vg}Cond$ = Full-load condenser leaving fluid temperature (°F).

$L_{vg}Evap$ = Full-load evaporator leaving temperature (°F).

The FL_{adj} and PLV_{adj} values are only applicable for centrifugal chillers meeting all of the following full-load design ranges:

1. Minimum evaporator leaving temperature: 36°F.
2. Maximum condenser leaving temperature: 115°F.
3. 20°F ≤ LIFT ≤ 80°F.

C403.4 Heating and cooling system controls (Mandatory). Each heating and cooling system shall be provided with controls in accordance with Sections C403.4.1 through C403.4.5.

C403.4.1 Thermostatic controls (Mandatory). The supply of heating and cooling energy to each *zone* shall be controlled by individual thermostatic controls capable of responding to temperature within the *zone*. Where humidification or dehumidification or both is provided, not fewer than one humidity control device shall be provided for each humidity control system.

Exception: Independent perimeter systems that are designed to offset only building envelope heat losses, gains or both serving one or more perimeter *zones* also served by an interior system provided that both of the following conditions are met:

1. The perimeter system includes not fewer than one thermostatic control *zone* for each building exposure having exterior walls facing only one orientation (within ± 45 degrees) (0.8 rad) for more than 50 contiguous feet (15 240 mm).
2. The perimeter system heating and cooling supply is controlled by thermostats located within the *zones* served by the system.

C403.4.1.1 Heat pump supplementary heat (Mandatory). Heat pumps having supplementary electric resistance heat shall have controls that, except during defrost, prevent supplementary heat operation where the heat pump can provide the heating load.

C403.4.1.2 Deadband (Mandatory). Where used to control both heating and cooling, *zone* thermostatic controls shall be configured to provide a temperature range or deadband of not less than 5°F (2.8°C) within which the supply of heating and cooling energy to the *zone* is shut off or reduced to a minimum.

Exceptions:

1. Thermostats requiring manual changeover between heating and cooling modes.
2. Occupancies or applications requiring precision in indoor temperature control as *approved* by the *code official*.

C403.4.1.3 Setpoint overlap restriction (Mandatory). Where a *zone* has a separate heating and a separate cooling thermostatic control located within the *zone*, a limit switch, mechanical stop or direct digital control system with software programming shall be configured to prevent the heating setpoint from exceeding the cooling setpoint and to maintain a deadband in accordance with Section C403.4.1.2.

C403.4.1.4 Heated or cooled vestibules (Mandatory). The heating system for heated vestibules and air curtains with integral heating shall be provided with controls configured to shut off the source of heating when the outdoor air temperature is greater than 45°F (7°C). Vestibule heating and cooling systems shall be controlled by a thermostat located in the vestibule configured to limit heating to a temperature not greater than 60°F (16°C) and cooling to a temperature not less than 85°F (29°C).

Exception: Control of heating or cooling provided by site-recovered energy or transfer air that would otherwise be exhausted.

C403.4.1.5 Hot water boiler outdoor temperature setback control (Mandatory). Hot water boilers that supply heat to the building through one- or two-pipe heating systems shall have an outdoor setback control that lowers the boiler water temperature based on the outdoor temperature.

C403.4.2 Off-hour controls (Mandatory). Each *zone* shall be provided with thermostatic setback controls that are controlled by either an automatic time clock or programmable control system.

Exceptions:

1. *Zones* that will be operated continuously.
2. *Zones* with a full HVAC load demand not exceeding 6,800 Btu/h (2 kW) and having a manual shutoff switch located with *ready access*.

C403.4.2.1 Thermostatic setback (Mandatory). Thermostatic setback controls shall be configured to set back or temporarily operate the system to maintain zone temperatures down to 55°F (13°C) or up to 85°F (29°C).

C403.4.2.2 Automatic setback and shutdown (Mandatory). Automatic time clock or programmable controls shall be capable of starting and stopping the system for seven different daily schedules per week and retaining their programming and time setting during a loss of power for not fewer than 10 hours. Additionally, the controls shall have a manual override that allows temporary operation of the system for up to 2 hours; a manually operated timer configured to operate the system for up to 2 hours; or an occupancy sensor.

C403.4.2.3 Automatic start (Mandatory). Automatic start controls shall be provided for each HVAC system. The controls shall be configured to automatically adjust the daily start time of the HVAC system in order to bring each space to the desired occupied temperature immediately prior to scheduled occupancy.

C403.4.3 Hydronic systems controls. The heating of fluids that have been previously mechanically cooled and the cooling of fluids that have been previously mechanically heated shall be limited in accordance with Sections C403.4.3.1 through C403.4.3.3. Hydronic heating systems comprised of multiple-packaged boilers and designed to deliver conditioned water or steam into a common distribution system shall include automatic controls configured to sequence operation of the boilers. Hydronic heating systems composed of a single boiler and greater than 500,000 Btu/h (146.5 kW) input design capacity shall include either a multistaged or modulating burner.

C403.5 Economizers (Prescriptive). Economizers shall comply with Sections C403.5.1 through C403.5.5. An air or water economizer shall be provided for the following cooling systems:

1. Chilled water systems with a total cooling capacity, less cooling capacity provided with air economizers, as specified in Table C403.5(1).
2. Individual fan systems with cooling capacity greater than or equal to 54,000 Btu/h (15.8 kW) in buildings having other than a *Group R* occupancy, The total supply capacity of all fan cooling units not provided with economizers shall not exceed 20 percent of the total supply capacity of all fan cooling units in the building or 300,000 Btu/h (88 kW), whichever is greater.
3. Individual fan systems with cooling capacity greater than or equal to 270,000 Btu/h (79.1 kW) in buildings having a *Group R* occupancy. The total supply capacity of all fan cooling units not provided with economizers shall not exceed 20 percent of the total supply capacity of all fan cooling units in the building or 1,500,000 Btu/h (440 kW), whichever is greater.

Exceptions: Economizers are not required for the following systems.

1. Individual fan systems not served by chilled water for buildings located in *Climate Zones* 1A and 1B.
2. Where more than 25 percent of the air designed to be supplied by the system is to spaces that are designed to be humidified above 35°F (1.7°C) dew-point temperature to satisfy process needs.
3. Systems expected to operate less than 20 hours per week.
4. Systems serving supermarket areas with open refrigerated casework.
5. Where the cooling efficiency is greater than or equal to the efficiency requirements in Table C403.5(2).
6. Systems that include a heat recovery system in accordance with Section C403.9.5.

C403.5.5 Economizer fault detection and diagnostics (Mandatory). Air-cooled unitary direct-expansion units listed in Tables C403.3.2(1) through C403.3.2(3) and variable refrigerant flow (VRF) units that are equipped with an economizer in accordance with Sections C403.5 through C403.5.4 shall include a fault detection and diagnostics system complying with the following:

1. The following temperature sensors shall be permanently installed to monitor system operation:
 - 1.1. Outside air.
 - 1.2. Supply air.
 - 1.3. Return air.
2. Temperature sensors shall have an accuracy of $\pm 2^{\circ}\text{F}$ (1.1°C) over the range of 40°F to 80°F (4°C to 26.7°C).
3. Refrigerant pressure sensors, where used, shall have an accuracy of ± 3 percent of full scale.
4. The unit controller shall be configured to provide system status by indicating the following:
 - 4.1. Free cooling available.
 - 4.2. Economizer enabled.
 - 4.3. Compressor enabled.

- 4.4. Heating enabled.
- 4.5. Mixed air low limit cycle active.
- 4.6. The current value of each sensor.
- 5. The unit controller shall be capable of manually initiating each operating mode so that the operation of compressors, economizers, fans and the heating system can be independently tested and verified.
- 6. The unit shall be configured to report faults to a fault management application available for access by day-to-day operating or service personnel, or annunciated locally on zone thermostats.
- 7. The fault detection and diagnostics system shall be configured to detect the following faults:
 - 7.1. Air temperature sensor failure/fault.
 - 7.2. Not economizing when the unit should be economizing.
 - 7.3. Economizing when the unit should not be economizing.
 - 7.4. Damper not modulating.
 - 7.5. Excess outdoor air.

C403.7.1 Demand control ventilation (Mandatory). Demand control ventilation (DCV) shall be provided for spaces larger than 500 square feet (46.5 m²) and with an average occupant load of 25 people or greater per 1,000 square feet (93 m²) of floor area, as established in Table 403.3.1.1 of the International Mechanical Code, and served by systems with one or more of the following:

- 1. An air-side economizer.
- 2. Automatic modulating control of the outdoor air damper.
- 3. A design outdoor airflow greater than 3,000 cfm (1416 L/s).

Exceptions:

- 1. Systems with energy recovery complying with Section C403.7.4.
- 2. Multiple-zone systems without direct digital control of individual zones communicating with a central control panel.
- 3. Systems with a design outdoor airflow less than 1,200 cfm (566 L/s).
- 4. Spaces where the supply airflow rate minus any makeup or outgoing transfer air requirement is less than 1,200 cfm (566 L/s).
- 5. Ventilation provided only for process loads.

C403.7.2 Enclosed parking garage ventilation controls (Mandatory). Enclosed parking garages used for storing or handling automobiles operating under their own power shall employ contamination-sensing devices and automatic controls configured to stage fans or modulate fan average airflow rates to 50 percent or less of design capacity, or intermittently operate fans less than 20 percent of the occupied time or as required to maintain acceptable contaminant levels in accordance with International Mechanical Code provisions. Failure of contamination-sensing devices shall cause the exhaust fans to operate continuously at design airflow.

Exceptions:

- 1. Garages with a total exhaust capacity less than 22,500 cfm (10 620 L/s) with ventilation systems that do not utilize heating or mechanical cooling.
- 2. Garages that have a garage area to ventilation system motor nameplate power ratio that exceeds 1125 cfm/hp (710 L/s/kW) and do not utilize heating or mechanical cooling.

C403.7.3 Ventilation air heating control (Mandatory). Units that provide ventilation air to multiple zones and operate in conjunction with zone heating and cooling systems shall not use heating or heat recovery to warm

supply air to a temperature greater than 60°F (16°C) when representative building loads or outdoor air temperatures indicate that the majority of zones require cooling.

C403.7.4 Energy recovery ventilation systems (Mandatory). Where the supply airflow rate of a fan system exceeds the values specified in Tables C403.7.4(1) and C403.7.4(2), the system shall include an energy recovery system. The energy recovery system shall be configured to provide a change in the enthalpy of the outdoor air supply of not less than 50 percent of the difference between the outdoor air and return air enthalpies, at design conditions. Where an air economizer is required, the energy recovery system shall include a bypass or controls that permit operation of the economizer as required by Section C403.5.

Exception: An energy recovery ventilation system shall not be required in any of the following conditions:

1. Where energy recovery systems are prohibited by the International Mechanical Code .
2. Laboratory fume hood systems that include not fewer than one of the following features:
 - 2.1. Variable-air-volume hood exhaust and room supply systems configured to reduce exhaust and makeup air volume to 50 percent or less of design values.
 - 2.2. Direct makeup (auxiliary) air supply equal to or greater than 75 percent of the exhaust rate, heated not warmer than 2°F (1.1°C) above room setpoint, cooled to not cooler than 3°F (1.7°C) below room setpoint, with no humidification added, and no simultaneous heating and cooling used for dehumidification control.
3. Systems serving spaces that are heated to less than 60°F (15.5°C) and that are not cooled.
4. Where more than 60 percent of the outdoor heating energy is provided from site-recovered or site-solar energy.
5. Heating energy recovery in *Climate Zones* 1 and 2.
6. Cooling energy recovery in *Climate Zones* 3C, 4C, 5B, 5C, 6B, 7 and 8.
7. Systems requiring dehumidification that employ energy recovery in series with the cooling coil.
8. Where the largest source of air exhausted at a single location at the building exterior is less than 75 percent of the design *outdoor air* flow rate.
9. Systems expected to operate less than 20 hours per week at the *outdoor air* percentage covered by Table C403.7.4(1).
10. Systems exhausting toxic, flammable, paint or corrosive fumes or dust.
11. Commercial kitchen hoods used for collecting and removing grease vapors and smoke.

C403.7.5 Kitchen exhaust systems (Mandatory). Replacement air introduced directly into the exhaust hood cavity shall not be greater than 10 percent of the hood exhaust airflow rate. Conditioned supply air delivered to any space shall not exceed the greater of the following:

1. The ventilation rate required to meet the space heating or cooling load.
2. The hood exhaust flow minus the available transfer air from adjacent space where available transfer air is considered to be that portion of outdoor ventilation air not required to satisfy other exhaust needs, such as restrooms, and not required to maintain pressurization of adjacent spaces.

Where total kitchen hood exhaust airflow rate is greater than 5,000 cfm (2360 L/s), each hood shall be a factory-built commercial exhaust hood listed by a nationally recognized testing laboratory in compliance with UL 710. Each hood shall have a maximum exhaust rate as specified in Table C403.7.5 and shall comply with one of the following:

1. Not less than 50 percent of all replacement air shall be transfer air that would otherwise be exhausted.

2. Demand ventilation systems on not less than 75 percent of the exhaust air that are configured to provide not less than a 50-percent reduction in exhaust and replacement air system airflow rates, including controls necessary to modulate airflow in response to appliance operation and to maintain full capture and containment of smoke, effluent and combustion products during cooking and idle.
3. Listed energy recovery devices with a sensible heat recovery effectiveness of not less than 40 percent on not less than 50 percent of the total exhaust airflow.

Where a single hood, or hood section, is installed over appliances with different duty ratings, the maximum allowable flow rate for the hood or hood section shall be based on the requirements for the highest appliance duty rating under the hood or hood section.

Exception: Where not less than 75 percent of all the replacement air is transfer air that would otherwise be exhausted.

C403.7.6 Automatic control of HVAC systems serving guestrooms (Mandatory). In *Group R-1* buildings containing more than 50 guestrooms, each guestroom shall be provided with controls complying with the provisions of Sections C403.7.6.1 and C403.7.6.2. Card key controls comply with these requirements.

C403.7.7 Shutoff dampers (Mandatory). Outdoor air intake and exhaust openings and stairway and shaft vents shall be provided with Class I motorized dampers. The dampers shall have an air leakage rate not greater than 4 cfm/ft² (20.3 L/s • m²) of damper surface area at 1.0 inch water gauge (249 Pa) and shall be labeled by an approved agency when tested in accordance with AMCA 500D for such purpose.

Outdoor air intake and exhaust dampers shall be installed with automatic controls configured to close when the systems or spaces served are not in use or during unoccupied period warm-up and setback operation, unless the systems served require outdoor or exhaust air in accordance with the International Mechanical Code or the dampers are opened to provide intentional economizer cooling.

Stairway and shaft vent dampers shall be installed with automatic controls configured to open upon the activation of any fire alarm initiating device of the building's fire alarm system or the interruption of power to the damper.

Exception: Nonmotorized gravity dampers shall be an alternative to motorized dampers for exhaust and relief openings as follows:

1. In buildings less than three stories in height above grade plane.
2. In buildings of any height located in *Climate Zones* 1, 2 or 3.
3. Where the design exhaust capacity is not greater than 300 cfm (142 L/s).

Nonmotorized gravity dampers shall have an air leakage rate not greater than 20 cfm/ft² (101.6 L/s • m²) where not less than 24 inches (610 mm) in either dimension and 40 cfm/ft² (203.2 L/s • m²) where less than 24 inches (610 mm) in either dimension. The rate of air leakage shall be determined at 1.0 inch water gauge (249 Pa) when tested in accordance with AMCA 500D for such purpose. The dampers shall be labeled by an approved agency.

C403.8.1 Allowable fan horsepower (Mandatory). Each HVAC system having a total fan system motor nameplate horsepower exceeding 5 hp (3.7 kW) at fan system design conditions shall not exceed the allowable *fan system motor nameplate hp* (Option 1) or *fan system bhp* (Option 2) shown in Table C403.8.1(1). This includes supply fans, exhaust fans, return/relief fans, and fan-powered terminal units associated with systems providing heating or cooling capability. Single-zone variable air volume systems shall comply with the constant volume fan power limitation.

Exceptions:

1. Hospital, vivarium and laboratory systems that utilize flow control devices on exhaust or return to maintain space pressure relationships necessary for occupant health and safety or environmental control shall be permitted to use variable volume fan power limitation.
2. Individual exhaust fans with motor nameplate horsepower of 1 hp (0.746 kW) or less are exempt from the allowable fan horsepower requirement.

C403.8.2 Motor nameplate horsepower (Mandatory). For each fan, the fan brake horsepower shall be indicated on the construction documents and the selected motor shall be not larger than the first available motor size greater than the following:

1. For fans less than 6 bhp (4413 W), 1.5 times the fan brake horsepower.
2. For fans 6 bhp (4413 W) and larger, 1.3 times the fan brake horsepower.
3. Systems complying with Section C403.8.1 *fan system motor nameplate hp* (Option 1).

Exception: Fans with motor nameplate horsepower less than 1 hp (746 W) are exempt from this section.

C403.8.3 Fan efficiency (Mandatory). Fans shall have a fan efficiency grade (FEG) of not less than 67, as determined in accordance with AMCA 205 by an *approved*, independent testing laboratory and labeled by the manufacturer. The total efficiency of the fan at the design point of operation shall be within 15 percentage points of the maximum total efficiency of the fan.

Exception: The following fans are not required to have a fan efficiency grade:

1. Fans of 5 hp (3.7 kW) or less as follows:
 - 1.1. Individual fans with a motor nameplate horsepower of 5 hp (3.7 kW) or less, unless Exception 1.2 applies.
 - 1.2. Multiple fans in series or parallel that have a combined motor nameplate horsepower of 5 hp (3.7 kW) or less and are operated as the functional equivalent of a single fan.
2. Fans that are part of equipment covered in Section C403.3.2.
3. Fans included in an equipment package certified by an *approved agency* for air or energy performance.
4. Powered wall/roof ventilators.
5. Fans outside the scope of AMCA 205.
6. Fans that are intended to operate only during emergency conditions.

C403.8.4 Fractional hp fan motors (Mandatory). Motors for fans that are not less than $\frac{1}{12}$ hp (0.082 kW) and less than 1 hp (0.746 kW) shall be electronically commutated motors or shall have a minimum motor efficiency of 70 percent, rated in accordance with DOE 10 CFR 431. These motors shall have the means to adjust motor speed for either balancing or remote control. The use of belt-driven fans to sheave adjustments for airflow balancing instead of a varying motor speed shall be permitted.

Exceptions: The following motors are not required to comply with this section

1. Motors in the airstream within fan coils and terminal units that only provide heating to the space served.
2. Motors in space-conditioning equipment that comply with Section C403.3.2 or Sections C403.8.1. through C403.8.3.
3. Motors that comply with Section C405.7.

C403.10.1 Walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers (Mandatory). *Refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with this section. Walk-in coolers and walk-in freezers that are neither site assembled nor site constructed shall comply with the following:*

1. Be equipped with automatic door-closers that firmly close walk-in doors that have been closed to within 1 inch (25 mm) of full closure.
Exception: Automatic closers are not required for doors more than 45 inches (1143 mm) in width or more than 7 feet (2134 mm) in height.
2. Doorways shall have strip doors, curtains, spring-hinged doors or other method of minimizing infiltration when doors are open.
3. *Walk-in coolers and refrigerated warehouse coolers* shall contain wall, ceiling, and door insulation of not less than R-25 and *walk-in freezers and refrigerated warehouse freezers* shall contain wall, ceiling and door insulation of not less than R-32.
Exception: Glazed portions of doors or structural members need not be insulated.
4. *Walk-in freezers* shall contain floor insulation of not less than R-28.
5. Transparent reach-in doors for *walk-in freezers* and windows in *walk-in freezer* doors shall be of triple-pane glass, either filled with inert gas or with heat-reflective treated glass.
6. Windows and transparent reach-in doors for *walk-in coolers* shall be of double-pane or triple-pane, inert gas-filled, heat-reflective treated glass.
7. Evaporator fan motors that are less than 1 hp (0.746 kW) and less than 460 volts shall use electronically commutated motors, brushless direct-current motors, or 3-phase motors.
8. Condenser fan motors that are less than 1 hp (0.746 kW) shall use electronically commutated motors, permanent split capacitor-type motors or 3-phase motors.
9. Where antisweat heaters without antisweat heater controls are provided, they shall have a total door rail, glass and frame heater power draw of not more than 7.1 W/ft² (76 W/m²) of door opening for *walk-in freezers* and 3.0 W/ft² (32 W/m²) of door opening for *walk-in coolers*.
10. Where antisweat heater controls are provided, they shall reduce the energy use of the antisweat heater as a function of the relative humidity in the air outside the door or to the condensation on the inner glass pane.
11. Lights in *walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers* shall either use light sources with an efficacy of not less than 40 lumens per watt, including ballast losses, or shall use light sources with an efficacy of not less than 40 lumens per watt, including ballast losses, in conjunction with a device that turns off the lights within 15 minutes when the space is not occupied.

C403.10.2 Walk-in coolers and walk-in freezers (Mandatory). Site-assembled or site-constructed *walk-in coolers and walk-in freezers* shall comply with the following:

1. Automatic door closers shall be provided that fully close walk-in doors that have been closed to within 1 inch (25 mm) of full closure.
Exception: Closers are not required for doors more than 45 inches (1143 mm) in width or more than 7 feet (2134 mm) in height.
2. Doorways shall be provided with strip doors, curtains, spring-hinged doors or other method of minimizing infiltration when the doors are open.
3. Walls shall be provided with insulation having a thermal resistance of not less than R-25, ceilings shall be provided with insulation having a thermal resistance of not less than R-25 and doors of *walk-in coolers and walk-in freezers* shall be provided with insulation having a thermal resistance of not less than R-32.

Exception: Insulation is not required for glazed portions of doors or at structural members

associated with the walls, ceiling or door frame.

4. The floor of *walk-in freezers* shall be provided with insulation having a thermal resistance of not less than R-28.
5. Transparent reach-in doors for and windows in opaque *walk-in freezer* doors shall be provided with triple-pane glass having the interstitial spaces filled with inert gas or provided with heat-reflective treated glass.
6. Transparent reach-in doors for and windows in opaque *walk-in cooler* doors shall be double-pane heat-reflective treated glass having the interstitial space gas filled.
7. Evaporator fan motors that are less than 1 hp (0.746 kW) and less than 460 volts shall be electronically commutated motors or 3-phase motors.
8. Condenser fan motors that are less than 1 hp (0.746 kW) in capacity shall be of the electronically commutated or permanent split capacitor-type or shall be 3-phase motors.
Exception: Fan motors in *walk-in coolers* and *walk-in freezers* combined in a single enclosure greater than 3,000 square feet (279 m²) in floor area are exempt.
9. Antisweat heaters that are not provided with anti-sweat heater controls shall have a total door rail, glass and frame heater power draw not greater than 7.1 W/ft² (76 W/m²) of door opening for *walk-in freezers*, and not greater than 3.0 W/ft² (32 W/m²) of door opening for *walk-in coolers*.
10. Antisweat heater controls shall be configured to reduce the energy use of the antisweat heater as a function of the relative humidity in the air outside the door or to the condensation on the inner glass pane.
11. Light sources shall have an efficacy of not less than 40 lumens per Watt, including any ballast losses, or shall be provided with a device that automatically turns off the lights within 15 minutes of when the *walk-in cooler* or *walk-in freezer* was last occupied.

C403.10.2.1 Performance standards (Mandatory). Effective January 1, 2020, *walk-in coolers* and *walk-in freezers* shall meet the requirements of Tables C403.10.2.1(1), C403.10.2.1(2) and C403.10.2.1(3).

C403.10.3 Refrigerated display cases (Mandatory). Site-assembled or site-constructed refrigerated display cases shall comply with the following:

1. Lighting and glass doors in refrigerated display cases shall be controlled by one of the following:
 - 1.1. Time-switch controls to turn off lights during nonbusiness hours. Timed overrides for display cases shall turn the lights on for up to 1 hour and shall automatically time out to turn the lights off.
 - 1.2. Motion sensor controls on each display case section that reduce lighting power by not less than 50 percent within 3 minutes after the area within the sensor range is vacated.
2. Low-temperature display cases shall incorporate temperature-based defrost termination control with a time-limit default. The defrost cycle shall terminate first on an upper temperature limit breach and second upon a time limit breach.
3. Antisweat heater controls shall reduce the energy use of the antisweat heater as a function of the relative humidity in the air outside the door or to the condensation on the inner glass pane.

C403.11.1 Duct and plenum insulation and sealing (Mandatory). Supply and return air ducts and plenums shall be insulated with not less than R-6 insulation where located in unconditioned spaces and where located outside the building with not less than R-8 insulation in *Climate Zones* 1 through 4 and not less than R-12 insulation in *Climate Zones* 5 through 8. Where located within a building envelope assembly, the duct or plenum shall be separated from the building exterior or unconditioned or exempt spaces by not less than R-8 insulation in *Climate Zones* 1 through 4 and not less than R-12 insulation in *Climate Zones* 5 through 8.

Exceptions:

1. Where located within equipment.
2. Where the design temperature difference between the interior and exterior of the duct or plenum is not greater than 15°F (8°C).

Ducts, air handlers and filter boxes shall be sealed. Joints and seams shall comply with Section 603.9 of the International Mechanical Code.

C403.11.2 Duct construction (Mandatory). Ductwork shall be constructed and erected in accordance with the International Mechanical Code .

C403.11.2.1 Low-pressure duct systems (Mandatory). Longitudinal and transverse joints, seams and connections of supply and return ducts operating at a static pressure less than or equal to 2 inches water gauge (w.g.) (498 Pa) shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mas-tic-plus-embedded-fabric systems or tapes installed in accordance with the manufacturer's instructions. Pressure classifications specific to the duct system shall be clearly indicated on the construction documents in accordance with the International Mechanical Code .

Exception: Locking-type longitudinal joints and seams, other than the snap-lock and button-lock types, need not be sealed as specified in this section.

C403.11.2.2 Medium-pressure duct systems (Mandatory). Ducts and plenums designed to operate at a static pressure greater than 2 inches water gauge (w.g.) (498 Pa) but less than 3 inches w.g. (747 Pa) shall be insulated and sealed in accordance with Section C403.11.1. Pressure classifications specific to the duct system shall be clearly indicated on the construction documents in accordance with the International Mechanical Code .

C403.11.2.3 High-pressure duct systems (Mandatory). Ducts and plenums designed to operate at static pressures equal to or greater than 3 inches water gauge (747 Pa) shall be insulated and sealed in accordance with Section C403.11.1. In addition, ducts and plenums shall be leak tested in accordance with the SMACNA HVAC Air Duct Leakage Test Manual and shown to have a rate of air leakage (CL) less than or equal to 4.0 as determined in accordance with Equation 4-8.

$$CL = F/P^{0.65}$$

$$CL = F/P^{0.65}$$

(Equation 4-8)

where:

F = The measured leakage rate in cfm per 100 square feet of duct surface.

P = The static pressure of the test.

Documentation shall be furnished by the designer demonstrating that representative sections totaling not less than 25 percent of the duct area have been tested and that all tested sections comply with the requirements of this section.

C403.11.3 Piping insulation (Mandatory). Piping serving as part of a heating or cooling system shall be thermally insulated in accordance with Table C403.11.3.

Exceptions:

1. Factory-installed piping within HVAC equipment tested and rated in accordance with a test procedure referenced by this code.
2. Factory-installed piping within room fan-coils and unit ventilators tested and rated according to AHRI 440 (except that the sampling and variation provisions of Section 6.5 shall not apply) and AHRI 840, respectively.

3. Piping that conveys fluids that have a design operating temperature range between 60°F (15°C) and 105°F (41°C).
4. Piping that conveys fluids that have not been heated or cooled through the use of fossil fuels or electric power.
5. Strainers, control valves, and balancing valves associated with piping 1 inch (25 mm) or less in diameter.
6. Direct buried piping that conveys fluids at or below 60°F (15°C).

C403.11.3.1 Protection of piping insulation (Mandatory). Piping insulation exposed to the weather shall be protected from damage, including that caused by sunlight, moisture, equipment maintenance and wind, and shall provide shielding from solar radiation that can cause degradation of the material. Adhesive tape shall not be permitted.

C403.12 Mechanical systems located outside of the building thermal envelope (Mandatory). Mechanical systems providing heat outside of the thermal envelope of a building shall comply with Sections C403.12.1 through C403.12.3.

SECTION C404 SERVICE WATER HEATING (MANDATORY)

C404.9 Energy consumption of pools and permanent spas (Mandatory). The energy consumption of pools and permanent spas shall be controlled by the requirements in Sections C404.9.1 through C404.9.3.

C404.10 Energy consumption of portable spas (Mandatory). The energy consumption of electric-powered portable spas shall be controlled by the requirements of APSP 14.

C405.1 General (Mandatory). This section covers lighting system controls, the maximum lighting power for interior and exterior applications and electrical energy consumption.

Dwelling units within multifamily buildings shall comply with Section R404.1. All other *dwelling units* shall comply with Section R404.1, or with Sections C405.2.4 and C405.3. *Sleeping units* shall comply with Section C405.2.4, and with Section R404.1 or C405.3. Lighting installed in walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with the lighting requirements of Section C403.10.1 or C403.10.2.

C405.2 Lighting controls (Mandatory). Lighting systems shall be provided with controls that comply with one of the following.

1. Lighting controls as specified in Sections C405.2.1 through C405.2.6.
2. Luminaire level lighting controls (LLLC) and lighting controls as specified in Sections C405.2.1, C405.2.4 and C405.2.5. The LLLC luminaire shall be independently capable of:
 - 2.1. Monitoring occupant activity to brighten or dim lighting when occupied or unoccupied, respectively.
 - 2.2. Monitoring ambient light, both electric light and daylight, and brighten or dim artificial light to maintain desired light level.
 - 2.3. For each control strategy, configuration and reconfiguration of performance parameters including; bright and dim setpoints, timeouts, dimming fade rates, sensor sensitivity adjustments, and wireless zoning configurations.

Exceptions: Lighting controls are not required for the following:

1. Areas designated as security or emergency areas that are required to be continuously lighted.

2. Interior exit stairways, interior exit ramps and exit passageways.
3. Emergency egress lighting that is normally off.

C405.3 Interior lighting power requirements (Prescriptive). A building complies with this section where its total connected interior lighting power calculated under Section C405.3.1 is not greater than the interior lighting power allowance calculated under Section C405.3.2.

C405.4 Exterior lighting power requirements (Mandatory). The total connected exterior lighting power calculated in accordance with Section C405.4.1 shall be not greater than the exterior lighting power allowance calculated in accordance with Section C405.4.2.

C405.4.3 Gas lighting (Mandatory). Gas-fired lighting appliances shall not be equipped with continuously burning pilot ignition systems.

C405.5 Dwelling electrical meter (Mandatory). Each dwelling unit located in a *Group R-2* building shall have a separate electrical meter.

C405.6 Electrical transformers (Mandatory). Low-voltage dry-type distribution electric transformers shall meet the minimum efficiency requirements of Table C405.6 as tested and rated in accordance with the test procedure listed in DOE 10 CFR 431. The efficiency shall be verified through certification under an approved certification program or, where a certification program does not exist, the equipment efficiency ratings shall be supported by data furnished by the transformer manufacturer.

Exceptions: The following transformers are exempt:

1. Transformers that meet the *Energy Policy Act of 2005* exclusions based on the DOE 10 CFR 431 definition of special purpose applications.
2. Transformers that meet the *Energy Policy Act of 2005* exclusions that are not to be used in general purpose applications based on information provided in DOE 10 CFR 431.
3. Transformers that meet the *Energy Policy Act of 2005* exclusions with multiple voltage taps where the highest tap is not less than 20 percent more than the lowest tap.
4. Drive transformers.
5. Rectifier transformers.
6. Auto-transformers.
7. Uninterruptible power system transformers.
8. Impedance transformers.
9. Regulating transformers.
10. Sealed and nonventilating transformers.
11. Machine tool transformers.
12. Welding transformers.
13. Grounding transformers.
14. Testing transformers.

C405.7 Electric (Mandatory). Electric motors shall meet the minimum efficiency requirements of Tables C405.7(1) through C405.7(4) when tested and rated in accordance with the DOE 10 CFR 431. The efficiency shall be verified through certification under an approved certification program or, where a certification program does not exist, the equipment efficiency ratings shall be supported by data furnished by the motor manufacturer.

Exception: The standards in this section shall not apply to the following exempt electric motors:

1. Air-over electric motors.

2. Component sets of an electric motor.
3. Liquid-cooled electric motors.
4. Submersible electric motors.
5. Inverter-only electric motors.

Proposal # 4192

CE42-19 Part I

CE42-19 Part II

IECC: R102.1.1 (IRC N1101.4), R401.3 (IRC N1101.14), R402.1 (IRC N1102.1), R402.2 (IRC N1102.2), R402.3 (IRC N1102.3), R402.4 (IRC N1102.4), R402.5 (IRC N1102.5), R403.1 (IRC N1103.1), R403.1.2 (IRC N1103.1.2), R403.3.1 (IRC N1103.3.1), R403.3.2 (IRC N1103.3.2), R403.3.3 (IRC N1103.3.3), R403.3.4 (IRC N1103.3.4), R403.3.5 (IRC N1103.3.5), R403.4 (IRC N1103.4), R403.5.1 (IRC N1103.5.1), R403.5.3 (IRC N1103.5.3), R403.6 (IRC N1103.6), R403.7 (IRC N1103.7), R403.8 (IRC N1103.8), R403.9 (IRC N1103.9), R403.10 (IRC N1103.10), R403.11 (IRC N1103.11), R404.1 (IRC N1104.1), R404.1.1 (IRC N1104.1.1) R405 (N1105), R405.2 (IRC N1105.2), TABLE R405.2 (IRC N1105.2) (New), R405.3 (IRC N1105.3), R406 (IRC N1106), R406.2 (IRC N1106.2), TABLE R406.2 (IRC N1106.2) (New), R406.3 (IRC N1106.3), R406.3.1 (IRC N1105.3.1), R406.3.2 (IRC N1106.3.2), TABLE R406.4 (IRC N1106.4)

Proponent: David Collins, SEHPCAC, representing SEHPCAC (SEHPCAC@iccsafe.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Energy Conservation Code

Revise as follows:

R102.1.1 (IRC N1101.4) Above code programs. The *code official* or other authority having jurisdiction shall be permitted to deem a national, state or local energy-efficiency program to exceed the energy efficiency required by this code. *Buildings approved* in writing by such an energy-efficiency program shall be considered to be in compliance with this code. The requirements identified as “mandatory” in ~~Chapter 4~~ Table R405.2 shall be met.

R401.2 (IRC N1101.13) Compliance. Projects shall comply with one of the following:

1. Sections R401 through R404.
2. Section R405. ~~and the provisions of Sections R401 through R404 indicated as “Mandatory”~~
3. The energy rating index (ERI) approach in Section R406.

R401.3 (IRC N1101.14) Certificate (~~Mandatory~~). A permanent certificate shall be completed by the builder or other *approved* party and posted on a wall in the space where the furnace is located, a utility room or an *approved* location inside the *building*. Where located on an electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label or other required labels. The certificate shall indicate the predominant *R*-values of insulation installed in or on ceilings, roofs, walls, foundation components such as slabs, *basement walls*, crawl space walls and floors and ducts outside *conditioned spaces*; *U*-factors of fenestration and the *solar heat gain coefficient* (SHGC) of fenestration, and the results from any required duct system and *building* envelope air leakage testing performed on the *building*. Where there is more than one value for each component, the certificate shall indicate the value covering the largest area. The certificate shall indicate the types and efficiencies of heating, cooling and service water heating equipment. Where a gas-fired unvented room heater, electric furnace or baseboard electric heater is installed in the residence, the certificate shall indicate “gas-fired unvented room heater,” “electric furnace” or “baseboard electric heater,” as appropriate. An efficiency shall not be indicated for gas-fired unvented room heaters, electric furnaces and electric baseboard heaters.

R402.1 (IRC N1102.1) General (~~Prescriptive~~). The *building thermal envelope* shall comply with the requirements of Sections R402.1.1 through R402.1.5.

Exceptions:

1. The following low-energy buildings, or portions thereof, separated from the remainder of the building by *building thermal envelope* assemblies complying with this section shall be exempt

from the *building thermal envelope* provisions of Section R402.

- 1.1. Those with a peak design rate of energy usage less than 3.4 Btu/h · ft² (10.7 W/m²) or 1.0 watt/ft² of floor area for space-conditioning purposes.
- 1.2. Those that do not contain *conditioned space*.
2. Log homes designed in accordance with ICC 400.

R402.2 (IRC N1102.2) Specific insulation requirements (Prescriptive). In addition to the requirements of Section R402.1, insulation shall meet the specific requirements of Sections R402.2.1 through R402.2.13.

R402.3 (IRC N1102.3) Fenestration (Prescriptive). In addition to the requirements of Section R402, fenestration shall comply with Sections R402.3.1 through R402.3.5.

R402.4 (IRC N1102.4) Air leakage (Mandatory). The *building thermal envelope* shall be constructed to limit air leakage in accordance with the requirements of Sections R402.4.1 through R402.4.5.

R402.5 (IRC N1102.5) Maximum fenestration U-factor and SHGC (Mandatory). The area-weighted average maximum fenestration U-factor permitted using tradeoffs from Section R402.1.5 or R405 shall be 0.48 in *Climate Zones* 4 and 5 and 0.40 in *Climate Zones* 6 through 8 for vertical fenestration, and 0.75 in *Climate Zones* 4 through 8 for skylights. The area-weighted average maximum fenestration SHGC permitted using tradeoffs from Section R405 in *Climate Zones* 1 through 3 shall be 0.50.

R403.1 (IRC N1103.1) Controls (Mandatory). Not less than one thermostat shall be provided for each separate heating and cooling system.

R403.1.2 (IRC N1103.1.2) Heat pump supplementary heat (Mandatory). Heat pumps having supplementary electric-resistance heat shall have controls that, except during defrost, prevent supplemental heat operation when the heat pump compressor can meet the heating load.

R403.3.1 (IRC N1103.3.1) Insulation (Prescriptive). Supply and return ducts in attics shall be insulated to an R-value of not less than R-8 for ducts 3 inches (76 mm) in diameter and larger and not less than R-6 for ducts smaller than 3 inches (76 mm) in diameter. Supply and return ducts in other portions of the *building* shall be insulated to not less than R-6 for ducts 3 inches (76 mm) in diameter and not less than R-4.2 for ducts smaller than 3 inches (76 mm) in diameter.

Exception: Ducts or portions thereof located completely inside the *building thermal envelope*.

R403.3.2 (IRC N1103.3.2) Sealing (Mandatory). Ducts, air handlers and filter boxes shall be sealed. Joints and seams shall comply with either the International Mechanical Code or International Residential Code, as applicable.

R403.3.3 (IRC N1103.3.3) Duct testing (Mandatory). Ducts shall be pressure tested to determine air leakage by one of the following methods:

1. Rough-in test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the system, including the manufacturer's air handler enclosure if installed at the time of the test. Registers shall be taped or otherwise sealed during the test.
2. Postconstruction test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. Registers shall be taped or otherwise sealed during the test.

Exceptions:

1. A duct air-leakage test shall not be required where the ducts and air handlers are located

entirely within the *building thermal envelope*.

2. A duct air-leakage test shall not be required for ducts serving heat or energy recovery ventilators that are not integrated with ducts serving heating or cooling systems.

A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*.

R403.3.4 (IRC N1103.3.4) Duct leakage (Prescriptive). The total leakage of the ducts, where measured in accordance with Section R403.3.3, shall be as follows:

1. Rough-in test: The total leakage shall be less than or equal to 4 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m²) of conditioned floor area where the air handler is installed at the time of the test. Where the air handler is not installed at the time of the test, the total leakage shall be less than or equal to 3 cubic feet per minute (85 L/min) per 100 square feet (9.29 m²) of conditioned floor area.
2. Postconstruction test: Total leakage shall be less than or equal to 4 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m²) of conditioned floor area.

R403.3.5 (IRC N1103.3.5) Building cavities (Mandatory). *Building* framing cavities shall not be used as ducts or plenums.

R403.4 (IRC N1103.4) Mechanical system piping insulation (Mandatory). Mechanical system piping capable of carrying fluids greater than 105°F (41°C) or less than 55°F (13°C) shall be insulated to an R-value of not less than R-3.

R403.5.1 (IRC N1103.5.1) Heated water circulation and temperature maintenance systems (Mandatory). Heated water circulation systems shall be in accordance with Section R403.5.1.1. Heat trace temperature maintenance systems shall be in accordance with Section R403.5.1.2. Automatic controls, temperature sensors and pumps shall be *accessible*. Manual controls shall be readily *accessible*.

R403.5.3 (IRC N1103.5.3) Hot water pipe insulation (Prescriptive). Insulation for hot water piping with a thermal resistance, *R*-value, of not less than R-3 shall be applied to the following:

1. Piping ³/₄ inch (19.1 mm) and larger in nominal diameter.
2. Piping serving more than one dwelling unit.
3. Piping located outside the *conditioned space*.
4. Piping from the water heater to a distribution manifold.
5. Piping located under a floor slab.
6. Buried piping.
7. Supply and return piping in recirculation systems other than demand recirculation systems.

R403.6 (IRC N1103.6) Mechanical ventilation (Mandatory). The *building* shall be provided with ventilation that complies with the requirements of the International Residential Code or International Mechanical Code, as applicable, or with other *approved* means of ventilation. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

R403.7 (IRC N1103.7) Equipment sizing and efficiency rating (Mandatory). Heating and cooling equipment shall be sized in accordance with ACCA Manual S based on *building* loads calculated in accordance with ACCA Manual J or other *approved* heating and cooling calculation methodologies. New or replacement heating and cooling equipment shall have an efficiency rating equal to or greater than the minimum required by federal law for the geographic location where the equipment is installed.

R403.8 (IRC N1103.8) Systems serving multiple dwelling units (Mandatory). Systems serving multiple

dwelling units shall comply with Sections C403 and C404 of the International Energy Conservation Code—Commercial Provisions instead of Section R403.

R403.9 (IRC N1103.9) Snow melt and ice system controls (Mandatory). Snow- and ice-melting systems, supplied through energy service to the building, shall include automatic controls capable of shutting off the system when the pavement temperature is greater than 50°F (10°C) and precipitation is not falling, and an automatic or manual control that will allow shutoff when the outdoor temperature is greater than 40°F (4.8°C).

R403.10 (IRC N1103.10) Pools and permanent spa energy consumption (Mandatory). The energy consumption of pools and permanent spas shall be in accordance with Sections R403.10.1 through R403.10.3.

R403.11 (IRC N1103.11) Portable spas (Mandatory). The energy consumption of electric-powered portable spas shall be controlled by the requirements of APSP-14.

R404.1 (IRC N1104.1) Lighting equipment (Mandatory). Not less than 90 percent of the permanently installed lighting fixtures shall contain only high-efficacy lamps.

R404.1.1 (IRC N1104.1.1) Lighting equipment (Mandatory). Fuel gas lighting systems shall not have continuously burning pilot lights.

SECTION R405 (N1105)

SIMULATED PERFORMANCE ALTERNATIVE (PERFORMANCE) TOTAL BUILDING PERFORMANCE

R405.1 (IRC N1105.1) Scope. This section establishes criteria for compliance using simulated energy performance analysis. Such analysis shall include heating, cooling, mechanical ventilation and service water heating energy only.

R405.2 (IRC N1105.2) ~~Mandatory requirements.~~ Performance Based Compliance. ~~Compliance with this section based on total building performance requires that the mandatory provisions identified in Section R401.2 be met.~~ a proposed design meets all of the following:

1. The requirements of the sections indicated within Table R405.2
2. Supply and return ducts not completely inside the *building thermal envelope* shall be insulated to an *R*-value of not less than R-6.
3. An annual energy cost that is less than or equal to the annual energy cost of the *standard reference design*. Energy prices shall be taken from a source approved by the code official, such as the Department of Energy, Energy Information Administration's State Energy Data System Prices and Expenditures reports. Code officials shall be permitted to require time-of-use pricing in energy cost calculations.

Exception: The energy use based on source energy expressed in Btu or Btu per square foot of *conditioned floor area* shall be permitted to be substituted for the energy cost. The source energy multiplier for electricity shall be 3.16. The source energy multiplier for fuels other than electricity shall be 1.1

Add new text as follows:

TABLE R405.2 (IRC N1105.2)

REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE

<u>Section^a</u>	<u>Title</u>
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General	
R401.3	Certificate
Envelope	
R402.1.1	Vapor Retarder
R402.4	Air Leakage
R402.5	Maximum fenestration U-factor and SHGC
Mechanical	
R403.1	Controls
R403.3, except sections R403.3.1, R403.3.4, R403.3.6 and R403.3.7	Ducts
R403.4	Mechanical system piping insulation
R403.5.1	Heated water circulation and temperature maintenance systems
R403.6	Mechanical ventilation
R403.7	Equipment sizing and efficiency rating
R403.8	Systems serving multiple dwelling units
R403.9	Snow melt and ice systems
R403.10	Pools and permanent spa energy consumption
R403.11	Portable spas
Electrical Power and Lighting Systems	
R404.1	Lighting equipment

^a Reference to a code section includes all the relative subsections except as indicated in the table.

Delete without substitution:

~~**R405.3 Performance-based compliance.** Compliance based on simulated energy performance requires that a proposed residence (*proposed design*) be shown to have an annual energy cost that is less than or equal to the annual energy cost of the *standard reference design*. Energy prices shall be taken from a source *approved* by the *code official*, such as the Department of Energy, Energy Information Administration's State Energy Data System Prices and Expenditures reports. *Code officials* shall be permitted to require time-of-use pricing in energy cost calculations.~~

~~**Exception:** The energy use based on source energy expressed in Btu or Btu per square foot of *conditioned floor area* shall be permitted to be substituted for the energy cost. The source energy multiplier for electricity shall be 3.16. The source energy multiplier for fuels other than electricity shall be 1.1.~~

Revise as follows:

SECTION R406 (IRC N1106) ENERGY RATING INDEX COMPLIANCE ALTERNATIVE

R406.1 (IRC N1106.1) Scope. This section establishes criteria for compliance using an Energy Rating Index (ERI) analysis.

Delete and substitute as follows:

R406.2 Mandatory requirements. Compliance with this section requires that the provisions identified in Sections R401 through R404 indicated as “Mandatory” and Section R403.5.3 be met. The *building thermal envelope* shall be greater than or equal to levels of efficiency and *Solar Heat Gain Coefficients* in Table 402.1.1 or 402.1.3 of the 2009 International Energy Conservation Code.

Exception: Supply and return ducts not completely inside the *building thermal envelope* shall be insulated to an *R*-value of not less than R-6.

R406.2 ERI Compliance Compliance based on the Energy Rating Index requires that the rated design meets all of the following:

1. The requirements of the sections indicated within Table R406.2
2. Supply and return ducts not completely inside the *building thermal envelope* shall be insulated to an *R*-value of not less than R-6.
3. Maximum energy rating index of Table R406.4

Add new text as follows:

TABLE R406.2 (IRC N1106.2)
REQUIREMENTS FOR ENERGY RATING INDEX

Section^a	Title
General	-
<u>R401.3</u>	<u>Certificate</u>
<u>Building Thermal Envelope</u>	
<u>R402.1.1</u>	<u>Vapor Retarder</u>
<u>R402.4</u>	<u>Air Leakage</u>
<u>R406.3</u>	<u>Building Thermal Envelope</u>
<u>Systems</u>	
<u>R403.1</u>	<u>Controls</u>
<u>R403.3 except sections R403.3.1, R403.3.4, R403.3.6, and R403.3.7</u>	<u>Ducts</u>
<u>R403.4</u>	<u>Mechanical system piping insulation</u>
<u>R403.5.1</u>	<u>Heated water circulation and temperature maintenance systems</u>
<u>R403.6</u>	<u>Mechanical ventilation</u>
<u>R403.7</u>	<u>Equipment sizing and efficiency rating</u>
<u>R403.8</u>	<u>Systems serving multiple dwelling units</u>
<u>R403.9</u>	<u>Snow melt and ice systems</u>
<u>R403.10</u>	<u>Pools and permanent spa energy consumption</u>
<u>R403.11</u>	<u>Portable spas</u>
<u>R403.12</u>	<u>Residential pools and permanent residential spas</u>
<u>Electrical Power and Lighting Systems</u>	
<u>R404.1</u>	<u>Lighting equipment</u>

^a Reference to a code section includes all of the relative subsections except as indicated in the table.

R406.3 (IRC N1106.3) Building Thermal Envelope Building and portions thereof shall comply with Section R406.3.1 or R406.3.2.

R406.3.1 (IRC N1105.3.1) On-site renewables are not included. Where on-site renewable is not included for compliance using the ERI analysis of Section R406.4, the building thermal envelope shall be greater than or equal to levels of efficiency and Solar Heat Gain Coefficients in Table 402.1.1 or 402.1.3 of the 2009 International Energy Conservation Code.

R406.3.2 (IRC N1106.3.2) On-site renewables are included Where on-site renewable energy is included for compliance using the ERI analysis of Section R406.4 the building thermal envelope shall be greater than or equal to the levels of efficiency and SHGC in Table R402.1.2 or Table R402.1.4 of the 2015 International Energy Conservation Code.

Revise as follows:

**TABLE R406.4 (IRC N1106.4)
MAXIMUM ENERGY RATING INDEX**

CLIMATE ZONE	ENERGY RATING INDEX^a
1	57
2	57
3	57
4	62
5	61
6	61
7	58
8	58

~~a. Where on-site renewable energy is included for compliance using the ERI analysis of Section R406.4 the building thermal envelope shall be greater than or equal to the levels of efficiency and SHGC in Table R402.1.2 or Table R402.1.4 of the 2015 International Energy Conservation Code.~~

Reason: No technical changes are intended. No advantage to any proprietary interests governed by the code is intended. The intent is strictly to make the IECC more understandable and easier to use, as explained below.

The labels “prescriptive” and “mandatory” are found in the IECC but they are not used consistently and no direction is provided for the intended application of the provisions with such labels. These terms are applied to various section and subsection titles throughout the IECC creating confusion for users of the code. The SEHPCAC reviewed every section of the IECC with the goal of simplifying the code by removing ‘mandatory’ and ‘prescriptive’ labels and finding a better way to communicate distinctions for what is required between the performance and prescriptive paths of the code.

The labels are not requirements and are not enforceable. It is SEHPCAC’s understanding that ‘mandatory’ was intended to mean ‘non-tradeable’ when using performance compliance options, meaning that where the procedures or systems described within the ‘mandatory’ section are included as part of the design, the requirements of that section must be met and it cannot be traded off. “Prescriptive”, on the other hand, was intended to mean “mandatory” when using the prescriptive path, but “tradeable” when using the performance path.

'Mandatory' requirements for the Total Building Performance compliance alternative as they are currently found in the code are identified and made enforceable by the charging language in R401.2 (2) and by reference from R405.2 (Mandatory requirements). "Mandatory" requirements for the Energy Rating Index compliance alternative as they are currently found in the code are identified and made enforceable by the charging language in R406.2 (Mandatory requirements).

This proposal borrows a formatting concept from the City of Seattle using a tabular approach to clearly identify the sections that are non-tradeable ('mandatory') when complying with either of the performance compliance alternatives. Proposed new Table R405.2 lists the section references to all required ('mandatory') measures for this specific compliance path, and proposed new Table R406.2 lists the section references to all required ("mandatory") measures for that specific compliance path. (An identical treatment of the performance path is also being proposed for the IECC-C to maintain consistent application and formatting).

The non-tradeable sections that populate the proposed new Tables R405.2 and R406.2 were identified using the following criteria:

- The section was specifically identified as a mandatory requirement by R401.2 (2) or R406.2.
- The subsection was specifically labeled 'mandatory' in the body of the code (e.g. R403.3.2) even though the parent section was not (R403.3) and other companion subsections were not (e.g. R403.3.1)
- For subsections, the parent section was labeled 'mandatory' and no subsection was labeled otherwise (e.g. R402.4)
- Compliance was required by reference to another code (e.g. R402.1.1)

Where all of a section has been identified as mandatory (e.g. R402.4), just that section number is listed in the table; a tabular footnote explains that all relative subsections are included.

Where subsections are identified as 'prescriptive,' (e.g. R403.3.1), but the parent section or associated subsections are identified as 'mandatory' (e.g. R403.3.2), an exception is provided for the 'prescriptive' subsection in new Tables R405.2 and R406.2 to make clear which subsections apply in each performance compliance alternative.

This reason statement includes a discussion version of new Tables R405.2/R406.2 that features an additional column which identifies what criteria were used to establish the related section's presence in the table. This additional column is not actually proposed for inclusion in the code and is merely for the convenience of the reviewers of the proposal.

Note that the discussion version of new Tables R405.2/R406.2 also features expanded rows (e.g. the R402.4 series) to identify the relevant criteria used to validate their inclusion in the new tables.

Adoption of new Tables R405.2 and R406.2 means that the R401.2 (2) and R406.2 laundry lists of mandatory requirements are no longer needed and that all 'mandatory' and 'prescriptive' labels are no longer needed.

Note that a number of the sections that the SEHPCAC reviewed did not meet the preceding criteria for populating new Tables R405.2 and R406.2 because they were not clearly 'prescriptive' or tradeable. Those sections are not proposed to be added to either new table as part of this proposal. Instead, those sections are proposed to be added to the new tables through separate individual code changes. SEHPCAC has simply called out these provisions to aid the committee's and membership's decision as to whether any of those individual sections is actually 'mandatory' or non-tradeable and appropriate for inclusion in new Tables R405.2 and R406.2.

Finally, a modification to Section R102.1.1 is required with the elimination of the labels identifying “mandatory” provisions.

Section	Title	Reasoning
General		
R401.3	Certificate	Labeled
Envelope		
R402.1.1	Vapor Retarder	References IRC, in which it is required
R402.4	Air Leakage	Labeled
R402.4.1	Building thermal envelope	Under Charging Lang Consist
R402.4.1.1	Installation	Under Charging Lang Consist
R402.4.1.2	Testing	Under Charging Lang Consist
R402.4.2	Fireplaces	Under Charging Lang Consist
R402.4.3	Fenestration air leakage	Under Charging Lang Consist
R402.4.4	Rooms containing fuel burning appliances	Under Charging Lang Consist
R402.4.5	Recessed lighting	Under Charging Lang Consist
R402.5	Maximum fenestration U-factor and SHGC	Included only in Table R405.2 - Labeled
R406.3	Building Thermal Envelope	Included only in Table R406.2 - Specified in Mandatory provisions Section R406.2 and Table R406.4 footnote a
Mechanical		
R403.1	Controls	Labeled
R403.1.1	Programmable thermostat	Under charging lang
R403.1.2	Heat pump supplementary heat	Labeled
R403.3.2	Sealing	Labeled
R403.3.2.1	Sealed air handler	Under charging lang
R403.3.3	Duct testing	Labeled
R403.3.5	Building cavities	Labeled
R403.4	Mechanical system piping insulation	Labeled
R403.4.1	Protection of piping insulation	Under charging lang
R403.5.1	Heated water circulation and temperature maintenance systems	Labeled
R403.5.1.1	Circulation systems	Under charging lang
R403.5.1.2	Heat trace systems	Under charging lang
R403.6	Mechanical ventilation	Labeled
R403.6.1	Whole-house mechanical ventilation system fan efficiency	Under charging lang
R403.7	Equipment sizing and efficiency rating	Labeled
R403.8	Systems serving multiple dwelling units	Labeled

R403.9	Snow melt and ice systems	Labeled
R403.10	Pools and permanent spa energy consumption	Labeled
R403.10.1	Heaters	Under charging lang
R403.10.2	Time switches	Under charging lang
R403.10.3	Covers	Under charging lang
R403.11	Portable spas	Labeled
Lighting		
R404.1	Lighting equipment	Labeled
R404.1.1	Lighting equipment	Labeled

This proposal is submitted by the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at:

<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>
(<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>)

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is a restructuring of information on mandatory provisions, not change to the provisions themselves

Proposal # 4423

CE42-19 Part II

CE43-19

IECC: C401.2, Chapter 6CE (New)

Proponent: Steven Rosenstock, Edison Electric Institute, representing Edison Electric Institute (srosenstock@eei.org)

2018 International Energy Conservation Code

Revise as follows:

C401.2 Application. Commercial buildings shall comply with one of the following:

1. The requirements of ANSI/ASHRAE/IESNA 90.1.
2. The requirements of ANSI/ASHRAE 90.4 for Data Centers.
3. The requirements of Sections C402 through C405 and C408. In addition, commercial buildings shall comply with Section C406 and tenant spaces shall comply with Section C406.1.1.
4. The requirements of Sections C402.5, C403.2, C403.3 through C403.3.2, C403.4 through C403.4.2.3, C403.5.5, C403.7, C403.8.1 through C403.8.4, C403.10.1 through C403.10.3, C403.11, C403.12, C404, C405, C407 and C408. The building energy cost shall be equal to or less than 85 percent of the standard reference design building.

Add new text as follows:

ASHRAE

ASHRAE
1791 Tullie Circle NE
Atlanta GA 30329

90.4-16: Energy Standard for Data Centers-

Reason: ASHRAE Standard 90.4, *Energy Standard for Data Centers*, was published in 2016 and is on continuous maintenance.

It establishes the minimum energy efficiency requirements of data centers for design and construction and for creation of a plan for operation and maintenance, and for utilization of on-site or off-site renewable energy resources.

Data center applications are unlike their commercial building counterparts in two significant ways. First, they include significantly higher plug loads (e.g., computer servers and UPS equipment). Second, they employ rapidly changing technology for the IT equipment and associated power/cooling approaches.

There is also a recognition that current industry modeling tools do not possess all the necessary mathematical models to accurately and appropriately model data center HVAC and electrical equipment design. As a result, demonstrating compliance to the 90.1 Chapter 11 or energy cost budget (ECB) approaches is usually impractical.

Along with ASHRAE 90.1, designers and owners of data centers should have the option to use ANSI/ASHRAE 90.4 as a compliance path.

Bibliography: American Society of Heating, Refrigeration, and Air Conditioning Engineers, *Energy Standard for Data Centers*, July 2016.

https://www.techstreet.com/ashrae/standards/ashrae-90-4-2016?product_id=1922463

Cost Impact: The code change proposal will increase the cost of construction
This proposal increases the costs of data centers due to its higher efficiency requirements.

Analysis: A review of the standard proposed for inclusion in the code, ASHRAE 90.4, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 4729

CE43-19

CE44-19

IECC: C401.1, C401.2, RESNET Chapter 06

Proponent: Gayathri Vijayakumar, Steven Winter Associates, Inc., representing Steven Winter Associates, Inc. (gayathri@swinter.com); Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

C401.1 Scope. The provisions in this chapter are applicable to commercial buildings and their building sites.

C401.2 Application. Commercial buildings shall comply with one of the following:

1. The requirements of ANSI/ASHRAE/IESNA 90.1.
2. The requirements of Sections C402 through C405 and C408. In addition, commercial buildings shall comply with Section C406 and tenant spaces shall comply with Section C406.1.1.

Exception: Dwelling units and sleeping units in Group R-2 buildings shall be deemed to be in compliance with this chapter provided they comply with the Energy Rating Index (ERI) Compliance Alternative in Section R406.

3. The requirements of Sections C402.5, C403.2, C403.3 through C403.3.2, C403.4 through C403.4.2.3, C403.5.5, C403.7, C403.8.1 through C403.8.4, C403.10.1 through C403.10.3, C403.11, C403.12, C404, C405, C407 and C408. The building energy cost shall be equal to or less than 85 percent of the standard reference design building.

Update standard(s) as follows:

RESNET

Residential Energy Services
Network, Inc.
P.O. Box 4561
Oceanside, CA 92052-4561

ANSI/RESNET/ICC ~~301—2014~~ 301—2019: Standard for the Calculation and Labeling of the Energy Performance of Low-rise Residential Buildings Dwelling and Sleeping Units using an Energy Rating Index First Published March 7, 2014—Republished January 2016

Reason: Multifamily buildings (Group R-2) have historically been split between the residential and commercial provisions of the IECC, based on their height, resulting in very different compliance requirements for similar buildings. Prior change proposals seeking to provide consistency for this building type have struggled to find a simple approach. This proposal provides a simple optional alternative for dwelling and sleeping units within these “commercial buildings” to instead meet the same energy efficiency requirements of dwelling and sleeping units under the Residential provisions, specifically section R406, the Energy Rating Index Compliance Alternative. This section R406 still requires compliance with mandatory items, including but not limited to those listed in sections R401 through R404. The other spaces in the building, such as corridors, stairwells, lobbies, community spaces, and sometimes, retail, still are required to comply with the commercial provisions. While this proposal was not possible before now, ANSI/RESNET/ICC 301-2019, which is the Standard for calculating the ERI, has recently expanded its scope to include dwelling and sleeping units in any height building, which means those units in ‘commercial buildings’ are now eligible for an ERI. While efficiency requirements can vary for the same building components, whether you are in the Residential or Commercial provisions, this is the 1st step in providing dwelling units in multifamily buildings the same path to code compliance, regardless of their building

height. This results in a dwelling unit in a 3 story building and the same exact dwelling unit in a 4 story building to both be deemed code compliant, with the same exact building components.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The cost impact depends on the code compliance currently being followed.

For those doing building simulations in accordance with C407, this may present a decrease in the costs to demonstrate compliance.

Those not choosing this alternative will experience no change in costs.

Those choosing this alternative will likely do so if they are able to utilize the same energy rating index being used in other multifamily programs, such as ENERGY STAR and LEED, or utility-sponsored incentive programs that require an ERI, as their code compliance option. This will also therefore result in no additional costs.

Proposal # 4882

CE44-19

CE45-19

IECC: C401.2, C407.3

Proponent: David Renn, PE, SE, City and County of Denver, representing Code Change Committee of Colorado Chapter of ICC (david.renn@denvergov.org)

2018 International Energy Conservation Code

Revise as follows:

C401.2 Application. Commercial buildings shall comply with one of the following:

1. The requirements of ANSI/ASHRAE/IESNA 90.1.
2. The requirements of Sections C402 through C405 and C408. In addition, commercial buildings shall comply with Section C406 and tenant spaces shall comply with Section C406.1.1.
3. The requirements of Sections C402.5, C403.2, C403.3 through C403.3.2, C403.4 through C403.4.2.3, C403.5.5, C403.7, C403.8.1 through C403.8.4, C403.10.1 through C403.10.3, C403.11, C403.12, C404, C405, C407 and C408. ~~The building energy cost shall be equal to or less than 85 percent of the standard reference design building.~~

C407.3 Performance-based compliance. Compliance based on total building performance requires that a proposed building (*proposed design*) be shown to have an annual energy cost that is less than or equal to 85 percent of the annual energy cost of the *standard reference design*. Energy prices shall be taken from a source *approved by the code official*, such as the Department of Energy, Energy Information Administration's *State Energy Price and Expenditure Report*. *Code officials* shall be permitted to require time-of-use pricing in energy cost calculations. The reduction in energy cost of the proposed design associated with *on-site renewable energy* shall be not more than 5 percent of the total energy cost. The amount of renewable energy purchased from off-site sources shall be the same in the *standard reference design* and the *proposed design*.

Exception: Jurisdictions that require site energy (1 kWh = 3413 Btu) rather than energy cost as the metric of comparison.

Reason: The third compliance option in C401.2 is for the total building performance compliance method and requires that the energy cost of the proposed design is less than or equal to 85% of the energy cost of the standard reference design, and requires compliance with C407 (and other sections). However, C407 only requires that the energy cost of the proposed design is less than or equal to the energy cost of the standard reference design. This proposal removes this apparent conflict by moving the 85% requirement to be only in C407. This is a more appropriate section for this requirement since C401.2 is a general section that should just give the required sections that must be complied with for each compliance option. There is no technical change intended by this proposal.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal is only a clarification so there is no change to the cost of construction.

Proposal # 4146

CE45-19

CE46-19

IECC: C401.2, C407.2, C407.3, C407.7 (New)

Proponent: Andrew Klein, representing Self Storage Association (andrew@asklein.com)

2018 International Energy Conservation Code

Revise as follows:

C401.2 Application. Commercial buildings shall comply with one of the following:

1. The requirements of ANSI/ASHRAE/IESNA 90.1.
2. The requirements of Sections C402 through C405 and C408. In addition, commercial buildings shall comply with Section C406 and tenant spaces shall comply with Section C406.1.1.
3. The requirements of Sections C402.5, C403.2, C403.3 through C403.3.2, C403.4 through C403.4.2.3, C403.5.5, C403.7, C403.8.1 through C403.8.4, C403.10.1 through C403.10.3, C403.11, C403.12, C404, C405, C407 and C408. The building energy cost shall be equal to or less than 85 percent of the standard reference design building.
4. The requirements of Sections C407 and C408. The building energy cost shall not exceed 0 percent of the standard reference design building.

C407.2 Mandatory requirements. Compliance with this section requires compliance with Sections C402.5, C403.2, C403.3 through C403.3.2, C403.4 through C403.4.2.3, C403.5.5, C403.7, C403.8.1 through C403.8.4, C403.10.1 through C403.10.3, C403.11, C403.12, C404 and C405.

Exception: Buildings and building sites complying with Item 4 of Section C401.2.

C407.3 Performance-based compliance. Compliance based on total building performance requires that a proposed building (*proposed design*) be shown to have an annual energy cost that is less than or equal to the annual energy cost of the *standard reference design*. Energy prices shall be taken from a source *approved* by the *code official*, such as the Department of Energy, Energy Information Administration's *State Energy Price and Expenditure Report*. *Code officials* shall be permitted to require time-of-use pricing in energy cost calculations. The reduction in energy cost of the proposed design associated with *on-site renewable energy* shall be not more than 5 percent of the total energy cost. The amount of renewable energy purchased from off-site sources shall be the same in the *standard reference design* and the *proposed design*.

Exception Exceptions:

1. Jurisdictions that require site energy (1 kWh = 3413 Btu) rather than energy cost as the metric of comparison.
2. When complying with Item 4 of Section C401.2, the reduction in energy cost of the proposed design associated with on-site renewable energy shall not be limited to 5 percent of the total energy cost.

Add new text as follows:

C407.7 Onsite energy storage. Compliance with Item 4 of Section C401.2 requires an onsite energy storage system with a usable capacity greater than or equal to 1/730 of the annual building energy use calculated without the contribution of on-site renewable energy.

Reason: The purpose of the IECC is the reduction of building energy use for two overall philosophical purposes: (1) reducing strain on infrastructure so that new power plants do not need to be built and (2) the

reduction of greenhouse gas emissions.

The elimination of “backstops” (e.g., minimum insulation levels, minimum equipment efficiency, etc.) is balanced with the net-zero energy requirement and the 12-hour energy storage requirement. Buildings of certain uses have shown success utilizing this net-zero energy approach, with as little as 5-year paybacks for equipment cost.

20 years in the future, when it comes time to begin replacing renewable power generators and storage systems, equipment will be even more efficient, more affordable, and more mainstream.

This approach will spur new designs and technology development that will fast track us in meeting our two overall philosophical goals: reduced grid infrastructure costs and zero greenhouse gas emissions.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This Code Change Proposal provides an alternative path.

Proposal # 5362

CE46-19

CE47-19

IECC: C105.2.6, C202 (New), C401.2, C402.5.7, C406.4, C408, C408(New), Chapter 6CE (New)

Proponent: Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); jim edelson, representing New Buildings Institute (jim@newbuildings.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Add new definition as follows:

ZERO ENERGY PERFORMANCE INDEX (zEPI₂₀₀₄). A value representative of the ratio of energy performance based on the proposed design compared to the average energy performance of a comparative baseline building (ASHRAE 90.1-2004) and its site.

SECTION C401 GENERAL

C401.1 Scope. The provisions in this chapter are applicable to commercial *buildings* and their *building sites*.

Revise as follows:

C401.2 Application. Commercial buildings shall comply with one of the following:

1. The requirements of ANSI/ASHRAE/IESNA 90.1.
2. The requirements of Sections C402 through C405 and ~~C408~~: C409. In addition, commercial buildings shall comply with Section C406 and tenant spaces shall comply with Section C406.1.1.
3. The requirements of Sections C402.5, C403.2, C403.3 through C403.3.2, C403.4 through C403.4.2.3, C403.5.5, C403.7, C403.8.1 through C403.8.4, C403.10.1 through C403.10.3, C403.11, C403.12, C404, C405, C407 and ~~C408~~: C409. The building energy cost shall be equal to or less than 85 percent of the standard reference design building.
4. The requirements of Section C408 to achieve near-net zero energy performance.

Add new text as follows:

C408 **Near Net-Zero Energy Performance**

C408.1 Near Net-Zero Energy Performance Performance-based designs shall demonstrate a zEPI₂₀₀₄ of 30 or below as determined in accordance with Equation xxx-1.

zEPI₂₀₀₄ = 75 x Proposed building performance/Baseline building performance (Equation xxx-1)

where:

Proposed building performance = The proposed building performance in source kBtu for the proposed design of the building and its site calculated in accordance with Section C408.1.1.

Baseline building performance = The baseline building performance in source kBtu for a baseline building and its site in accordance with Section C408.1.1.

75 = a fixed value representing the performance of a baseline building designed to comply with ASHRAE 90.1-2004.

C408.1.1 Modeling methodology The proposed building performance and the baseline building performance of the building and building site shall be calculated in accordance with Appendix G to ASHRAE 90.1, as modified by Sections C408.1.1.1 and C408.1.1.2. The energy use modeling shall include all energy used for building and site functions and anticipated occupancy..

C408.1.1.1 Energy units The building performance calculations in Section G3 of ASHRAE 90.1 shall be based on energy use instead of energy cost. Energy use shall be converted to consistent units by multiplying the nonrenewable energy fossil fuel use at the utility meter or measured point of delivery to Btus and multiplying by the conversion factor in Table C408.1.1.1 based on the geographical location of the building.

TABLE C408.1.1.1
ELECTRICITY GENERATION ENERGY CONVERSION FACTORS BY EPA eGRID SUB-REGION

<u>eGRID 2010 SUB-REGION ACRONYM</u>	<u>eGRID 2010 SUB-REGION NAME</u>	<u>ENERGY CONVERSION FACTOR</u>
<u>AKGD</u>	<u>ASCC Alaska Grid</u>	<u>3.15</u>
<u>AKMS</u>	<u>ASCC Miscellaneous</u>	<u>1.90</u>
<u>ERCT</u>	<u>ERCOT All</u>	<u>3.08</u>
<u>FRCC</u>	<u>FRCC All</u>	<u>3.26</u>
<u>HIMS</u>	<u>HICC Miscellaneous</u>	<u>3.67</u>
<u>HIOA</u>	<u>HICC Oahu</u>	<u>3.14</u>
<u>MORE</u>	<u>MRO East</u>	<u>3.50</u>
<u>MROW</u>	<u>MRO West</u>	<u>3.64</u>
<u>NYLI</u>	<u>NPCC Long Island</u>	<u>3.47</u>
<u>NEWE</u>	<u>NPCC New England</u>	<u>3.03</u>
<u>NYCW</u>	<u>NPCC NYC/Westchester</u>	<u>3.21</u>
<u>NYUP</u>	<u>NPCC Upstate NY</u>	<u>2.66</u>
<u>RFCE</u>	<u>RFC East</u>	<u>3.28</u>
<u>RFCM</u>	<u>RFC Michigan</u>	<u>3.35</u>
<u>RFCW</u>	<u>RFC West</u>	<u>3.29</u>
<u>SRMW</u>	<u>SERC Midwest</u>	<u>3.40</u>
<u>SRMV</u>	<u>SERC Mississippi Valley</u>	<u>3.20</u>
<u>SRSO</u>	<u>SERC South</u>	<u>3.20</u>
<u>SRTV</u>	<u>SERC Tennessee Valley</u>	<u>3.30</u>
<u>SRVC</u>	<u>SERC Virginia/Carolina</u>	<u>3.24</u>
<u>SPNO</u>	<u>SPP North</u>	<u>3.57</u>
<u>SPSO</u>	<u>SPP South</u>	<u>3.26</u>
<u>CAMX</u>	<u>WECC California</u>	<u>2.89</u>
<u>NWPP</u>	<u>WECC Northwest</u>	<u>2.32</u>
<u>RMPA</u>	<u>WECC Rockies</u>	<u>3.82</u>

<u>AZNM</u>	<u>WECC Southwest</u>	<u>3.10</u>
<u>None</u>	<u>Not included</u>	<u>3.15</u>

C408.1.1.2 Site to source electric power conversion. In calculating the proposed building performance and the baseline building performance, electric energy used shall be calculated in source energy by multiplying the electric power use at the utility meter or measured point of delivery in Btus by the conversion factor in Tables C408.1.1.1 and C408.1.1.2 based on the geographical location of the building.

**Table C408.1.1.2
U.S. AVERAGE BUILDING FUELS ENERGY CONVERSION FACTORS BY FUEL TYPE**

FUEL TYPE	ENERGY CONVERSION FACTOR
<u>Natural Gas</u>	<u>1.09</u>
<u>Fuel Oil</u>	<u>1.19</u>
<u>LPG</u>	<u>1.15</u>
<u>Purchased District Heating - Hot Water</u>	<u>1.35</u>
<u>Purchased District Heating - Steam</u>	<u>1.45</u>
<u>District Cooling</u>	<u>0.33 x value in Table C408.1.1.1</u>
<u>Other</u>	<u>1.1</u>

Revise as follows:

C105.2.6 Final inspection. The final inspection shall include verification of the installation and proper operation of all required building controls, and documentation verifying activities associated with required *building commissioning* have been conducted in accordance with Section ~~C408~~. C409.

C402.5.7 Vestibules. Building entrances shall be protected with an enclosed vestibule, with all doors opening into and out of the vestibule equipped with self-closing devices. Vestibules shall be designed so that in passing through the vestibule it is not necessary for the interior and exterior doors to open at the same time. The installation of one or more revolving doors in the building entrance shall not eliminate the requirement that a vestibule be provided on any doors adjacent to revolving doors.

Exceptions: Vestibules are not required for the following:

1. Buildings in *Climate Zones* 1 and 2.
2. Doors not intended to be used by the public, such as doors to mechanical or electrical equipment rooms, or intended solely for employee use.
3. Doors opening directly from a *sleeping unit* or dwelling unit.
4. Doors that open directly from a space less than 3,000 square feet (298 m²) in area.
5. Revolving doors.
6. Doors used primarily to facilitate vehicular movement or material handling and adjacent personnel doors.
7. Doors that have an air curtain with a velocity of not less than 6.56 feet per second (2 m/s) at the floor that have been tested in accordance with ANSI/AMCA 220 and installed in accordance with the manufacturer's instructions. Manual or automatic controls shall be provided that will operate the air curtain with the opening and closing of the door. Air curtains and their controls shall comply with Section ~~C408-2.3~~. C409.2.3.

C406.4 Enhanced digital lighting controls. Interior lighting in the building shall have the following enhanced

lighting controls that shall be located, scheduled and operated in accordance with Section C405.2.2.

1. Luminaires shall be configured for continuous dimming.
2. Luminaires shall be addressed individually. Where individual addressability is not available for the luminaire class type, a controlled group of not more than four luminaries shall be allowed.
3. Not more than eight luminaires shall be controlled together in a *daylight zone*.
4. Fixtures shall be controlled through a digital control system that includes the following function:
 - 4.1. Control reconfiguration based on digital addressability.
 - 4.2. Load shedding.
 - 4.3. Individual user control of overhead general illumination in open offices.
 - 4.4. Occupancy sensors shall be capable of being reconfigured through the digital control system.
5. Construction documents shall include submittal of a Sequence of Operations, including a specification outlining each of the functions in Item 4.
6. Functional testing of lighting controls shall comply with Section ~~C408~~, C409.

SECTION ~~C408~~ C409

MAINTENANCE INFORMATION AND SYSTEM COMMISSIONING

Add new standard(s) as follows:

ASHRAE

ASHRAE
1791 Tullie Circle NE
Atlanta GA 30329

90.1 - 2004: Energy Standard for Buildings Except Low-rise Residential Buildings

Reason: This proposal adds a compliance option for projects or jurisdictions striving for a near net-zero energy performance metric.

The zEPI methodology was created by Charles Eley and first introduced to codes in the *International Green Construction Code*. It served as a means of calculating energy performance modeling that would simplify the ability of moving the IgCC energy performance target to net zero energy within several code cycles. With the technical content of the IgCC now being developed by ASHRAE 189.1, this unique approach has been lost.

zEPI points to a unit on a scale that goes from a theoretical 100 to zero, where 100 equals actual performance for existing buildings as identified in the 2003 CBECs database. The 75 on that scale is a fixed number representing the energy performance level of the ASHRAE 90.1-2004, which is the baseline model using ASHRAE Appendix G.

The zEPI target in this proposal is 30 or below, which represents an energy performance level that is 70% better in terms of energy efficiency/conservation than a 2013 CBECs building. Based on data from many built "net zero" and Passive House buildings, 30 is a reasonable target for the building envelope and systems, where the remaining energy consumed by the building can be accommodated with on-site renewables in many climate and insolation zones.

The section has been added to Chapter CE 4 as Section C408, renumbering the existing C408 (Maintenance Information and System Commissioning) and all related subsections to C409. References to this section have been edited accordingly.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. It is a compliance option for projects or jurisdictions seeking a higher level of energy performance than the base

code. Even if selected, many projects have been designed and built using a near net-zero energy goal at no increase in cost over conventional energy performance goals.

Analysis: The referenced standard, ASHRAE 90.1-2004 was previously referenced in the 2006 edition of the IECC, but is not currently referenced in other 2018 I-codes.

Proposal # 5598

CE47-19

CE48-19

IECC: C401.2, C407.2

Proponent: David Renn, PE, SE, City and County of Denver, representing Code Change Committee of Colorado Chapter of ICC (david.renn@denvergov.org)

2018 International Energy Conservation Code

Revise as follows:

C401.2 Application. Commercial buildings shall comply with one of the following:

1. The requirements of ANSI/ASHRAE/IESNA 90.1.
2. The requirements of Sections C402 through C405 and C408. In addition, commercial buildings shall comply with Section C406 and tenant spaces shall comply with Section C406.1.1.
3. The requirements of Sections ~~C402.5, C403.2, C403.3 through C403.3.2, C403.4 through C403.4.2.3, C403.5.5, C403.7, C403.8.1 through C403.8.4, C403.10.1 through C403.10.3, C403.11, C403.12, C404, C405, C407 and C408.~~ The building energy cost shall be equal to or less than 85 percent of the standard reference design building.

C407.2 Mandatory requirements. Compliance with this section requires compliance with Sections C402.5, C403.2, C403.3 through C403.3.2, C403.4 through C403.4.2.3, C403.5.5, C403.7, C403.8.1 through C403.8.4, C403.10.1 through C403.10.3, C403.11, C403.12, C404 and C405.

Reason: This proposal is intended to simplify the code by providing mandatory requirements of the Total Building Performance method in one location only. Currently, the third compliance method in the general application section C401.2 lists all of the mandatory sections that are required for the Total Building Performance method, and also requires compliance with C407 and C408. Then, these same mandatory sections are given in C407.2. There is no need to have these requirements in the code in two locations and this proposal locates them only as a specific requirement of the C407 for the Total Building Performance method. By giving these requirements in one location only, it reduces the risk of changes being made in one section without updating the other section.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal is a simplification of the code without any technical change, so cost of construction will not change.

Proposal # 4149

CE48-19

CE49-19

IECC: C401.2, C407.3

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

C401.2 Application. Commercial buildings shall comply with one of the following:

1. The requirements of ANSI/ASHRAE/IESNA 90.1.
2. The requirements of Sections C402 through C405 and C408. In addition, commercial buildings shall comply with Section C406 and tenant spaces shall comply with Section C406.1.1.
3. The requirements of Sections C402.5, C403.2, C403.3 through C403.3.2, C403.4 through C403.4.2.3, C403.5.5, C403.7, C403.8.1 through C403.8.4, C403.10.1 through C403.10.3, C403.11, C403.12, C404, C405, C407 and C408. The building energy cost shall be equal to or less than ~~85~~ 80 percent of the standard reference design building.

C407.3 Performance-based compliance. Compliance based on total building performance requires that a proposed building (*proposed design*) be shown to have an annual energy cost that is less than or equal to 80 percent of the annual energy cost of the *standard reference design*. Energy prices shall be taken from a source *approved by the code official*, such as the Department of Energy, Energy Information Administration's *State Energy Price and Expenditure Report*. *Code officials* shall be permitted to require time-of-use pricing in energy cost calculations. The reduction in energy cost of the proposed design associated with *on-site renewable energy* shall be not more than 5 percent of the total energy cost. The amount of renewable energy purchased from off-site sources shall be the same in the *standard reference design* and the *proposed design*.

Exception: Jurisdictions that require site energy (1 kWh = 3413 Btu) rather than energy cost as the metric of comparison.

Reason: The purpose of this code change proposal is to improve the efficiency of buildings designed to comply under the IECC performance path by altering the multiplier for the standard reference design building from 85% to 80%. Starting with the 2012 IECC, rather than undertake a complete retooling of the performance path, advocates added a percentage multiplier to the standard reference design to reduce the energy budget for the baseline. This approach provided maximum flexibility to the code user. Improvements could be made to any part of the building to achieve the 15% improvement. This approach also established a means of easily updating the performance path in the future: As additional efficiency is needed, the multiplier can be lowered to meet those needs.

Since the 2012 IECC, the 85% multiplier has not been changed, even though other parts of the commercial IECC have undergone improvements. This proposal updates the multiplier by essentially improving efficiency by about 5% (as compared to the original baseline code, the 2009 IECC).

This proposal also includes the same multiplier in Section C407.3. We believe this is a more appropriate place for the multiplier, since it is closer to the other assumptions included in the standard reference design. However, we would prefer to see it included in both C407.3 and C401.2 to make sure that code users understand the requirements of the performance path.

Cost Impact: The code change proposal will increase the cost of construction. Adding additional efficiency measures will increase construction cost. However, we expect that design professionals and builders will select the improvements that are the most cost-effective and the easiest to implement into specific designs.

Proposal # 4460

CE49-19

CE50-19

IECC: C401.2.1, C402.4.3.4

Proponent: Thomas D. Culp, Ph.D., Birch Point Consulting LLC, representing the Glazing Industry Code Committee and the Aluminum Extruders Council (culp@birchpointconsulting.com)

2018 International Energy Conservation Code

Revise as follows:

C401.2.1 Application to replacement fenestration products. Where some or all of an existing *fenestration* unit is replaced with a new *fenestration* product, including sash and glazing, the replacement *fenestration* unit shall meet the applicable requirements for *U*-factor and *SHGC* in Table C402.4.

Exception: An area-weighted average of the *U*-factor of replacement fenestration products being installed in the building for each fenestration product category listed in Table C402.4 shall be permitted to satisfy the *U*-factor requirements of Table C402.4. The combined area-weighted average *U*-factor calculated using the respective area for each fenestration product category listed in Table C402.4. Individual fenestration products from different product categories listed in Table C402.4 shall not be combined in calculating the area-weighted average *U*-factor. equal to or less than the combined area-weighted average *U*-factor calculated using the *U*-factors from Table C402.4 with the same fenestration area and product types.

C402.4.3.4 Area-weighted *U*-factor. An area-weighted average shall be permitted to satisfy the *U*-factor requirements of Table C402.4. The combined area-weighted average *U*-factor calculated using the respective area for each fenestration product category listed in Table C402.4. Individual fenestration products from different fenestration product categories listed in Table C402.4 shall not be combined in calculating area-weighted average *U*-factor. equal to or less than the combined area-weighted average *U*-factor calculated using the *U*-factors from Table C402.4 with the same fenestration area and product types.

Reason: The purpose of this proposal is to clarify the area-weighted averaging of *U*-factor for fenestration products and make it consistent with other parts of the code. The current language includes a sentence that says fenestration products from different product categories listed in Table C402.4 shall not be combined in area-weighted averages, such as fixed and operable windows. However, this is inconsistent with other parts of the code. Section C402.1.5 permits it through Factor A of Equation 4-2 for the commercial energy code, and Sections R402.1.5 and R402.3.1 permit it for fenestration and all envelope components in the residential energy code. Furthermore, there is no technical reason they should not be combined for calculating area-weighted average *U*-factor.

As a practical example, in curtain wall, higher *U*-factors of operable commercial awning/vent products can be compensated for by lower *U*-factors of the main fixed window area, with the same overall performance of the facade. If this section is not corrected, it could inadvertently restrict flexibility for the designer, and also potentially discourage the use of operable products for natural ventilation, as casements and vents have a more difficult time complying with the prescriptive *U*-factors than sliding or fixed windows. Therefore, this proposal is necessary for practical considerations as well as clarification and consistency with other parts of the code. At the same time, this proposal also clarifies how the average is calculated and compared to the baseline prescriptive requirements. Finally, in response to public comments and discussion last cycle, this proposal does not include area-weighted averaging of *SHGC*.

(Note: if section C402.1.2.1 is moved to chapter 5 by other proposals, our intent is that the same changes in this proposal also be included in the section moved to chapter 5.)

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal simply clarifies the use of area-weighted averaging of fenestration product *U*-factors, and does

not impact cost of construction.

Proposal # 4752

CE50-19

CE51-19 Part I

PART I — IECC: C401.2 (New), C401.2, C407.2, SECTION C408

PART II — IECC: R401.2 (IRC N1101.6) (New), R401.2 (IRC N1101.13), R405.2 (IRC N1105.2), R406.2 (IRC N1106.2)

Proponent: David Collins, SEHPCAC, representing SEHPCAC (SEHPCAC@iccsafe.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

Add new text as follows:

C401.2 Mandatory and Prescriptive. Provisions labeled as "Mandatory" are required using any compliance option. Provisions labeled "Prescriptive" are only required when complying with Item 2 of Section C401.3. Charging section labels apply to unlabeled subsections.

Revise as follows:

~~C401.2~~ **C401.3 Application.** Commercial buildings shall comply with one of the following:

1. The requirements of ANSI/ASHRAE/IESNA 90.1.
2. The requirements of Sections C402 through ~~C405~~ C406 and C408. ~~In addition, commercial buildings shall comply with Section C406 and tenant spaces shall comply with Section C406.1.1.~~
3. The requirements of ~~Sections~~ Section C407. ~~C402.5, C403.2, C403.3 through C403.3.2, C403.4 through C403.4.2.3, C403.5.5, C403.7, C403.8.1 through C403.8.4, C403.10.1 through C403.10.3, C403.11, C403.12, C404, C405, C407 and C408.~~ The building energy cost shall be equal to or less than 85 percent of the standard reference design building.

Delete without substitution:

~~**C407.2 Mandatory requirements.** Compliance with this section requires compliance with Sections C402.5, C403.2, C403.3 through C403.3.2, C403.4 through C403.4.2.3, C403.5.5, C403.7, C403.8.1 through C403.8.4, C403.10.1 through C403.10.3, C403.11, C403.12, C404 and C405.~~

Revise as follows:

SECTION C408 MAINTENANCE INFORMATION AND SYSTEM COMMISSIONING (MANDATORY)

Proposal # 4702

CE51-19 Part I

CE51-19 Part II

IECC: R401.2 (IRC N1101.6) (New), R401.2 (IRC N1101.13), R405.2 (IRC N1105.2), R406.2 (IRC N1106.2)

Proponent: David Collins, SEHPCAC, representing SEHPCAC (SEHPCAC@iccsafe.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Energy Conservation Code

Revise as follows:

R401.1 Scope. This chapter applies to residential buildings.

Add new text as follows:

R401.2 (IRC N1101.6) Mandatory and Prescriptive Provisions labeled as "Mandatory" are required using any compliance option. Provisions labeled "Prescriptive" are only required when complying with Item 1 of Section R401.2. Charging section labels apply to unlabeled subsections.

Revise as follows:

~~R401.2 (IRC N 1101.13)~~ **R401.3 (IRC N1101.14) Compliance.** Projects shall comply with one of the following:

1. Sections R401 through R404.
2. Section R405 ~~and the provisions of Sections R401 through R404 indicated as "Mandatory."~~
3. The energy rating index (ERI) approach in Section R406.

~~R405.2 (IRC N1105.2) Mandatory requirements: Supply and Return Ducts (Mandatory).~~ ~~Compliance with this section requires that the mandatory provisions identified in Section R401.2 be met.~~ Supply and return ducts not completely inside the *building thermal envelope* shall be insulated to an *R*-value of not less than R-6.

~~R406.2 (IRC N1106.2) Thermal envelope (Mandatory requirements.)~~ ~~Compliance with this section requires that the provisions identified in Sections R401 through R404 indicated as "Mandatory" and Section R403.5.3 be met.~~ The *building thermal envelope* shall be greater than or equal to levels of efficiency and *Solar Heat Gain Coefficients* in Table 402.1.1 or 402.1.3 of the 2009 International Energy Conservation Code .

Exception: Supply and return ducts not completely inside the *building thermal envelope* shall be insulated to an *R*-value of not less than R-6.

Reason: This proposal is submitted by the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx> (<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>)

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This code change makes no additions nor deletions to the technical provisions of the code and has no impact on design or construction.

CE52-19

IECC: C401.2.1, C402.4.3.4

Proponent: Tom Zaremba, Roetzel & Address, representing Self (tzaremba@ralaw.com)

2018 International Energy Conservation Code

Revise as follows:

C401.2.1 Application to replacement fenestration products. Where some or all of an existing *fenestration* unit is replaced with a new *fenestration* product, including sash and glazing, the replacement *fenestration* unit shall meet the applicable requirements for *U*-factor and *SHGC* in Table C402.4.

Exception: An area-weighted average of the *U*-factor and *SHGC* of replacement fenestration products being installed in the building for each fenestration product category listed in Table C402.4 shall be permitted to satisfy the *U*-factor and *SHGC* requirements of Table C402.4. The combined area-weighted average *U*-factor calculated using the respective area for each fenestration product category listed in Table C402.4. Individual fenestration products from different product categories listed in Table C402.4 Table C402.4 shall be equal to or less than the combined area-weighted average *U*-factor calculated using the *U*-factors from Table C402.4 with the same fenestration area and product types. Area-weighted average *SHGC* shall only be calculated for *vertical fenestration* facing within 45 degrees of each cardinal direction and shall be equal to or less than the area-weighted average *SHGC* calculated using the *SHGC* from Table C402.4 with the same fenestration area and orientation. *Vertical fenestration* and *skylights* shall not be combined in calculating the area-weighted average *U*-factor *SHGC*.

C402.4.3.4 Area-weighted *U*-factor, *U*-factor and *SHGC*. An area-weighted average shall be permitted to satisfy the *U*-factor and *SHGC* requirements of Table C402.4. The combined area-weighted average *U*-factor calculated using the respective area for each fenestration product category listed in Table C402.4. Individual fenestration products from different fenestration product categories listed in Table C402.4 C402.4 shall be equal to or less than the combined area-weighted average *U*-factor calculated using the *U*-factors from Table C402.4 with the same fenestration area and product types. Area-weighted average *SHGC* shall only be calculated for *vertical fenestration* facing within 45 degrees of each cardinal direction and shall be equal to or less than the area-weighted average *SHGC* calculated using the *SHGC* from Table C402.4 with the same fenestration area and orientation. *Vertical fenestration* and *skylights* shall not be combined in calculating area-weighted average *U*-factor. *SHGC*.

Reason: This proposal clarifies the area-weighted averaging of fenestration product properties for prescriptive compliance, and provides consistency with other parts of the code. Last cycle, a similar proposal passed the code development committee by a vote of 11-1, but failed in the final vote as a result of misunderstanding about (a) how to calculate the baseline for comparison, and (b) how the *SHGC* of products facing different directions should be handled. Both of these concerns have been addressed in this proposal.

Area-weighted averaging of *U*-factor of all fenestration products is already included in Section C402.1.5 through Factor A of Equation 4-2 for the commercial energy code, and in Sections R402.1.5 and R402.3.1 for the residential energy code, so it makes sense to allow averaging of all products here too. To address prior concerns, additional detail was added to the wording on how the area-weighted average *U*-factor is calculated and compared to the baseline prescriptive requirements.

For *SHGC*, Section R402.3.2 allows area-weighted averaging of *SHGC* of all products for the residential code. For the commercial code, the IECC code development body indicated in previous cycles that products facing different directions, e.g. north and west, should not be combined. However, there is no technical reason to not allow averaging of *SHGC* as long as it is limited by orientation and vertical vs. skylight. Therefore, *SHGC* averaging is included here, and to address concerns from last cycle, the wording was made more specific such

as only allowing products facing within 45 degrees of each cardinal direction to be combined.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal only addresses the option to use area-weighted averaging of fenestration product U-factors and SHGC, and does not impact cost of construction.

Proposal # 4816

CE52-19

CE53-19

IECC: C202(New), C401.2.2(New), C406.5

Proponent: jim edelson, representing New Buildings Institute (jim@newbuildings.org)

2018 International Energy Conservation Code

Add new text as follows:

Renewable Energy Certificate (REC). An instrument that represents the environmental attributes of one megawatt-hour of renewable electricity; also known as an energy attribute certificate (EAC).

C401.2.2 On-site renewable energy Each building site shall have equipment for on-site renewable energy with a rated capacity of not less than 0.25 W/ft² (2.7 W/m²) multiplied by the sum of the gross conditioned floor area of the three largest floors. Documentation shall be provided to the code official that indicates that renewable energy certificates (RECs) associated with the on-site renewable energy will be retained and retired by or on behalf of the owner or tenant.

Exceptions:

1. Any building located where an unshaded flat plate collector oriented towards the equator and tilted at an angle from horizontal equal to the latitude receives an annual daily average incident solar radiation less than 3.5 kWh/m²·day (1.1 kBtu/ft²·day).
2. Any building where more than 80 percent of the roof area is covered by any combination of equipment other than for on-site renewable energy systems, planters, vegetated space, skylights or occupied roof deck.
3. Any building where more than 50 percent of roof area is shaded from direct-beam sunlight by natural objects or by structures that are not part of the building for more than 2,500 annual hours between 8:00 AM and 4:00 PM.

Revise as follows:

C406.5 On-site renewable energy. The total minimum ratings of *on-site renewable energy* systems, not including *on-site renewable energy* system capacity used for compliance with Section C401.2.2, shall be one of the following:

1. Not less than 1.71 Btu/h per square foot (5.4 W/m²) or 0.50 watts per square foot (5.4 W/m²) of conditioned floor area.
2. Not less than 3 percent of the energy used within the building for building mechanical and service water heating equipment and lighting regulated in Chapter 4.

Reason: Onsite renewable energy installations are becoming widespread in many parts of the country, and mandatory in other parts. This proposal creates a mandatory requirement for a system that is approximately one-half of the capacity that has been a compliance package selection in Section 406 since the 2012 IECC. This language is largely based on Addendum “by” now pending to modify ASHRAE 90.1-2016. The three exceptions are written to ensure that the requirement is not being applied to buildings without adequate space on the roof, to buildings that are in areas of the country where unblocked insolation levels do not provide enough energy to make the equipment cost-effective (according to ASHRAE cost-effective criteria), and to buildings where solar access is wholly or partially blocked. The economic analysis supporting the Addendum is what was used to derive the specifications in the measure’s exceptions. The analysis included multi-variate calculations on the PNNL 3-Story Medium Office Bldg Prototype and modeled @ 0.25W/SF of renewable capacity for conditioned area on all 3 floors. The solar equipment on the prototype models passed the ASHRAE

Economic Scalar in 5 of 6 insulation zones. The sixth zone aligns with the third exception in the proposal .

Section 406.5 is modified so that the renewable capacity used for compliance with the new minimum requirement is not also counted towards compliance with Section 406.

The proposal also ensures that renewable energy used for compliance with another obligation (eg. through the transfer of RECs then applied to a state Renewable Portfolio Standard) is not double counted towards compliance with the IECC. While this proposal does not cite Green-E, the Green-E Standard describes how double counting occurs when RECs associated with an on-site system have been transferred to another party in the transaction for the onsite renewable system (such as a lease or financing contract) and are then counted towards code compliance:

Examples of prohibited double uses include, but are not limited to:

- 1) When the same REC is sold by one party to more than one party, or any case where another party has a conflicting contract for the RECs or the renewable electricity;*
- 2) When the same REC is claimed by more than one party, including any expressed or implied environmental claims made pursuant to electricity coming from a renewable energy resource, environmental labeling or disclosure requirements. This includes representing the energy from which RECs are derived as renewable in calculating another entity's product or portfolio resource mix for the purposes of marketing or disclosure;*
- 3) When the same REC is used by an electricity provider or utility to meet an environmental mandate, such as an RPS, and is also used to satisfy customer sales under Green-e Energy; or*
- 4) Use of one or more attributes of the renewable energy or REC by another party. This includes when a REC is simultaneously sold to represent "renewable electricity" to one party, and one or more Attributes associated with the same MWh of generation (such as CO2 reduction) are also sold, to another party.*

Bibliography: Addendum *by* to Standard 90.1-2016, Energy Standard for Buildings Except Low-Rise Residential Buildings; ASHRAE, January 2018. (pending at the time of submittal)
Green-e Renewable Energy Standard for Canada and the United States, Version 3.2; March 20, 2018.

Cost Impact: The code change proposal will increase the cost of construction
The representative average price for onsite renewable energy systems as analyzed in 2018 by the ASHRAE 90.1 working group was \$2.50 per installed watt of capacity, before incentives. The workgroup also indicated that the required capacity levels were cost-effective, according to ASHRAE criteria, for buildings in the areas that were subject to the requirement (i.e. not excepted from the requirement).

Proposal # 4967

CE53-19

CE54-19 Part I

PART I — IECC: C401.2, C401.3 (New), C401.3.1.1 (New), C401.3.2 (New)

PART II — IECC: R401.2, R401.2.1 (IRC N1101.13.1) (New), R401.2.1.1 (IRC N1101.13.1.1) (New), R401.2.1.2 (IRC N1101.13.1.2) (New)

Proponent: Craig Conner, representing self (craig.conner@mac.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

Revise as follows:

C401.2 Application. Commercial buildings shall comply with one of the following:

1. The requirements of ANSI/ASHRAE/IESNA 90.1. 2.
2. The requirements of Sections C402 through C405 and C408. In addition, commercial buildings shall comply with Section C406 and tenant spaces shall comply with Section C406.1.1.
3. The requirements of Sections C402.5, C403.2, C403.3 through C403.3.2, C403.4 through C403.4.2.3, C403.5.5, C403.7, C403.8.1 through C403.8.4, C403.10.1 through C403.10.3, C403.11, C403.12, C404, C405, C407 and C408. The building energy cost shall be equal to or less than 85 percent of the standard reference design building.
4. Tropical zone alternative in C401.3

Add new text as follows:

C401.3 Tropical zone alternative. Group R-2 buildings in the tropical zone at elevations less than 2,400 feet (731.5 m) above sea level shall be deemed to be in compliance with this chapter where the conditions of either Section C401.3.1 or C401.3.2 are met.

C401.3.1.1 Limited air-conditioning option. Where a portion of the dwelling unit is provided with air-conditioning, all the following shall be met:

1. Not more than one-half of the occupied space is air conditioned.
2. The occupied space is not heated.
3. Solar, wind or other renewable energy source supplies not less than 80 percent of the energy for service water heating.
4. Glazing in conditioned spaces has a solar heat gain coefficient of less than or equal to 0.30, or has an overhang with a projection factor equal to or greater than 0.30.
5. Permanently installed lighting is in accordance with Section R404.
6. The exterior roof surface complies with one of the options in Table C402.3 or the roof or ceiling has insulation with an R-value of R-15 or greater. Where attics are present, attics above the insulation are vented and attics below the insulation are unvented.
7. Roof surfaces have a slope of not less than one-fourth unit vertical in 12 units horizontal (21-percent slope). The finished roof does not have water accumulation areas.
8. Operable fenestration provides a ventilation area of not less than 14 percent of the floor area in each room. Alternatively, equivalent ventilation is provided by a ventilation fan.
9. Bedrooms with exterior walls facing two different directions have operable fenestration on exterior walls facing two directions.
10. Interior doors to bedrooms are capable of being secured in the open position.

11. A ceiling fan or ceiling fan rough-in is provided for bedrooms and the largest space that is not used as a bedroom.

C401.3.2 Dwelling units without air-conditioning option. Where none of the occupied space is air conditioned or heated, all of the following shall be met:

1. There are no requirements for glazing U-factor, SHGC or air tightness.
2. Permanently installed lighting is in accordance with Section R404.
3. The exterior roof and wall surfaces have an 0.85 initial and 0.70 aged reflectivity or have insulation with an R-value of R-5 or greater.
4. Roof surfaces have a slope of not less than one-fourth unit vertical in 12 units horizontal (21-percent slope). The finished roof does not have water accumulation areas.
5. Operable fenestration provides ventilation in each room. There shall be at least one window per face of the dwelling unit.
6. Bedrooms with exterior walls facing two different directions have operable fenestration on exterior walls facing two directions.
7. Interior doors to bedrooms are capable of being secured in the open position.
8. Ceiling fans are provided in at least one bedroom and in the largest space that is not used as a bedroom.

Proposal # 5633

CE54-19 Part I

CE54-19 Part II

IECC: R401.2, R401.2.1 (IRC N1101.13.1) (New), R401.2.1.1 (IRC N1101.13.1.1) (New), R401.2.1.2 (IRC N1101.13.1.2) (New)

Proponent: Craig Conner, representing self (craig.conner@mac.com)

2018 International Energy Conservation Code

R401.2 Compliance. Projects shall comply with one of the following:

1. Sections R401 through R404.
2. Section R405 and the provisions of Sections R401 through R404 indicated as "Mandatory."
3. The energy rating index (ERI) approach in Section R406.
4. The tropical zone alternative in accordance with Section R401.2.1.

Revise as follows:

R401.2.1 (IRC N1101.13.1) Tropical zone. *Residential buildings* in the tropical zone at elevations less than 2,400 feet (731.5 m) above sea level shall be deemed to be in compliance with this chapter ~~provided that where~~ the following conditions ~~of either Section R401.2.1.1 or R401.2.1.2~~ are met:

1. ~~Not more than one-half of the occupied space is air conditioned.~~
2. ~~The occupied space is not heated.~~
3. ~~Solar, wind or other renewable energy source supplies not less than 80 percent of the energy for service water heating.~~
4. ~~Glazing in conditioned spaces has a solar heat gain coefficient of less than or equal to 0.40, or has an overhang with a projection factor equal to or greater than 0.30.~~
5. ~~Permanently installed lighting is in accordance with Section R404.~~
6. ~~The exterior roof surface complies with one of the options in Table C402.3 or the roof or ceiling has insulation with an R-value of R-15 or greater. Where attics are present, attics above the insulation are vented and attics below the insulation are unvented.~~
7. ~~Roof surfaces have a slope of not less than one-fourth unit vertical in 12 units horizontal (21-percent slope). The finished roof does not have water accumulation areas.~~
8. ~~Operable fenestration provides a ventilation area of not less than 14 percent of the floor area in each room. Alternatively, equivalent ventilation is provided by a ventilation fan.~~
9. ~~Bedrooms with exterior walls facing two different directions have operable fenestration on exterior walls facing two directions.~~
10. ~~Interior doors to bedrooms are capable of being secured in the open position.~~
11. ~~A ceiling fan or ceiling fan rough-in is provided for bedrooms and the largest space that is not used as a bedroom.~~

R401.2.1.1 (IRC N1101.13.1.1) Limited air-conditioning option. Where a portion of the dwelling unit is provided with air-conditioning, all of the following shall be met:

1. Not more than one-half of the occupied space is air conditioned.
2. The occupied space is not heated.
3. Solar, wind or other renewable energy source supplies not less than 80 percent of the energy for service water heating.
4. Glazing in conditioned spaces has a solar heat gain coefficient of less than or equal to 0.40, or has an overhang with a projection factor equal to or greater than 0.30.
5. Permanently installed lighting is in accordance with Section R404.
6. The exterior roof surface complies with one of the options in Table C402.3 or the roof or ceiling has insulation with an R-value of R-15 or greater. Where attics are present, attics above the insulation are

vented and attics below the insulation are unvented.

7. Roof surfaces have a slope of not less than one-fourth unit vertical in 12 units horizontal (21-percent slope). The finished roof does not have water accumulation areas.
8. Operable fenestration provides a ventilation area of not less than 14 percent of the floor area in each room. Alternatively, equivalent ventilation is provided by a ventilation fan.
9. Bedrooms with exterior walls facing two different directions have operable fenestration on exterior walls facing two directions.
10. Interior doors to bedrooms are capable of being secured in the open position.
11. A ceiling fan or ceiling fan rough-in is provided for bedrooms and the largest space that is not used as a bedroom.

Add new text as follows:

R401.2.1.2 (IRC N1101.13.1.2) Dwelling units without air-conditioning option. Where none of the occupied space of the dwelling unit is air-conditioned or heated, all of the following shall be met:

1. There are no requirements for glazing U-factor, SHGC or air tightness.
2. Permanently installed lighting is in accordance with Section R404.
3. The exterior roof and wall surfaces shall have an 0.85 initial and 0.70 aged reflectivity or have insulation with an R-value of R-5 or greater.
4. Roof surfaces have a slope of not less than one-fourth unit vertical in 12 units horizontal (21-percent slope). The finished roof does not have water accumulation areas.
5. Operable fenestration provides ventilation in each room. There shall be at least one window per face of the dwelling unit.
6. Bedrooms with exterior walls facing two different directions have operable fenestration on exterior walls facing two directions.
7. Interior doors to bedrooms are capable of being secured in the open position.
8. Ceiling fans are provided for a bedroom and the largest space that is not used as a bedroom.

Reason: This change provides a very low-income option which achieves energy savings primarily by having no air conditioning and no heating which yields a very low energy residence compared to the code home. This new option includes reflective ceilings, walls, and fans. Cooling is provided by ventilation and ceiling fans. Without this option many of the low income Puerto Rico residences will be building 'informally', which translates to outside the code.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This provides an alternative to "informal" housing which is built outside the code. Mainland style air tightness, windows, and even the HVAC systems are not appropriate to this housing. How do you access the costs for housing that is not built under the code now?

Staff Analysis: Please note that due to the requirements of the cdpACCESS system, where a new subsection is created and is populated with existing text, the existing text must be shown as removed from the existing section and shown as new in the new section. The 11 items in the new section R401.2.1.1 are the 11 items in the current code. They are simply relocated.

Proposal # 5640

CE54-19 Part II

CE55-19

IECC C401.3(New)

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Add new text as follows:

C401.3 Thermal envelope certificate (Mandatory). A permanent thermal envelope certificate shall be completed by an *approved* party. Such certificate shall be posted on a wall in the space where the space conditioning equipment is located, a utility room or other *approved* location. If located on an electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label or other required labels. A copy of the certificate shall also be included in the construction files for the project. The certificate shall include:

1. R-values of insulation installed in or on ceilings, roofs, walls, foundations and slabs, *basement walls, crawl space walls and floors and ducts outside conditioned spaces*;
2. U-factors and solar heat gain coefficients (SHGC) of fenestration;
3. Results from any *building envelope air leakage testing performed on the building*

Where there is more than one value for any component of the building envelope, the certificate shall indicate the area-weighted average value where available. If the area-weighted average is not available, the certificate shall list each value that applies to 10% or more of the total component area.

Reason: The purpose of this code change proposal is to add a permanent certificate to commercial buildings that will record basic information related to the building thermal envelope. This is similar to the requirement for residential buildings in Section R401.3, which has been in the IECC since at least the 2006 edition and has been successfully integrated into software programs such as REScheck. A significant percentage of commercial buildings will undergo system commissioning under Section C408, which will include documentation of mechanical and lighting systems. However, there is no similar requirement or documentation for the building's thermal envelope components. We acknowledge that the commercial provisions of the IECC are intended to cover an extremely broad range of commercial buildings, so the certificate requirement has been simplified to cover only the basic elements of the thermal envelope.

The information contained in this certificate will be readily available at construction, but as the building ages and ownership is transferred, some of this critical information could be lost. As future owners or lessors undertake load calculations for HVAC sizing or other measures that require a working knowledge of the building's thermal envelope characteristics, this information will be important. Recording the information in a permanent manner in an approved location at the building, as well as including documentation in the construction files for the project would not be overly burdensome but would provide valuable information to future building owners.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The information required to be included in the thermal envelope certificate will be readily available at construction and can be easily integrated into compliance software. This same information could be difficult to obtain several years down the road and recording it at construction will save future owners and lessors of a commercial building both time and money.

Proposal # 5065

CE55-19

CE56-19

IECC: 202, 202, 202 (New), C402.1.1, 402.1.1.1 (New), TABLE C402.1.1.1 (New)

Proponent: Nicholas O'Neil, NW Energy Codes Group, representing NW Energy Codes Group
(noneil@energy350.com)

2018 International Energy Conservation Code

FENESTRATION. Products classified as either skylights or vertical fenestration.

Skylights Glass or other transparent or translucent glazing material installed at a slope of less than 60 degrees (1.05 rad) from horizontal, including unit skylights, tubular daylighting devices and glazing materials in solariums, sunrooms, roofs, greenhouses, and sloped walls.

Vertical fenestration Windows that are fixed or operable, opaque doors, glazed doors, glazed block and combination opaque and glazed doors composed of glass or other transparent or translucent glazing materials and installed at a slope of not less than 60 degrees (1.05 rad) from horizontal.

Revise as follows:

GREENHOUSE. A structure or a thermally isolated area of a building that maintains a specialized sunlit environment exclusively used for, and essential to, the cultivation, protection or maintenance of plants. Greenhouses are those that are erected for a period of 180 days or more.

Add new definition as follows:

INTERNAL CURTAIN SYSTEM. An internal curtain system consists of moveable panels of fabric or plastic film used to cover and uncover the space enclosed in a greenhouse on a daily basis.

Revise as follows:

C402.1.1 Low-energy buildings and greenhouses. The following low-energy buildings, or portions thereof separated from the remainder of the building by *building thermal envelope* assemblies complying with this section, shall be exempt from the *building thermal envelope* provisions of Section C402.

1. Those with a peak design rate of energy usage less than 3.4 Btu/h • ft² (10.7 W/m²) or 1.0 watt per square foot (10.7 W/m²) of floor area for space conditioning purposes.
2. Those that do not contain *conditioned space*.
3. ~~Greenhouses.~~

Add new text as follows:

402.1.1.1 Greenhouses Greenhouse structures or areas that are mechanically heated or cooled and that comply with all of the following shall be exempt from the building envelope requirements of this code:

1. Exterior opaque envelope assemblies comply with Sections C402.2 and C402.4.5.

Exception: Low energy greenhouses that comply with Section C402.1.1.

2. Interior partition building thermal envelope assemblies that separate the greenhouse from conditioned space comply with Sections C402.2, C402.4.3 and C402.4.5.
3. Fenestration assemblies that comply with the thermal envelope requirements in Table C402.1.1.1. The U-factor for a roof shall be for the roof assembly or a roof that includes the

assembly and an internal curtain system.

Exception: Unconditioned greenhouses.

TABLE C402.1.1.1
FENESTRATION THERMAL ENVELOPE MAXIMUM REQUIREMENTS

Component	U-factor (BTU/h-ft²-°F)
Skylight	0.5
Vertical fenestration	0.7

Reason: Greenhouses are currently exempt from the energy code through the low-energy building path even though they can use substantial amounts of energy. This proposal places commonplace envelope requirements on the structure when it is being mechanically heated or cooled. Low-energy use greenhouses structures are still exempt if they have a low energy usage per square foot in line with C402.1.1.

Cost Impact: The code change proposal will increase the cost of construction. Costs of \$1.27/sqft are based on a one-time installation cost of double IR poly-film at \$0.10/sqft and a thermal curtain at \$1.17/sqft. These costs are based on product offerings and utility rebate program findings. Total size of greenhouse assumed to be an average size single bay with dimensions of 35 feet wide, 100 feet long, 4-foot sidewalls and 14-foot total ceiling height.

Proposal # 4674

CE56-19

CE57-19

IECC C402.1.1

Proponent: Steven Rosenstock, Edison Electric Institute, representing Edison Electric Institute (srosenstock@eei.org)

2018 International Energy Conservation Code

Revise as follows:

C402.1.1 Low-energy buildings. The following low-energy buildings, or portions thereof separated from the remainder of the building by *building thermal envelope* assemblies complying with this section, shall be exempt from the *building thermal envelope* provisions of Section C402.

1. Those with a peak design rate of energy usage less than 3.4 Btu/h • ft² (10.7 W/m²) or 1.0 watt per square foot (10.7 W/m²) of floor area for space conditioning purposes.
2. Those that do not contain *conditioned space*.
3. Greenhouses.
4. Buildings with a floor area not greater than 1,100 square feet (102.2 square meters) in size and solely used to house electric distribution system equipment.

Reason: These buildings are used to house electric distribution equipment, not people. They are equipment sheds or equipment vaults. Any space conditioning installed is only meant to prevent damage to equipment due to extreme weather or storms. The amount of time that people work in these buildings (for maintenance or testing or repair) is minimal.

Based on feedback from EEI member companies, anywhere from 50% to 100% of utility vaults or enclosed switching stations or substations are not conditioned at all. For electric equipment buildings that are conditioned, the temperature settings are typically much higher in the summer (85 degrees F or higher) and much lower in the winter (60 degrees F or lower) than spaces that are meant for human comfort to be maintained on a regular basis.

Some of the electric equipment vaults being used by utilities are as large as 18 feet by 60 feet, or 1,080 square feet. The size limit of 1,100 square feet will ensure that the exemption is limited to these types of buildings.

Bibliography: Specifications for vaults from from different utilities can be found at the following web site links:
<https://www.coned.com/-/media/files/coned/documents/es/specs/electricbluebook.pdf>

<https://www.smud.org/-/media/Documents/Business-Solutions-and-Rebates/PDFs/Custom-Built-Vaults.ashx?la=en&hash=ACE6D4512846A1FC65A8A37EEE224AC31C2791BF>

https://www.nationalgridus.com/media/pronet/constr_esb754759.pdf

Cost Impact: The code change proposal will decrease the cost of construction

This proposal is adding an exemption to the envelope requirements of Section Chapter 4, and as a result, will decrease the cost of construction for these low energy buildings.

Proposal # 4218

CE57-19

CE58-19

IECC: C402.1.2

Proponent: Steven Rosenstock, Edison Electric Institute, representing Edison Electric Institute (srosenstock@eei.org)

2018 International Energy Conservation Code

Revise as follows:

C402.1.2 Equipment buildings. Buildings that comply with the following shall be exempt from the *building thermal envelope* provisions of this code:

1. Are separate buildings with floor area not more than ~~500-1,200~~ square feet (~~50-110~~ m²).
2. Are intended to house ~~electronic~~ electric equipment with installed equipment power totaling not less than 7 watts per square foot (75 W/m²) and not intended for human occupancy.
3. Have a heating system capacity not greater than (17,000 Btu/hr) (5 kW) and a heating thermostat setpoint that is restricted to not more than 50°F (10°C).
4. Have an average wall and roof *U*-factor less than 0.200 in *Climate Zones* 1 through 5 and less than 0.120 in *Climate Zones* 6 through 8.
5. Comply with the roof solar reflectance and thermal emittance provisions for *Climate Zone* 1.

Reason: There are many buildings that are used to house electric distribution equipment, not people. They are equipment sheds or equipment vaults. Any space conditioning installed is only meant to prevent damage to equipment due to extreme weather or storms. The amount of time that people work in these buildings (for maintenance or testing or repair) is minimal.

Based on feedback from EEI member companies, anywhere from 50% to 100% of utility vaults or enclosed switching stations or substations are not conditioned at all. They would qualify for this exception.

Some of the electric equipment vaults being used by utilities are as large as 18 feet by 60 feet, or 1,080 square feet. The size limit of 1,200 square feet will ensure that the exemption is limited to these types of buildings.

The other change, from "electronic" to "electric" is editorial and designed to prevent any confusion as to what types of equipment qualify for this section (e.g., a transformer vault has electric equipment that may be considered to be different from "electronic" equipment).

Bibliography: Specifications for vaults from from different utilities can be found at the following web site links:
<https://www.coned.com/-/media/files/coned/documents/es/specs/electricbluebook.pdf>

<https://www.smud.org/-/media/Documents/Business-Solutions-and-Rebates/PDFs/Custom-Built-Vaults.ashx?la=en&hash=ACE6D4512846A1FC65A8A37EEE224AC31C2791BF>

https://www.nationalgridus.com/media/pronet/constr_esb754759.pdf

Cost Impact: The code change proposal will decrease the cost of construction

This proposal reduces the envelope requirements for these types of equipment buildings in Chapter 4, and as a result, will decrease the cost of construction for these low energy buildings.

Proposal # 5151

CE58-19

CE59-19

IECC: C402.1.3 (New), C402.1.3.1(New), C402.1.3.2(New)

Proponent: Andrew Klein, representing the Self Storage Association (andrew@asklein.com)

2018 International Energy Conservation Code

Add new text as follows:

C402.1.3 Low occupancy buildings Group S and and Group U occupancy buildings shall be permitted to have a thermal performance in accordance with Sections C402.1.3.1 and C402.1.3.2.

Exception: Refrigerated warehouses.

C402.1.3.1 R-value-based method Opaque thermal envelope insulation components shall be not less than 65% of the values specified in Table C402.1.3 for commercial buildings.

C402.1.3.2 U-factor-based method Opaque thermal envelope assemblies shall be not greater than 150% of the values specified in Table C402.1.4 for commercial buildings.

Reason: This Code Change Proposal recognizes that building energy use is dependent upon more than whether a building is conditioned or non-conditioned-the use of the building has a greater impact. ASHRAE 90.1 recognizes that higher insulation levels are not always cost-justified and has a category of reduced thermal insulation requirements for "semi-heated buildings."

This code change proposal simplifies the application of those provisions by identifying the building occupancies that have low occupancies (low ventilation requirements) and often have high thermal masses of contents, resulting in low energy use for space conditioning. The R-values and U-factors are aligned closely with the insulation values in the 2006 edition of the IECC.

Cost Impact: The code change proposal will decrease the cost of construction

This code change proposal will reduce the cost of constuction for many Group S and U occupancies.

Proposal # 5474

CE59-19

CE60-19 Part I

PART I — IECC: C402.1.3

PART II — IECC: R202 (IRC N1101.6), R402.1.3 (IRC N1102.1.3)

Proponent: John Woestman, representing Extruded Polystyrene Foam Association
(jwoestman@kellencompany.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

Revise as follows:

C402.1.3 Insulation component *R*-value-based method. Building thermal envelope opaque assemblies shall comply with the requirements of Sections C402.2 and C402.4 based on the climate zone specified in Chapter 3. For opaque portions of the building thermal envelope intended to comply on an insulation component R-value basis, the ~~R-values~~ R-values for cavity insulation and continuous insulation shall be not less than that specified in Table C402.1.3. Where cavity insulation is installed in multiple layers, the cavity insulation R-values shall be summed to determine compliance with the cavity insulation R-value requirements. Where continuous insulation is installed in multiple layers, the continuous insulation R-values shall be summed to determine compliance with the continuous insulation R-value requirements. Cavity insulation R-values shall not be used to determine compliance with the continuous insulation R-value requirements in Table C402.1.3. Commercial buildings or portions of commercial buildings enclosing Group R occupancies shall use the R-values from the “~~Group R~~” “Group R” column of Table C402.1.3. Commercial buildings or portions of commercial buildings enclosing occupancies other than Group R shall use the ~~R-values~~ R-values from the “All other” column of Table C402.1.3.

Proposal # 5250

CE60-19 Part I

CE60-19 Part II

IECC: R202 (IRC N1101.6), R402.1.3 (IRC N1102.1.3)

Proponent: John Woestman, representing Extruded Polystyrene Foam Association
(jwoestman@kellencompany.com)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Add new definition as follows:

CAVITY INSULATION. Insulating material located between framing members.

Revise as follows:

R402.1.3 (IRC N1102.1.3) *R*-value computation. ~~Insulation material used in layers, such as framing cavity insulation or continuous insulation, Cavity insulation alone shall be used to determine compliance with the cavity insulation *R*-value requirements in Table R402.1.2. Where cavity insulation is installed in multiple layers, the *R*-values of the cavity insulation layers shall be summed to compute the corresponding component *R*-value.~~ Insulation material used in layers, such as framing cavity insulation or continuous insulation, Cavity insulation alone shall be used to determine compliance with the cavity insulation *R*-value requirements in Table R402.1.2. Where cavity insulation is installed in multiple layers, the *R*-values of the cavity insulation layers shall be summed to determine compliance with the cavity insulation *R*-value requirements. The manufacturer's settled *R*-value shall be used for blown-in insulation. Continuous insulation alone shall be used to determine compliance with the continuous insulation (ci) *R*-value requirements in Table R402.1.2. Where continuous insulation is installed in multiple layers, the *R*-values of the continuous insulation layers shall be summed to determine compliance with the continuous insulation *R*-value requirements. Cavity insulation *R*-values shall not be used to determine compliance with the continuous insulation *R*-value requirements in Table R402.1.2. Computed *R*-values shall not include an *R*-value for other building materials or air films. Where insulated siding is used for the purpose of complying with the continuous insulation requirements of Table R402.1.2, the manufacturer's labeled *R*-value for the insulated siding shall be reduced by R-0.6.

Reason: This proposal coordinates with proposed revisions to the IECC-C regarding appropriate consideration of multiple layers of insulation within a given insulation component and also clarifies that different insulation components (e.g., cavity insulation & continuous insulation) *R*-values cannot be summed because the mathematical result will not result in equivalent thermal performance due to cavity insulation components being interrupted by framing and continuous insulation not interrupted by framing.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. As this proposal is consistent with the intent of the code, there should be no effects on the cost of construction.

Proposal # 5248

CE60-19 Part II

CE61-19

IECC: TABLE C402.1.3, TABLE C402.1.4

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

**TABLE C402.1.3
OPAQUE THERMAL ENVELOPE INSULATION COMPONENT MINIMUM REQUIREMENTS, R-VALUE
METHOD^{a, i}**

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		All other
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	
Roofs													
Insulation entirely above roof deck	R-20ci	R-25ci	R-25ci	R-25ci	R-25ci	R-25ci	R-30ci	R-30ci	R-30ci	R-30ci	R-30ci	R-30ci	R-35ci
Metal buildings ^b	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-25 + R-11 LS	R-25 + R-11 LS R-30 + R-11 LS	R-30 R-11 LS
Attic and other	R-38	R-38	R-38	R-38	R-38	R-38	R-38 R-49	R-38 R-49	R-38 R-49	R-49	R-49	R-49	R-49 R-60
Walls, above grade													
Mass ^g	R-5.7ci ^c	R-5.7ci ^c	R-5.7ci ^c	R-7.6ci	R-7.6ci	R-9.5ci	R-9.5ci	R-11.4ci	R-11.4ci	R-13.3ci	R-13.3ci	R-15.2ci	R-15.2ci
Metal building	R-13+ R-6.5ci	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 R-13ci
Metal framed	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 R-7.5ci

Wood framed and other	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-7.5ci or R-20 + R-3.8ci	R-13 + R-7.5ci or R-20 + R-3.8ci	R-13 + R-7.5ci or R-20 + R-3.8ci	R-13 or R-20 + R-3.8			
Walls, below grade														
Below-grade wall ^d	NR	NR	NR	NR	NR	NR	NR	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-10ci
Floors														
Mass ^e	NR	NR	R-6.3ci	R-8.3ci	R-10ci	R-10ci	R-10ci	R-10ci	R-10.4ci	R-10ci	R-12.5ci	R-12.5ci	R-12.5ci	R-15ci
Joist/framing	NR	NR	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30 ^f	R-30
Slab-on-grade floors														
Unheated slabs	NR	NR	NR	NR	NR	NR	NR	R-10 for 24" below	R-15 for 24" below	R-15 for 24" below				
Heated slabs ^h	R-7.5 for 12" below+ R-5 full slab	R-10 for 24" below+ R-5 full slab	R-10 for 24" below+ R-5 full slab	R-10 for 24" below+ R-5 full slab	R-15 for 24" below+ R-5 full slab	R-15 for 24" below+ R-5 full slab	R-15 for 36" below+ R-5 full slab	R-15 for 36" below+ R-5 full slab	R-15 for 36" below+ R-5 full slab	R-20 for 48" below+ R-5 full slab	R-20 for 48" below+ R-5 full slab			
Opaque doors														
Nonswinging	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.

ci = Continuous insulation, NR = No Requirement, LS = Liner System.

- a. Assembly descriptions can be found in ANSI/ASHRAE/IESNA Appendix A.
- b. Where using *R*-value compliance method, a thermal spacer block shall be provided, otherwise use the *U*-factor compliance method in Table C402.1.4.
- c. R-5.7ci is allowed to be substituted with concrete block walls complying with ASTM C90, ungrouted or partially grouted at 32 inches or less on center vertically and 48 inches or less on center horizontally, with ungrouted cores filled with materials having a maximum thermal conductivity of 0.44 Btu-in/h-f² °F.
- d. Where heated slabs are below grade, below-grade walls shall comply with the exterior insulation requirements for heated slabs.
- e. "Mass floors" shall be in accordance with Section C402.2.3.
- f. Steel floor joist systems shall be insulated to R-38.
- g. "Mass walls" shall be in accordance with Section C402.2.2.
- h. The first value is for perimeter insulation and the second value is for slab insulation. Perimeter insulation is not required to extend below the bottom of the slab.
- i. Not applicable to garage doors. See Table C402.1.4.

TABLE C402.1.4
OPAQUE THERMAL ENVELOPE ASSEMBLY MAXIMUM REQUIREMENTS, *U*-FACTOR METHOD^{a, b}

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Roofs														
Insulation entirely above roof deck	U-0.048	U-0.039	U-0.039	U-0.039	U-0.039	U-0.039	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.028	U-0.028
Metal buildings	U-0.044 U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.031	U-0.029	U-0.029	U-0.029
Attic and other	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027 U-0.021	U-0.027 U-0.021	U-0.027 U-0.021	U-0.021	U-0.021	U-0.021	U-0.021 U-0.017	U-0.021 U-0.017
Walls, above grade														
Mass ⁹	U-0.151	U-0.151	U-0.151	U-0.123	U-0.123	U-0.104	U-0.104	U-0.090	U-0.090	U-0.080	U-0.080	U-0.071	U-0.071	U-0.071
Metal building	U-0.079	U-0.079	U-0.079	U-0.079	U-0.079	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.039
Metal framed	U-0.077	U-0.077	U-0.077	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.052
Wood framed and other ^c	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.051	U-0.051	U-0.051						
Walls, below grade														
Below-grade wall ^c	C-1.140 ^e	C-1.119	C-1.119	C-1.119	C-1.119	C-1.119	C-1.119	C-1.092						
Floors														
Mass ^d	U-0.322 ^e	U-0.322 ^e	U-0.107	U-0.087	U-0.076	U-0.076	U-0.076	U-0.074	U-0.074	U-0.064	U-0.064	U-0.064	U-0.055	U-0.051
Joist/framing	U-0.066 ^e	U-0.066 ^e	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033
Slab-on-grade floors														
Unheated slabs	F-0.73 ^e	F-0.54	F-0.54	F-0.54	F-0.54	F-0.54	F-0.52	F-0.40	F-0.40					
Heated slabs ^f	F-1.02 0.74	F-1.02 0.74	F-1.02 0.74	F-1.02 0.74	F-0.90 0.74	F-0.90 0.74	F-0.86 0.64	F-0.86 0.64	F-0.79 0.64	F-0.79 0.64	F-0.79 0.55	F-0.69 0.55	F-0.69 0.55	F-0.69 0.55
Opaque doors														

Swinging door	U-0.61	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37							
Garage door <14% glazing	U-0.31													

For SI: 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.

ci = Continuous insulation, NR = No Requirement, LS = Liner System.

- a. Where assembly *U*-factors, *C*-factors, and *F*-factors are established in ANSI/ASHRAE/IESNA 90.1 Appendix A, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table, and provided that the construction, excluding the cladding system on walls, complies with the appropriate construction details from ANSI/ASHRAE/ISNEA 90.1 Appendix A.
- b. Where *U*-factors have been established by testing in accordance with ASTM C1363, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table. The *R*-value of continuous insulation shall be permitted to be added to or subtracted from the original tested design.
- c. Where heated slabs are below grade, below-grade walls shall comply with the *U*-factor requirements for above-grade mass walls.
- d. "Mass floors" shall be in accordance with Section C402.2.3.
- e. These *C*-, *F*- and *U*-factors are based on assemblies that are not required to contain insulation.
- f. The first value is for perimeter insulation and the second value is for full slab insulation.
- g. "Mass walls" shall be in accordance with Section C402.2.2.

Reason: The purpose of this code change proposal is to reduce energy costs for commercial building owners and improve long-term energy efficiency by adopting the more efficient and cost-effective opaque envelope requirements from ASHRAE Standard 90.1-2016 or the IECC for roofs. The building envelope typically remains the same for many years after construction and it is particularly important to capture as much cost-effective energy efficiency as possible at construction. After all, the intent of the IECC (C101.3) is to "regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building."

The commercial opaque envelope requirements of the IECC have not been comprehensively improved since the 2012 edition, even though ASHRAE has continued to make cost-effective improvements during that same period. This proposal leverages ASHRAE's thorough energy savings and cost-effectiveness analyses to make improvements to the opaque envelope table where ASHRAE improves upon the IECC requirement, but without rolling back the IECC requirements where they meet or exceed the ASHRAE requirement.

We applied a consistent set of actions to each of the values in this table:

- Where ASHRAE Standard 90.1-2016 has a more efficient *U*-factor for an assembly, we propose adopting the ASHRAE *U*-factor.
- Where an improved *U*-factor is adopted, we incorporate an equivalent *R*-value based on Normative Appendix A of ASHRAE Standard 90.1-2016.

The resulting table provides moderate improvements in energy efficiency based on an established model energy code and corrects inconsistencies and errors in the current IECC prescriptive tables.

Cost Impact: The code change proposal will increase the cost of construction

The improved U-factors and R-values in Tables C402.1.3 and C402.1.4 will typically require the addition of more insulation or other efficiency improvements in the IECC's performance-based compliance paths. However, each U-factor selected by ASHRAE for Standard 90.1 has gone through a rigorous energy-savings and cost-effectiveness analysis and consensus vetting from affected interests, so even in cases where construction costs are increased, the improvements will be achievable and cost-effective over the useful life of the product.

Proposal # 4216

CE61-19

CE62-19 Part I

PART I — IECC: TABLE C402.1.3, TABLE C402.1.4, C402.2.2, C402.2.2.1 (New)

PART II — IECC: R402.2.5 (IRC N1102.2.5)

Proponent: John Woestman, representing Extruded Polystyrene Foam Association
(jwoestman@kellencompany.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

Revise as follows:

**TABLE C402.1.3
OPAQUE THERMAL ENVELOPE INSULATION COMPONENT MINIMUM REQUIREMENTS, R-VALUE
METHOD^{a, i}**

Portions of table not shown remain unchanged.

Walls, above grade																
Mass ^g	R-5.7ci ^c	R-5.7ci ^c	R-5.7ci ^c	R-7.6ci	R-7.6ci	R-9.5ci	R-9.5ci	R-11.4ci	R-11.4ci	R-13.3ci	R-13.3ci	R-15.2ci	R-15.2ci	R-15.2ci	R-25ci	R-25ci
Metal building	R-13+ R-6.5ci	R-13+ R-6.5ci	R-13+ R-6.5ci	R-13+ R-13ci	R-13+ R-6.5ci	R-13+ R-13ci	R-13+ R-13ci	R-13+ R-13ci	R-13+ R-13ci	R-13+ R-13ci	R-13+ R-13ci	R-13+ R-13ci	R-13+ R-13ci	R-13+ R-13ci	R-13+ R-13ci	R-13+ R-19.5ci
Metal framed	R-13+ R-5ci	R-13+ R-5ci	R-13+ R-5ci	R-13+ R-7.5ci	R-13+ R-7.5ci	R-13+ R-7.5ci	R-13+ R-7.5ci	R-13+ R-7.5ci	R-13+ R-7.5ci	R-13+ R-17.5ci						
Wood framed and other	R-13+ R-3.8ci or R-20	R-13+ R-7.5ci or R-20+ R-3.8ci	R-13+ R-7.5ci or R-20+ R-10ci	R-13+ R-15.6ci or R-20+ R-10ci												

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.

ci = Continuous insulation, NR = No Requirement, LS = Liner System.

- Assembly descriptions can be found in ANSI/ASHRAE/IESNA Appendix A.
- Where using *R*-value compliance method, a thermal spacer block shall be provided, otherwise use the *U*-factor compliance method in Table C402.1.4.
- R-5.7ci is allowed to be substituted with concrete block walls complying with ASTM C90, ungrouted or partially grouted at 32 inches or less on center vertically and 48 inches or less on center horizontally, with ungrouted cores filled with materials having a maximum thermal

conductivity of 0.44 Btu-in/h-f² °F.

- d. Where heated slabs are below grade, below-grade walls shall comply with the exterior insulation requirements for heated slabs.
- e. "Mass floors" shall be in accordance with Section C402.2.3.
- f. Steel floor joist systems shall be insulated to R-38.
- g. "Mass walls" shall be in accordance with ~~Section~~ Sections C402.2.2 and C402.2.2.1.
- h. The first value is for perimeter insulation and the second value is for slab insulation. Perimeter insulation is not required to extend below the bottom of the slab.
- i. Not applicable to garage doors. See Table C402.1.4.

TABLE C402.1.4

OPAQUE THERMAL ENVELOPE ASSEMBLY MAXIMUM REQUIREMENTS, U-FACTOR METHOD^{a, b}

Portions of table not shown remain unchanged.

Walls, above grade																
Mass ^g	U-0.151	U-0.151	U-0.151	U-0.123	U-0.123	U-0.104	U-0.104	U-0.090	U-0.090	U-0.080	U-0.080	U-0.071	U-0.071	U-0.071	U-0.061	U-0.061
Metal building	U-0.079	U-0.079	U-0.079	U-0.079	U-0.079	U-0.052	U-0.039	U-0.052	U-0.039							
Metal framed	U-0.077	U-0.077	U-0.077	U-0.064	U-0.052	U-0.064	U-0.045									
Wood framed and other ^c	U-0.064	U-0.051	U-0.051	U-0.051	U-0.051	U-0.036	U-0.036									

For SI: 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.

ci = Continuous insulation, NR = No Requirement, LS = Liner System.

- a. Where assembly *U*-factors, *C*-factors, and *F*-factors are established in ANSI/ASHRAE/IESNA 90.1 Appendix A, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table, and provided that the construction, excluding the cladding system on walls, complies with the appropriate construction details from ANSI/ASHRAE/ISNEA 90.1 Appendix A.
- b. Where *U*-factors have been established by testing in accordance with ASTM C1363, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table. The *R*-value of continuous insulation shall be permitted to be added to or subtracted from the original tested design.
- c. Where heated slabs are below grade, below-grade walls shall comply with the *U*-factor requirements for above-grade mass walls.
- d. "Mass floors" shall be in accordance with Section C402.2.3.
- e. These *C*-, *F*- and *U*-factors are based on assemblies that are not required to contain insulation.
- f. The first value is for perimeter insulation and the second value is for full slab insulation.
- g. "Mass walls" shall be in accordance with ~~Section~~ Sections C402.2.2 and C402.2.2.1.

C402.2.2 Above-grade walls. The minimum thermal resistance (*R*-value) of materials installed in the wall cavity between framing members and continuously on the walls shall be as specified in Table C402.1.3, based on framing type and construction materials used in the wall assembly. The *R*-value of integral insulation

installed in concrete masonry units shall not be used in determining compliance with Table C402.1.3 except as otherwise noted in the table. In determining compliance with Table C402.1.4, the use of the *U*-factor of concrete masonry units with integral insulation shall be permitted.

~~“Mass walls” where used as a component in the thermal envelope of a building shall comply with one of the following:~~

- ~~1. Weigh not less than 35 pounds per square foot (171 kg/m²) of wall surface area.~~
- ~~2. Weigh not less than 25 pounds per square foot (122 kg/m²) of wall surface area where the material weight is not more than 120 pcf (1900 kg/m³).~~
- ~~3. Have a heat capacity exceeding 7 Btu/ft² • °F (144 kJ/m² • K).~~
- ~~4. Have a heat capacity exceeding 5 Btu/ft² • °F (103 kJ/m² • K), where the material weight is not more than 120 pcf (1900 kg/m³).~~

Add new text as follows:

C402.2.2.1 Mass walls. “Mass walls” where used as a component in the thermal envelope of a building shall comply with one of the following:

1. Weigh not less than 35 pounds per square foot (171 kg/m²) of wall surface area.
2. Weigh not less than 25 pounds per square foot (122 kg/m²) of wall surface area where the material weight is not more than 120 pcf (1900 kg/m³).
3. Have a heat capacity exceeding 7 Btu/ft² • °F (144 kJ/m² • K).
4. Have a heat capacity exceeding 5 Btu/ft² • °F (103 kJ/m² • K), where the material weight is not more than 120 pcf (1900 kg/m³).

Wall elements to the exterior of a vented air space shall be excluded when evaluating the mass wall thermal envelope criteria of this section.

Proposal # 5242

CE62-19 Part I

CE62-19 Part II

IECC: R402.2.5 (IRC N1102.2.5)

Proponent: John Woestman, representing Extruded Polystyrene Foam Association
(jwoestman@kellencompany.com)

2018 International Energy Conservation Code

Revise as follows:

R402.2.5 (IRC N1102.2.5) Mass walls. Mass walls where used as a component of the building thermal envelope shall be one of the following:

1. Above-ground walls of concrete block, concrete, insulated concrete form, masonry cavity, brick ~~but not brick veneer~~, adobe, compressed earth block, rammed earth, solid timber, or solid logs ~~but not anchored brick veneer, anchored stone or masonry veneer.~~
2. Any wall having a heat capacity greater than or equal to 6 Btu/ft² ● °F (123 kJ/m² ● K) ~~except components to the exterior of a vented air space shall be excluded from the heat capacity determination.~~

Reason: In Item 1, anchored brick veneer, anchored stone, and anchored masonry veneer are required by IRC Section R703.8 and Table R703.8.4(1) to be installed with an airspace of between 1" and 4 ½". The components of a wall to the exterior of a non-sealed (vented) air space required to provide drainage are disconnected thermally from the rest of the thermal envelope of the structure. Accordingly, components of walls to the exterior of a vented air space should not be considered a component of the building thermal envelope. This situation was recognized in Item 1 with the original text of "but not brick veneer". This proposal, for clarity, moves "but not brick veneer" to the end of the sentence and includes *anchored stone* and *masonry veneer* which performs thermally similar to brick veneer. Also, "anchored" is inserted in two locations to appropriately differentiate anchored veneer with the required airspace from adhered masonry veneer addressed in IRC Section R703.12.

Proposed revisions in Item 2 exclude components of the wall to the exterior of a vented air space from the heat capacity calculation because these components are disconnected thermally from the rest of the thermal envelope of the structure.

This proposal is consistent with requirements for mass walls in IECC-C Section C402.2.2 which is similarly clarified in a separate proposal. These changes are needed to clearly recognize that the "mass" of a mass wall must be an integral part of the wall (not thermally disconnected by a vented air space) as was the basis for determining thermal inertia (thermal mass) effects and associated R-value requirements for mass wall assemblies.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The revisions in Item 1 should not raise the cost of construction because the proposed revisions are consistent with the intent of Item 1. In Item 2, if exterior wall components to the exterior of a vented air space have been considered mass walls in conflict with the intent of Item 1, there could be a cost increase.

Proposal # 5229

CE62-19 Part II

CE63-19

IECC: TABLE C402.1.3, TABLE C402.1.4

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

**TABLE C402.1.3
OPAQUE THERMAL ENVELOPE INSULATION COMPONENT MINIMUM REQUIREMENTS, R-VALUE
METHOD^{a, i}**

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other
Roofs													
Insulation entirely above roof deck	R-20ci	R-25ci	R-25ci	R-25ci	R-25ci	R-25ci	R-30ci	R-30ci	R-30ci	R-30ci	R-30ci	R-30ci	R-35ci
Metal buildings ^b	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-25 + R-11 LS	R-25 + R-11 LS	R-30 + R-11 LS
Attic and other	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-49	R-49	R-49	R-49
Walls, above grade													
Mass ^g	R-5.7ci ^c	R-5.7ci ^c	R-5.7ci ^c	R-7.6ci	R-7.6ci	R-9.5ci	R-9.5ci	R-11.4ci	R-11.4ci	R-13.3ci	R-13.3ci	R-15.2ci	R-15.2ci
Metal building	R-13+ R-6.5ci	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci
Metal framed	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci

Wood framed and other	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-7.5ci or R-20 + R-3.8ci						
Walls, below grade														
Below-grade wall ^d	NR	NR	NR	NR	NR	NR	NR	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-10ci
Floors														
Mass ^e	NR	NR	R-6.3ci	R-8.3ci	R-10ci	R-10ci	R-10ci	R-10ci	R-10.4ci	R-10ci	R-12.5ci	R-12.5ci	R-12.5ci	R-15ci
Joist/framing	NR	NR	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30 ^f	R-30
Slab-on-grade floors														
Unheated slabs	NR	NR	NR	NR	NR	NR	NR	R-10 for 24" below	R-15 for 24" below	R-15 for 24" below				
Heated slabs ^h	R-7.5 for 12" below+ R-5 full slab	R-10 for 24" below+ R-5 full slab	R-10 for 24" below+ R-5 full slab	R-15 for 36" below+ R-5 full slab	R-15 for 36" below+ R-5 full slab	R-15 for 36" below+ R-5 full slab	R-20 for 48" below+ R-5 full slab	R-20 for 48" below+ R-5 full slab						
Opaque doors														
Nonswinging	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.

ci = Continuous insulation, NR = No Requirement, LS = Liner System.

- a. Assembly descriptions can be found in ANSI/ASHRAE/IESNA Appendix A.
- b. Where using *R*-value compliance method, a thermal spacer block shall be provided, otherwise use the *U*-factor compliance method in Table ~~C402.1.4~~ C402.1.4.
- c. R-5.7ci is allowed to be substituted with concrete block walls complying with ASTM C90, ungrouted or partially grouted at 32 inches or less on center vertically and 48 inches or less on center horizontally, with ungrouted cores filled with materials having a maximum thermal conductivity of 0.44 Btu-in/h-f² °F.
- d. Where heated slabs are below grade, below-grade walls shall comply with the exterior insulation requirements for heated slabs.
- e. "Mass floors" shall be in accordance with Section C402.2.3.
- f. Steel floor joist systems shall be insulated to R-38.
- g. "Mass walls" shall be in accordance with Section C402.2.2.
- h. The first value is for perimeter insulation and the second value is for slab insulation. Perimeter insulation is not required to extend below the bottom of the slab.

i. Not applicable to garage doors. See Table C402.1.4.C402.1.4.

TABLE C402.1.4
OPAQUE THERMAL ENVELOPE ASSEMBLY MAXIMUM REQUIREMENTS, U-FACTOR METHOD^{a, b}

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Roofs														
Insulation entirely above roof deck	U-0.048	U-0.039	U-0.039	U-0.039	U-0.039	U-0.039	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.028	U-0.028
Metal buildings	U-0.044	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.031	U-0.031	U-0.029	U-0.029
Attic and other	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021
Walls, above grade														
Mass ^g	U-0.151	U-0.151	U-0.151	U-0.123	U-0.123	U-0.104	U-0.104	U-0.090	U-0.090	U-0.080	U-0.080	U-0.071	U-0.071	U-0.071
Metal building	U-0.079	U-0.079	U-0.079	U-0.079	U-0.079	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.039
								U-0.050	U-0.050	U-0.050	U-0.050	U-0.050	U-0.044	
Metal framed	U-0.077	U-0.077	U-0.077	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.052
								U-0.055	U-0.055	U-0.055	U-0.049	U-0.049	U-0.049	U-0.042
Wood framed and other ^c	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.051	U-0.051	U-0.051	U-0.051
								U-0.051	U-0.051					
Walls, below grade														
Below-grade wall ^c	C-1.140 ^e	C-0.119	C-0.119	C-0.119	C-0.119	C-0.119	C-0.119	C-0.092	C-0.092					
Floors														

Mass ^d	U-0.322 ^e	U-0.322 ^e	U-0.107	U-0.087	U-0.076	U-0.076	U-0.076	U-0.076	U-0.074	U-0.074	U-0.064	U-0.064	U-0.064	U-0.055	U-0.051
Joist/framing	U-0.066 ^e	U-0.066 ^e	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033
Slab-on-grade floors															
Unheated slabs	F-0.73 ^e	F-0.73 ^e	F-0.73 ^e	F-0.73 ^e	F-0.73 ^e	F-0.73 ^e	F-0.54	F-0.54	F-0.54	F-0.54	F-0.54	F-0.52	F-0.40	F-0.40	F-0.40
Heated slabs ^f	F-1.02 0.74	F-1.02 0.74	F-1.02 0.74	F-1.02 0.74	F-0.90 0.74	F-0.90 0.74	F-0.86 0.64	F-0.86 0.64	F-0.79 0.64	F-0.79 0.64	F-0.79 0.55	F-0.69 0.55	F-0.69 0.55	F-0.69 0.55	F-0.69 0.55
Opaque doors															
Swinging door	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.37						
Garage door <14% glazing	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31

For SI: 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.

ci = Continuous insulation, NR = No Requirement, LS = Liner System.

- a. Where assembly *U*-factors, *C*-factors, and *F*-factors are established in ANSI/ASHRAE/IESNA 90.1 Appendix A, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table, and provided that the construction, excluding the cladding system on walls, complies with the appropriate construction details from ANSI/ASHRAE/ISNEA 90.1 Appendix A.
- b. Where *U*-factors have been established by testing in accordance with ASTM C1363, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table. The *R*-value of continuous insulation shall be permitted to be added to or subtracted from the original tested design.
- c. Where heated slabs are below grade, below-grade walls shall comply with the *U*-factor requirements for above-grade mass walls.
- d. "Mass floors" shall be in accordance with Section C402.2.3.
- e. These *C*-, *F*- and *U*-factors are based on assemblies that are not required to contain insulation.
- f. The first value is for perimeter insulation and the second value is for full slab insulation.
- g. "Mass walls" shall be in accordance with Section C402.2.2.

Reason: The purpose of this code change proposal is to reduce energy costs for commercial building owners and improve long-term energy efficiency by adopting the more efficient and cost-effective opaque envelope requirements from either ASHRAE Standard 90.1-2016 or the IECC for above-grade walls. The building envelope typically remains the same for many years after construction and it is particularly important to capture as much cost-effective energy efficiency as possible at construction. After all, the intent of the IECC (C101.3) is to "regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building."

The commercial opaque envelope requirements of the IECC have not been comprehensively improved since the 2012 edition, even though ASHRAE has continued to make cost-effective improvements during that same period. This proposal leverages ASHRAE's thorough energy savings and cost-effectiveness analyses to make improvements to the opaque envelope table where ASHRAE improves upon the IECC requirement, but without rolling back the IECC requirements where they meet or exceed the ASHRAE requirement.

We applied a consistent set of actions to each of the values in this table:

- Where we discovered clear errors or inconsistencies between the U-factor and R-value table, we corrected them.
- Where ASHRAE Standard 90.1-2016 has a more efficient U-factor for an assembly, we propose adopting the ASHRAE U-factor.
- Where an improved U-factor is adopted, we incorporate an equivalent R-value based on Normative Appendix A of ASHRAE Standard 90.1-2016.

The resulting table provides moderate improvements in energy efficiency based on an established model energy code and corrects inconsistencies and errors in the current IECC prescriptive tables.

Cost Impact: The code change proposal will increase the cost of construction

The improved U-factors and R-values in Tables C402.1.3 and C402.1.4 will typically require the addition of more insulation or other efficiency improvements in the IECC's performance-based compliance paths. However, each U-factor selected by ASHRAE for Standard 90.1 has gone through a rigorous energy-savings and cost-effectiveness analysis and consensus vetting from affected interests, so even in cases where construction costs are increased, the improvements will be achievable and cost-effective over the useful life of the product.

Proposal # 4213

CE63-19

CE64-19

IECC: TABLE C402.1.3, TABLE C402.1.4

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

**TABLE C402.1.3
OPAQUE THERMAL ENVELOPE INSULATION COMPONENT MINIMUM REQUIREMENTS, R-VALUE
METHOD^{a, i}**

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE CLIMATE	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Roofs								
Insulation entirely above roof deck	R-20ci	R-25ci	R-25ci	R-25ci	R-25ci	R-25ci	R-30ci	R-30ci
Metal buildings ^b	R-19 + R-11 LS	R-19 + R-11 LS						
Attic and other	R-38	R-38						
Walls, above grade								
Mass ^g	R-5.7ci ^c	R-5.7ci ^c	R-5.7ci ^c	R-7.6ci	R-7.6ci	R-9.5ci	R-9.5ci	R-11ci
Metal building	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci
Metal framed	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci
Wood framed and other	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20						
Walls, below grade								
Below-grade wall ^d	NR	NR	NR	NR	NR	NR	R-7.5ci	R-7.5ci
Floors								
Mass ^e	NR	NR	R-6.3ci	R-8.3ci	R-10ci	R-10ci	R-10ci	R-10ci
Joist/framing	NR	NR	R-30	R-30	R-30	R-30	R-30	R-30
Slab-on-ground								
Unheated slabs	NR	NR	NR	NR	NR	NR	R-10 for 24" below	R-10 for 24" below

Heated slabs ^h	R-7.5 for 12" below+ R-5 full slab	R-10 for 24" below+ R-5 full slab	R-10 for 24" below+ R-5 full slab	R-15 for 24" below+ R-5 full slab	R-15 f below full :			
Opaque								
Nonswinging	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.

ci = Continuous insulation, NR = No Requirement, LS = Liner System.

- a. Assembly descriptions can be found in ANSI/ASHRAE/IESNA Appendix A.
- b. Where using *R*-value compliance method, a thermal spacer block shall be provided, otherwise use the *U*-factor compliance method in Table C402.1.4.
- c. R-5.7ci is allowed to be substituted with concrete block walls complying with ASTM C90, ungrouted or partially grouted at 32 inches or less on center vertically and 48 inches or less on center horizontally, with ungrouted cores filled with materials having a maximum thermal conductivity of 0.44 Btu-in/h-f² °F.
- d. Where heated slabs are below grade, below-grade walls shall comply with the exterior insulation requirements for heated slabs.
- e. "Mass floors" shall be in accordance with Section C402.2.3.
- f. Steel floor joist systems shall be insulated to R-38.
- g. "Mass walls" shall be in accordance with Section C402.2.2.
- h. The first value is for perimeter insulation and the second value is for slab insulation. Perimeter insulation is not required to extend below the bottom of the slab.
- i. Not applicable to garage doors. See Table C402.1.4.

TABLE C402.1.4
OPAQUE THERMAL ENVELOPE ASSEMBLY MAXIMUM REQUIREMENTS, U-FACTOR METHOD^{a, b}

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Roofs														
Insulation entirely above roof deck	U-0.048	U-0.039	U-0.039	U-0.039	U-0.039	U-0.039	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.028	U-0.028
Metal buildings	U-0.044	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.031	U-0.031	U-0.029	U-0.029
Attic and other	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021
Walls, above grade														
Mass ^g	U-0.151	U-0.151	U-0.151	U-0.123	U-0.123	U-0.104	U-0.104	U-0.090	U-0.090	U-0.080	U-0.080	U-0.071	U-0.071	U-0.071
Metal building	U-0.079	U-0.079	U-0.079	U-0.079	U-0.079	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.039

Metal framed	U-0.077	U-0.077	U-0.077	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.052
Wood framed and other ^c	U-0.064	U-0.064	U-0.064	U-0.064	U-0.051	U-0.051	U-0.051	U-0.051						
Walls, below grade														
Below-grade wall ^c	C-1.140 ^e	C-0.119	C-0.119	C-0.119	C-0.119	C-0.119	C-0.092	C-0.092						
								C-0.119	C-0.119	C-0.092	C-0.092	C-0.063	C-0.063	C-0.063
Floors														
Mass ^d	U-0.322 ^e	U-0.322 ^e	U-0.107	U-0.087	U-0.076	U-0.076	U-0.076	U-0.074	U-0.074	U-0.064	U-0.064	U-0.064	U-0.055	U-0.051
Joist/framing	U-0.066 ^e	U-0.066 ^e	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033
Slab-on-grade floors														
Unheated slabs	F-0.73 ^e	F-0.54	F-0.54	F-0.54	F-0.54	F-0.52	F-0.40	F-0.40	F-0.40					
Heated slabs ^f	F-1.02 0.74	F-1.02 0.74	F-1.02 0.74	F-1.02 0.74	F-0.90 0.74	F-0.90 0.74	F-0.86 0.64	F-0.86 0.64	F-0.79 0.64	F-0.79 0.64	F-0.69 0.55	F-0.69 0.55	F-0.69 0.55	F-0.69 0.55
Opaque doors														
Swinging door	U-0.61	U-0.61	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37						
Garage door <14% glazing	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31						

For SI: 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.

ci = Continuous insulation, NR = No Requirement, LS = Liner System.

- a. Where assembly *U*-factors, *C*-factors, and *F*-factors are established in ANSI/ASHRAE/IESNA 90.1 Appendix A, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table, and provided that the construction, excluding the cladding system on walls, complies with the appropriate construction details from ANSI/ASHRAE/ISNEA 90.1 Appendix A.
- b. Where *U*-factors have been established by testing in accordance with ASTM C1363, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table. The *R*-value of continuous insulation shall be permitted to be added to or subtracted from the original tested design.
- c. Where heated slabs are below grade, below-grade walls shall comply with the *U*-factor requirements for above-grade mass walls.
- d. "Mass floors" shall be in accordance with Section C402.2.3.
- e. These *C*-, *F*- and *U*-factors are based on assemblies that are not required to contain insulation.
- f. The first value is for perimeter insulation and the second value is for full slab insulation.

g. “Mass walls” shall be in accordance with Section C402.2.2.

Reason: The purpose of this code change proposal is to reduce energy costs for commercial building owners and improve long-term energy efficiency by adopting the more efficient and cost-effective opaque envelope requirements from ASHRAE Standard 90.1-2016 or the IECC for below-grade walls. The building envelope typically remains the same for many years after construction and it is particularly important to capture as much cost-effective energy efficiency as possible at construction. After all, the intent of the IECC (C101.3) is to “regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building.”

The commercial opaque envelope requirements of the IECC have not been comprehensively improved since the 2012 edition, even though ASHRAE has continued to make cost-effective improvements during that same period. This proposal leverages ASHRAE’s thorough energy savings and cost-effectiveness analyses to make improvements to the opaque envelope table where ASHRAE improves upon the IECC requirement, but without rolling back the IECC requirements where they meet or exceed the ASHRAE requirement.

We applied a consistent set of actions to each of the values in this table:

- Where ASHRAE Standard 90.1-2016 has a more efficient U-factor for an assembly, we propose adopting the ASHRAE U-factor.
- Where an improved U-factor is adopted, we incorporate an equivalent R-value based on Normative Appendix A of ASHRAE Standard 90.1-2016.

The resulting table provides moderate improvements in energy efficiency based on an established model energy code and corrects inconsistencies and errors in the current IECC prescriptive tables.

Cost Impact: The code change proposal will increase the cost of construction. The improved U-factors and R-values in Tables C402.1.3 and C402.1.4 will typically require the addition of more insulation or other efficiency improvements in the IECC’s performance-based compliance paths. However, each U-factor selected by ASHRAE for Standard 90.1 has gone through a rigorous energy-savings and cost-effectiveness analysis and consensus vetting from affected interests, so even in cases where construction costs are increased, the improvements will be achievable and cost-effective over the useful life of the product.

Proposal # 4217

CE64-19

CE65-19

IECC: TABLE C402.1.3

Proponent: Daniel Bresette, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, representing BCAP-IBTS (mguttpgh@aol.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE C402.1.3
OPAQUE THERMAL ENVELOPE INSULATION COMPONENT MINIMUM REQUIREMENTS, R-VALUE
METHOD^{a, i}**

Portions of table not shown remain unchanged.

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		Other
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	
Floors															
Mass ^e	NR	NR	R-6.3ci	R-8.3ci	R-10ci	R-10ci	R-10.4ci	R-10ci	R-12.5ci	R-12.5ci	R-12.5ci	R-15ci	R-16.7ci	R-16.7ci	1
Joist/framing	NR R-13	NR R-13	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30 ^f	R-30 ^f	R-30 ^f	R

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.

ci = Continuous insulation, NR = No Requirement, LS = Liner System.

- a. Assembly descriptions can be found in ANSI/ASHRAE/IESNA Appendix A.
- b. Where using *R*-value compliance method, a thermal spacer block shall be provided, otherwise use the *U*-factor compliance method in Table C402.1.4.
- c. R-5.7ci is allowed to be substituted with concrete block walls complying with ASTM C90, ungrouted or partially grouted at 32 inches or less on center vertically and 48 inches or less on center horizontally, with ungrouted cores filled with materials having a maximum thermal conductivity of 0.44 Btu-in/h-f² °F.
- d. Where heated slabs are below grade, below-grade walls shall comply with the exterior insulation requirements for heated slabs.
- e. "Mass floors" shall be in accordance with Section C402.2.3.
- f. Steel floor joist systems shall be insulated to R-38.
- g. "Mass walls" shall be in accordance with Section C402.2.2.
- h. The first value is for perimeter insulation and the second value is for slab insulation. Perimeter insulation is not required to extend below the bottom of the slab.
- i. Not applicable to garage doors. See Table C402.1.4.

**TABLE C402.1.4
OPAQUE THERMAL ENVELOPE ASSEMBLY MAXIMUM REQUIREMENTS, U-FACTOR METHOD^{a, b}**

Portions of table not shown remain unchanged.

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Floors														
Mass ^d	U-0.322 ^e	U-0.322 ^e	U-0.107	U-0.087	U-0.076	U-0.076	U-0.076	U-0.074	U-0.074	U-0.064	U-0.064	U-0.064	U-0.055	U-0.051
Joist/framing	U-0.066 ^e	U-0.066 ^e	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033

For SI: 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.

ci = Continuous insulation, NR = No Requirement, LS = Liner System.

- a. Where assembly *U*-factors, *C*-factors, and *F*-factors are established in ANSI/ASHRAE/IESNA 90.1 Appendix A, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table, and provided that the construction, excluding the cladding system on walls, complies with the appropriate construction details from ANSI/ASHRAE/ISNEA 90.1 Appendix A.
- b. Where *U*-factors have been established by testing in accordance with ASTM C1363, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table. The *R*-value of continuous insulation shall be permitted to be added to or subtracted from the original tested design.
- c. Where heated slabs are below grade, below-grade walls shall comply with the *U*-factor requirements for above-grade mass walls.
- d. "Mass floors" shall be in accordance with Section C402.2.3.
- e. These *C*-, *F*- and *U*-factors are based on assemblies that are not required to contain insulation.
- f. The first value is for perimeter insulation and the second value is for full slab insulation.
- g. "Mass walls" shall be in accordance with Section C402.2.2.

Reason: The purpose of this code change proposal is to improve consistency by applying an R-value for joist/framing floors in climate zone 1 in Table C402.1.3 that matches the corresponding U-factor in Table C402.1.4. The U-factor for joist/framing floors in Table C402.1.4 is consistent with a wood-framed floor insulated to R-13, despite the "NR" notation and footnote "e," which indicate no insulation in the assembly. Because other U-factors and R-values for joist/framing floors in Table C402.1.3 are based on wood-framed assemblies, we applied the equivalent R-value requirement for a U-factor of 0.066, which is R-13. This will improve energy efficiency as compared to the current Table C402.1.3, but it will bring consistency to the two prescriptive tables and simplify enforcement.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. We believe the R-value equivalent in Table C402.1.4 is an error in the IECC and should be made consistent with the U-factor Table.

Proposal # 4645

CE65-19

CE66-19

IECC: TABLE C402.1.3, TABLE C402.1.4

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

**TABLE C402.1.3
OPAQUE THERMAL ENVELOPE INSULATION COMPONENT MINIMUM REQUIREMENTS, R-VALUE
METHOD^{a, i}**

Portions of table not shown remain unchanged.

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Floors														
Mass ^e	NR	NR	R-6.3ci	R-8.3ci	R-10ci	R-10ci	R-10ci	R-10.4ci	R-10ci	R-12.5ci	R-12.5ci	R-12.5ci	R-15ci	R-16.7ci
			<u>R-14.6ci</u>	<u>R-16.7ci</u>	<u>R-14.6ci</u>	<u>R-16.7ci</u>	<u>R-16.7ci</u>	<u>R-16.7ci</u>	<u>R-20.9ci</u>	<u>R-20.9ci</u>				
Joist/framing	NR	NR	R-30	R-30	R-30 ^f	R-30 ^f	R-30 ^f							
	<u>R-13</u>	<u>R-13</u>										<u>R-38</u>	<u>R-38</u>	<u>R-38</u>

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.

ci = Continuous insulation, NR = No Requirement, LS = Liner System.

- a. Assembly descriptions can be found in ANSI/ASHRAE/IESNA Appendix A.
- b. Where using *R*-value compliance method, a thermal spacer block shall be provided, otherwise use the *U*-factor compliance method in Table C402.1.4.
- c. R-5.7ci is allowed to be substituted with concrete block walls complying with ASTM C90, ungrouted or partially grouted at 32 inches or less on center vertically and 48 inches or less on center horizontally, with ungrouted cores filled with materials having a maximum thermal conductivity of 0.44 Btu-in/h-f² °F.
- d. Where heated slabs are below grade, below-grade walls shall comply with the exterior insulation requirements for heated slabs.
- e. "Mass floors" shall be in accordance with Section C402.2.3.
- f. ~~Steel floor joist systems shall be insulated to R-38.~~
- g. "Mass walls" shall be in accordance with Section C402.2.2.
- h. The first value is for perimeter insulation and the second value is for slab insulation. Perimeter insulation is not required to extend below the bottom of the slab.
- i. Not applicable to garage doors. See Table C402.1.4.

TABLE C402.1.4

OPAQUE THERMAL ENVELOPE ASSEMBLY MAXIMUM REQUIREMENTS, U-FACTOR METHOD^{a, b}

Portions of table not shown remain unchanged.

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Floors														
Mass ^d	U-0.322 ^e	U-0.322 ^e	U-0.107	U-0.087	U-0.076	U-0.076	U-0.076	U-0.074	U-0.074	U-0.064	U-0.064	U-0.064	U-0.055	U-0.051
					<u>U-0.074</u>	<u>U-0.074</u>	<u>U-0.057</u>	<u>U-0.051</u>	<u>U-0.057</u>	<u>U-0.051</u>	<u>U-0.051</u>	<u>U-0.051</u>	<u>U-0.042</u>	<u>U-0.042</u>
Joist/framing	U-0.066 ^e	U-0.066 ^e	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033
											<u>U-0.027</u>	<u>U-0.027</u>	<u>U-0.027</u>	<u>U-0.027</u>

For SI: 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.

ci = Continuous insulation, NR = No Requirement, LS = Liner System.

- a. Where assembly *U*-factors, *C*-factors, and *F*-factors are established in ANSI/ASHRAE/IESNA 90.1 Appendix A, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table, and provided that the construction, excluding the cladding system on walls, complies with the appropriate construction details from ANSI/ASHRAE/ISNEA 90.1 Appendix A.
- b. Where *U*-factors have been established by testing in accordance with ASTM C1363, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table. The *R*-value of continuous insulation shall be permitted to be added to or subtracted from the original tested design.
- c. Where heated slabs are below grade, below-grade walls shall comply with the *U*-factor requirements for above-grade mass walls.
- d. "Mass floors" shall be in accordance with Section C402.2.3.
- e. These *C*-, *F*- and *U*-factors are based on assemblies that are not required to contain insulation.
- f. The first value is for perimeter insulation and the second value is for full slab insulation.
- g. "Mass walls" shall be in accordance with Section C402.2.2.

Reason: The purpose of this code change proposal is to reduce energy costs for commercial building owners and improve long-term energy efficiency by adopting the more efficient and cost-effective opaque envelope requirements from ASHRAE Standard 90.1-2016 or the IECC for floors. Because all framed floor systems will be required to be insulated to R-38, there is no longer a need for footnote "f" in Table C402.1.3. The building envelope typically remains the same for many years after construction and it is particularly important to capture as much cost-effective energy efficiency as possible at construction. After all, the intent of the IECC (C101.3) is to "regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building."

The commercial opaque envelope requirements of the IECC have not been comprehensively improved since

the 2012 edition, even though ASHRAE has continued to make cost effective improvements during that same period. This proposal leverages ASHRAE's thorough energy savings and cost-effectiveness analyses to make improvements to the opaque envelope table where ASHRAE improves upon the IECC requirement, but without rolling back the IECC requirements where they meet or exceed the ASHRAE requirement.

We applied a consistent set of actions to each of the values in this table:

- Where we discovered clear errors or inconsistencies between the U-factor and R-value table, we corrected them.
- Where ASHRAE Standard 90.1-2016 has a more efficient U-factor for an assembly, we propose adopting the ASHRAE U-factor.
- Where an improved U-factor is adopted, we incorporate an equivalent R-value based on Normative Appendix A of ASHRAE Standard 90.1-2016.

The resulting table provides moderate improvements in energy efficiency based on an established model energy code and corrects inconsistencies and errors in the current IECC prescriptive tables.

Cost Impact: The code change proposal will increase the cost of construction

The improved U-factors and R-values in Tables C402.1.3 and C402.1.4 will typically require the addition of more insulation or other efficiency improvements in the IECC's performance-based compliance paths. However, each U-factor selected by ASHRAE for Standard 90.1 has gone through a rigorous energy-savings and cost-effectiveness analysis and consensus vetting from affected interests, so even in cases where construction costs are increased, the improvements will be achievable and cost-effective over the useful life of the product.

Proposal # 4644

CE66-19

CE67-19

IECC: TABLE C402.1.3, TABLE C402.1.4

Proponent: Darren Meyers, P.E., International Energy Conservation Consultants LLC, representing Self (dmeyers@ieccode.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE C402.1.3
OPAQUE THERMAL ENVELOPE INSULATION COMPONENT MINIMUM REQUIREMENTS, R-VALUE
METHOD^{a, i}**

Portions of table not shown remain unchanged.

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other
Slab-on-grade floors													
Unheated slabs	NR	NR	NR	NR	NR	NR	R-10 for 24" below	R-15 for 24" below	R-15 for 24" below				
Heated slabs ^h	R-7.5 for 12" below+ R-5 full slab	R-10 for 24" below+ R-5 full slab	R-10 for 24" below+ R-5 full slab	R-15 for 24" below+ R-5 full slab	R-15 for 24" below+ R-5 full slab	R-15 for 36" below+ R-5 full slab	R-15 for 36" below+ R-5 full slab	R-15 for 36" below+ R-5 full slab	R-20 for 48" below+ R-5 full slab	R-20 for 48" below+ R-5 full slab			

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.

ci = Continuous insulation, NR = No Requirement, LS = Liner System.

- a. Assembly descriptions can be found in ANSI/ASHRAE/IESNA Appendix A.
- b. Where using *R*-value compliance method, a thermal spacer block shall be provided, otherwise use the *U*-factor compliance method in Table C402.1.4.
- c. R-5.7ci is allowed to be substituted with concrete block walls complying with ASTM C90, ungrouted or partially grouted at 32 inches or less on center vertically and 48 inches or less on center horizontally, with ungrouted cores filled with materials having a maximum thermal conductivity of 0.44 Btu-in/h-f² °F.
- d. Where heated slabs are below grade, below-grade walls shall comply with the exterior insulation requirements for heated slabs.
- e. "Mass floors" shall be in accordance with Section C402.2.3.
- f. Steel floor joist systems shall be insulated to R-38.
- g. "Mass walls" shall be in accordance with Section C402.2.2.
- h. The first value is for perimeter insulation and the second value is for full, under-slab insulation. Perimeter insulation is not required to extend below the bottom of the slab.
- i. Not applicable to garage doors. See Table C402.1.4.

TABLE C402.1.4

OPAQUE THERMAL ENVELOPE ASSEMBLY MAXIMUM REQUIREMENTS, U-FACTOR METHOD^{a, b}

Portions of table not shown remain unchanged.

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		All other
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	
Slab-on-grade floors															
Unheated slabs	F-0.73 ^e	F-0.54	F-0.54	F-0.54	F-0.54	F-0.54	F-0.52	F-0.40	F-0.40	F-0.40					
Heated slabs ^f	F-1.02 0.74	F-1.02 0.74	F-1.02 0.74	F-1.02 0.74	F-0.90 0.74	F-0.90 0.74	F-0.86 0.64	F-0.86 0.64	F-0.79 0.64	F-0.79 0.64	F-0.79 0.55	F-0.69 0.55	F-0.69 0.55	F-0.69 0.55	F-0.69 0.55

For SI: 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.

ci = Continuous insulation, NR = No Requirement, LS = Liner System.

- a. Where assembly *U*-factors, *C*-factors, and *F*-factors are established in ANSI/ASHRAE/IESNA 90.1 Appendix A, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table, and provided that the construction, excluding the cladding system on walls, complies with the appropriate construction details from ANSI/ASHRAE/ISNEA 90.1 Appendix A.
- b. Where *U*-factors have been established by testing in accordance with ASTM C1363, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table. The *R*-value of continuous insulation shall be permitted to be added to or subtracted from the original tested design.
- c. Where heated slabs are below grade, below-grade walls shall comply with the *U*-factor requirements for above-grade mass walls.
- d. "Mass floors" shall be in accordance with Section C402.2.3.
- e. These *C*-, *F*- and *U*-factors are based on assemblies that are not required to contain insulation.
- f. The first value is for perimeter insulation and the second value is for full, under-slab insulation.
- g. "Mass walls" shall be in accordance with Section C402.2.2.

Reason: To be clear, it was the intent of the proponent to be specific to "full, under-slab" installations in these instances; Table C402.1.3 and Table C402.1.4.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. There is no cost implication aligned with this proposal. Rather, it is an exercise steeped in clarification. No change to stringency is proposed.

CE68-19

IECC: TABLE C402.1.3, TABLE C402.1.4

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

**TABLE C402.1.3
OPAQUE THERMAL ENVELOPE INSULATION COMPONENT MINIMUM REQUIREMENTS, R-VALUE
METHOD^{a, i}**

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		All other
	All other	Group R	All other	Group R									
Roofs													
Insulation entirely above roof deck	R-20ci	R-25ci	R-25ci	R-25ci	R-25ci	R-25ci	R-30ci	R-30ci	R-30ci	R-30ci	R-30ci	R-30ci	R-35ci
Metal buildings ^b	R-19 + R-11 LS	R-25 + R-11 LS	R-25 + R-11 LS	R-30 + R-11 LS									
Attic and other	R-38	R-49	R-49	R-49	R-49								
Walls, above grade													
Mass ^g	R-5.7ci ^c	R-5.7ci ^c	R-5.7ci ^c	R-7.6ci	R-7.6ci	R-9.5ci	R-9.5ci	R-11.4ci	R-11.4ci	R-13.3ci	R-13.3ci	R-15.2ci	R-15.2ci
Metal building	R-13+ R-6.5ci	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci					
Metal framed	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci							
Wood framed and other	R-13 + R-3.8ci or R-20	R-13 + R-7.5ci or R-20 + R-3.8ci	R-13 + R-7.5ci or R-20 + R-3.8ci	R-13 + R-7.5ci or R-20 + R-3.8ci									
Walls, below grade													
Below-grade wall ^d	NR	NR	NR	NR	NR	NR	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-10ci

Floors													
Mass ^e	NR	NR	R-6.3ci	R-8.3ci	R-10ci	R-10ci	R-10ci	R-10.4ci	R-10ci	R-12.5ci	R-12.5ci	R-12.5ci	R-15ci
Joist/framing	NR	NR	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30 ^f	R-30
Slab-on-grade floors													
Unheated slabs	NR	NR	NR	NR	NR	NR	R-10 for 24" below	R-15 for 24" below	R-15 for 24" below				
						R-10 for 24" below	R-15 for 24" below	R-15 for 24" below	R-15 for 24" below	R-20 for 24" below	R-20 for 24" below	R-20 for 48" below	
Heated slabs ^h	R-7.5 for 12" below+ R-5 full slab	R-10 for 24" below+ R-5 full slab	R-10 for 24" below+ R-5 full slab	R-15 for 24" below+ R-5 full slab	R-15 for 24" below+ R-5 full slab	R-15 for 36" below+ R-5 full slab	R-15 for 36" below+ R-5 full slab	R-15 for 36" below+ R-5 full slab	R-20 for 48" below+ R-5 full slab	R-20 for 48" below+ R-5 full slab			
Opaque doors													
Nonswinging	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.

ci = Continuous insulation, NR = No Requirement, LS = Liner System.

- Assembly descriptions can be found in ANSI/ASHRAE/IESNA Appendix A.
- Where using *R*-value compliance method, a thermal spacer block shall be provided, otherwise use the *U*-factor compliance method in Table C402.1.4.
- R-5.7ci is allowed to be substituted with concrete block walls complying with ASTM C90, ungrouted or partially grouted at 32 inches or less on center vertically and 48 inches or less on center horizontally, with ungrouted cores filled with materials having a maximum thermal conductivity of 0.44 Btu-in/h-f² °F.
- Where heated slabs are below grade, below-grade walls shall comply with the exterior insulation requirements for heated slabs.
- "Mass floors" shall be in accordance with Section C402.2.3.
- Steel floor joist systems shall be insulated to R-38.
- "Mass walls" shall be in accordance with Section C402.2.2.
- The first value is for perimeter insulation and the second value is for slab insulation. Perimeter insulation is not required to extend below the bottom of the slab.
- Not applicable to garage doors. See Table C402.1.4.

TABLE C402.1.4
OPAQUE THERMAL ENVELOPE ASSEMBLY MAXIMUM REQUIREMENTS, U-FACTOR METHOD^{a, b}

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Roofs														

Insulation entirely above roof deck	U-0.048	U-0.039	U-0.039	U-0.039	U-0.039	U-0.039	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.028	U-0.028	
Metal buildings	U-0.044	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.031	U-0.031	U-0.029	U-0.029
Attic and other	U-0.027	U-0.027	U-0.027	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021							
Walls, above grade															
Mass ^g	U-0.151	U-0.151	U-0.151	U-0.123	U-0.123	U-0.104	U-0.104	U-0.090	U-0.090	U-0.080	U-0.080	U-0.071	U-0.071	U-0.071	
Metal building	U-0.079	U-0.079	U-0.079	U-0.079	U-0.079	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.039	
Metal framed	U-0.077	U-0.077	U-0.077	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.052	
Wood framed and other ^c	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.051	U-0.051	U-0.051							
Walls, below grade															
Below-grade wall ^c	C-1.140 ^e	C-0.119	C-0.119	C-0.119	C-0.119	C-0.119	C-0.119	C-0.092	C-0.092						
Floors															
Mass ^d	U-0.322 ^e	U-0.322 ^e	U-0.107	U-0.087	U-0.076	U-0.076	U-0.076	U-0.074	U-0.074	U-0.064	U-0.064	U-0.064	U-0.055	U-0.051	
Joist/framing	U-0.066 ^e	U-0.066 ^e	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	
Slab-on-grade floors															
Unheated slabs	F-0.73 ^e	F-0.54 F-0.54	F-0.54 F-0.52	F-0.54 F-0.52	F-0.54 F-0.51	F-0.54 F-0.51	F-0.52 F-0.434	F-0.40	F-0.40						
Heated slabs ^f	F-1.02 0.74	F-1.02 0.74	F-1.02 0.74	F-1.02 0.74	F-0.90 0.74	F-0.90 0.74	F-0.86 0.64	F-0.86 0.64	F-0.79 0.64	F-0.79 0.64	F-0.79 0.55	F-0.69 0.55	F-0.69 0.55	F-0.69 0.55	
Opaque doors															
Swinging door	U-0.61	U-0.61	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37							
Garage door <14% glazing	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31							

For SI: 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.

ci = Continuous insulation, NR = No Requirement, LS = Liner System.

- a. Where assembly *U*-factors, *C*-factors, and *F*-factors are established in ANSI/ASHRAE/IESNA 90.1 Appendix A, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table, and provided that the construction, excluding the cladding system on walls, complies with the appropriate construction details from ANSI/ASHRAE/ISNEA 90.1 Appendix A.
- b. Where *U*-factors have been established by testing in accordance with ASTM C1363, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table. The *R*-value of continuous insulation shall be permitted to be added to or subtracted from the original tested design.
- c. Where heated slabs are below grade, below-grade walls shall comply with the *U*-factor requirements for above-grade mass walls.
- d. "Mass floors" shall be in accordance with Section C402.2.3.
- e. These *C*-, *F*- and *U*-factors are based on assemblies that are not required to contain insulation.
- f. The first value is for perimeter insulation and the second value is for full slab insulation.
- g. "Mass walls" shall be in accordance with Section C402.2.2.

Reason: The purpose of this code change proposal is to reduce energy costs for commercial building owners and improve long-term energy efficiency by adopting the more efficient and cost-effective opaque envelope requirements from ASHRAE Standard 90.1-2016 or the IECC for slab-on-grade floors in climate zones 3-6. The building envelope typically remains the same for many years after construction and it is particularly important to capture as much cost-effective energy efficiency as possible at construction. After all, the intent of the IECC (C101.3) is to "regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building."

The commercial opaque envelope requirements of the IECC have not been comprehensively improved since the 2012 edition, even though ASHRAE has continued to make cost-effective improvements during that same period. This proposal leverages ASHRAE's thorough energy savings and cost-effectiveness analyses to make improvements to the opaque envelope table where ASHRAE improves upon the IECC requirement, but without rolling back the IECC requirements where they meet or exceed the ASHRAE requirement.

We applied a consistent set of actions to each of the values in this table:

- Where ASHRAE Standard 90.1-2016 has a more efficient *U*-factor for an assembly, we propose adopting the ASHRAE *U*-factor.
- Where an improved *U*-factor is adopted, we incorporate an equivalent *R*-value based on Normative Appendix A of ASHRAE Standard 90.1-2016.

The resulting table provides moderate improvements in energy efficiency based on an established model energy code and corrects inconsistencies and errors in the current IECC prescriptive tables.

Cost Impact: The code change proposal will increase the cost of construction. The improved *F*-factors and *R*-values in Tables C402.1.3 and C402.1.4 will typically require the addition of more insulation or other efficiency improvements in the IECC's performance-based compliance paths. However, each *U*-factor selected by ASHRAE for Standard 90.1 has gone through a rigorous energy-savings and cost-effectiveness analysis and consensus vetting from affected interests, so even in cases where construction costs are increased, the improvements will be achievable and cost-effective over the useful life of the product.

Proposal # 4657

CE68-19

CE69-19

IECC: TABLE C402.1.3, TABLE C402.1.4

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Harry Misuriello, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

**TABLE C402.1.3
OPAQUE THERMAL ENVELOPE INSULATION COMPONENT MINIMUM REQUIREMENTS, R-VALUE
METHOD^{a, i}**

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		All other
	All other	Group R	All other	Group R									
Roofs													
Insulation entirely above roof deck	R-20ci	R-25ci	R-25ci	R-25ci	R-25ci	R-25ci	R-30ci	R-30ci	R-30ci	R-30ci	R-30ci	R-30ci	R-35ci
Metal buildings ^b	R-19 + R-11 LS	R-25 + R-11 LS	R-25 + R-11 LS	R-30 + R-11 LS									
Attic and other	R-38	R-49	R-49	R-49	R-49								
Walls, above grade													
Mass ^g	R-5.7ci ^c	R-5.7ci ^c	R-5.7ci ^c	R-7.6ci	R-7.6ci	R-9.5ci	R-9.5ci	R-11.4ci	R-11.4ci	R-13.3ci	R-13.3ci	R-15.2ci	R-15.2ci
Metal building	R-13+ R-6.5ci	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci					
Metal framed	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci							
Wood framed and other	R-13 + R-3.8ci or R-20	R-13 + R-7.5ci or R-20 + R-3.8ci	R-13 + R-7.5ci or R-20 + R-3.8ci	R-13 + R-7.5ci or R-20 + R-3.8ci									
Walls, below grade													
Below-grade wall ^d	NR	NR	NR	NR	NR	NR	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-10ci

Floors													
Mass ^e	NR	NR	R-6.3ci	R-8.3ci	R-10ci	R-10ci	R-10ci	R-10.4ci	R-10ci	R-12.5ci	R-12.5ci	R-12.5ci	R-15ci
Joist/framing	NR	NR	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30 ^f	R-30
Slab-on-grade floors													
Unheated slabs	NR	NR	NR	NR	NR	NR	R-10 for 24" below	R-15 for 24" below	R-15 for 24" below				
Heated slabs ^h	R-7.5 for 12" below+ R-5 full slab	R-10 for 24" below+ R-5 full slab	R-10 for 24" below+ R-5 full slab	R-15 for 24" below+ R-5 full slab	R-15 for 24" below+ R-5 full slab	R-15 for 36" below+ R-5 full slab	R-15 for 36" below+ R-5 full slab	R-15 for 36" below+ R-5 full slab	R-20 for 48" below+ R-5 full slab	R-20 for 48" below+ R-5 full slab			
Opaque doors													
Nonswinging	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.

ci = Continuous insulation, NR = No Requirement, LS = Liner System.

- Assembly descriptions can be found in ANSI/ASHRAE/IESNA Appendix A.
- Where using *R*-value compliance method, a thermal spacer block shall be provided, otherwise use the *U*-factor compliance method in Table C402.1.4.
- R-5.7ci is allowed to be substituted with concrete block walls complying with ASTM C90, ungrouted or partially grouted at 32 inches or less on center vertically and 48 inches or less on center horizontally, with ungrouted cores filled with materials having a maximum thermal conductivity of 0.44 Btu-in/h-f² °F.
- Where heated slabs are below grade, below-grade walls shall comply with the exterior insulation requirements for heated slabs.
- "Mass floors" shall be in accordance with Section C402.2.3.
- Steel floor joist systems shall be insulated to R-38.
- "Mass walls" shall be in accordance with Section C402.2.2.
- The first value is for perimeter insulation and the second value is for slab insulation. Perimeter insulation is not required to extend below the bottom of the slab.
- Not applicable to garage doors. See Table C402.1.4.

TABLE C402.1.4
OPAQUE THERMAL ENVELOPE ASSEMBLY MAXIMUM REQUIREMENTS, U-FACTOR METHOD^{a, b}

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Roofs														

Insulation entirely above roof deck	U-0.048	U-0.039	U-0.039	U-0.039	U-0.039	U-0.039	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.028	U-0.028
Metal buildings	U-0.044	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.031	U-0.031	U-0.029	U-0.029
Attic and other	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021
Walls, above grade														
Mass ^g	U-0.151	U-0.151	U-0.151	U-0.123	U-0.123	U-0.104	U-0.104	U-0.090	U-0.090	U-0.080	U-0.080	U-0.071	U-0.071	U-0.071
Metal building	U-0.079	U-0.079	U-0.079	U-0.079	U-0.079	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.039
Metal framed	U-0.077	U-0.077	U-0.077	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.052
Wood framed and other ^c	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.051	U-0.051	U-0.051	U-0.051
Walls, below grade														
Below-grade wall ^c	C-1.140 ^e	C-0.119	C-0.119	C-0.119	C-0.119	C-0.119	C-0.119	C-0.092	C-0.092					
Floors														
Mass ^d	U-0.322 ^e	U-0.322 ^e	U-0.107	U-0.087	U-0.076	U-0.076	U-0.076	U-0.074	U-0.074	U-0.064	U-0.064	U-0.064	U-0.055	U-0.051
Joist/framing	U-0.066 ^e	U-0.066 ^e	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033
Slab-on-grade floors														
Unheated slabs	F-0.73 ^e	F-0.54	F-0.54	F-0.54	F-0.54	F-0.54	F-0.52	F-0.40	F-0.40					
													F-0.51	F-0.434
Heated slabs ^f	F-1.02 0.74	F-1.02 0.74	F-1.02 0.74	F-1.02 0.74	F-0.90 0.74	F-0.90 0.74	F-0.86 0.64	F-0.86 0.64	F-0.79 0.64	F-0.79 0.64	F-0.79 0.55	F-0.69 0.55	F-0.69 0.55	F-0.69 0.55
Opaque doors														
Swinging door	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37
Garage door <14% glazing	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31

For SI: 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.

ci = Continuous insulation, NR = No Requirement, LS = Liner System.

- a. Where assembly *U*-factors, *C*-factors, and *F*-factors are established in ANSI/ASHRAE/IESNA 90.1 Appendix A, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table, and provided that the construction, excluding the cladding system on walls, complies with the appropriate construction details from ANSI/ASHRAE/ISNEA 90.1 Appendix A.
- b. Where *U*-factors have been established by testing in accordance with ASTM C1363, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table. The *R*-value of continuous insulation shall be permitted to be added to or subtracted from the original tested design.
- c. Where heated slabs are below grade, below-grade walls shall comply with the *U*-factor requirements for above-grade mass walls.
- d. "Mass floors" shall be in accordance with Section C402.2.3.
- e. These *C*-, *F*- and *U*-factors are based on assemblies that are not required to contain insulation.
- f. The first value is for perimeter insulation and the second value is for full slab insulation.
- g. "Mass walls" shall be in accordance with Section C402.2.2.

Reason: The purpose of this code change proposal is to reduce building energy costs and improve long-term energy efficiency by adopting ASHRAE's more efficient and cost-effective requirements for unheated slab insulation in climate zones 7-8. The current IECC F-factors for unheated slabs in these climate zones do not correspond with the R-value requirements in Table C402.1.3, nor do they correspond with F-factor data for common slab-on-grade floor assemblies per Normative Appendix A of ASHRAE Standard 90.1-2016. We believe the F-factors in the IECC are in error, and we propose adopting both ASHRAE's R-values and F-factors for these climate zones. The result will be improved efficiency and consistency across the IECC's prescriptive tables. The building envelope typically remains the same for many years after construction and it is particularly important to capture as much cost-effective energy efficiency as possible at construction. After all, the intent of the IECC (C101.3) is to "regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building."

Cost Impact: The code change proposal will increase the cost of construction. The improved F-factors and R-values in Tables C402.1.3 and C402.1.4 will typically require the addition of more insulation or other efficiency improvements in the IECC's performance-based compliance paths. However, each component value selected by ASHRAE for Standard 90.1 has gone through a rigorous energy-savings and cost-effectiveness analysis and consensus vetting from affected interests, so even in cases where construction costs are increased, the improvements will be achievable and cost-effective over the useful life of the product. This proposal will also correct an error in the IECC Table C402.1.4 and bring consistency between the two prescriptive tables, simplifying compliance and enforcement.

Proposal # 4659

CE69-19

CE70-19

IECC: TABLE C402.1.3, TABLE C402.1.4, C402.4.5, C402.4.5.1(New), C402.4.5.2(New)

Proponent: Connor Barbaree, representing ASHRAE (cbarbaree@ashrae.org)

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Revise as follows:

TABLE C402.1.3
OPAQUE THERMAL ENVELOPE INSULATION COMPONENT MINIMUM REQUIREMENTS, R-VALUE METHOD^{a, i}

Portions of table not shown remain unchanged.

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	
Opaque doors															
Nonswinging	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.

ci = Continuous insulation, NR = No Requirement, LS = Liner System.

- a. Assembly descriptions can be found in ANSI/ASHRAE/IESNA Appendix A.
- b. Where using *R*-value compliance method, a thermal spacer block shall be provided, otherwise use the *U*-factor compliance method in Table C402.1.4.
- c. R-5.7ci is allowed to be substituted with concrete block walls complying with ASTM C90, ungrouted or partially grouted at 32 inches or less on center vertically and 48 inches or less on center horizontally, with ungrouted cores filled with materials having a maximum thermal conductivity of 0.44 Btu-in/h-f² °F.
- d. Where heated slabs are below grade, below-grade walls shall comply with the exterior insulation requirements for heated slabs.
- e. "Mass floors" shall be in accordance with Section C402.2.3.
- f. Steel floor joist systems shall be insulated to R-38.
- g. "Mass walls" shall be in accordance with Section C402.2.2.
- h. The first value is for perimeter insulation and the second value is for slab insulation. Perimeter insulation is not required to extend below the bottom of the slab.
- i. Not applicable to garage doors. See Table C402.1.4.

TABLE C402.1.4
OPAQUE THERMAL ENVELOPE ASSEMBLY MAXIMUM REQUIREMENTS, U-FACTOR METHOD^{a, b}

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R

Roofs																
Insulation entirely above roof deck	U-0.048	U-0.039	U-0.039	U-0.039	U-0.039	U-0.039	U-0.039	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.028	U-0.028	
Metal buildings	U-0.044	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.031	U-0.031	U-0.029	U-0.029	
Attic and other	U-0.027	U-0.027	U-0.027	U-0.027	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021							
Walls, above grade																
Mass ^g	U-0.151	U-0.151	U-0.151	U-0.123	U-0.123	U-0.104	U-0.104	U-0.090	U-0.090	U-0.080	U-0.080	U-0.071	U-0.071	U-0.071	U-0.071	
Metal building	U-0.079	U-0.079	U-0.079	U-0.079	U-0.079	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.039	
Metal framed	U-0.077	U-0.077	U-0.077	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.052	
Wood framed and other ^c	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.051	U-0.051	U-0.051	U-0.051							
Walls, below grade																
Below-grade wall ^c	C-1.140 ^e	C-0.119	C-0.119	C-0.119	C-0.119	C-0.119	C-0.119	C-0.119	C-0.092	C-0.092						
Floors																
Mass ^d	U-0.322 ^e	U-0.322 ^e	U-0.107	U-0.087	U-0.076	U-0.076	U-0.076	U-0.076	U-0.074	U-0.074	U-0.064	U-0.064	U-0.064	U-0.055	U-0.051	
Joist/framing	U-0.066 ^e	U-0.066 ^e	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	
Slab-on-grade floors																
Unheated slabs	F-0.73 ^e	F-0.54	F-0.54	F-0.54	F-0.54	F-0.52	F-0.40	F-0.40	F-0.40							
Heated slabs ^f	F-1.02 0.74	F-1.02 0.74	F-1.02 0.74	F-1.02 0.74	F-0.90 0.74	F-0.90 0.74	F-0.86 0.64	F-0.86 0.64	F-0.79 0.64	F-0.79 0.64	F-0.79 0.55	F-0.69 0.55	F-0.69 0.55	F-0.69 0.55	F-0.69 0.55	
Opaque doors																
NonSwinging door	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31							
Swinging door	U-0.61 U-0.37	U-0.61 U-0.37	U-0.61 U-0.37	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37							
Garage door <14% glazing	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31							

For SI: 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.

ci = Continuous insulation, NR = No Requirement, LS = Liner System.

- a. Where assembly *U*-factors, *C*-factors, and *F*-factors are established in ANSI/ASHRAE/IESNA 90.1 Appendix A, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table, and provided that the construction, excluding the cladding system on walls, complies with the appropriate construction details from ANSI/ASHRAE/ISNEA 90.1 Appendix A.
- b. Where *U*-factors have been established by testing in accordance with ASTM C1363, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table. The *R*-value of continuous insulation shall be permitted to be added to or subtracted from the original tested design.
- c. Where heated slabs are below grade, below-grade walls shall comply with the *U*-factor requirements for above-grade mass walls.
- d. "Mass floors" shall be in accordance with Section C402.2.3.
- e. These *C*-, *F*- and *U*-factors are based on assemblies that are not required to contain insulation.
- f. The first value is for perimeter insulation and the second value is for full slab insulation.
- g. "Mass walls" shall be in accordance with Section C402.2.2.
- h. Swinging door U-factors shall be determined in accordance with NFRC-100.

C402.4.5 Doors. Opaque swinging doors shall be considered as part of the gross area of above-grade walls that are part of the building thermal envelope. Opaque doors shall comply with Section C402.4.5.1 or Section C402.5.2.

Add new text as follows:

C402.5.1 Opaque swinging doors Opaque nonswinging doors shall comply with Table C402.1.4.

C402.4.5.2 Nonswinging Doors. Opaque nonswinging doors that are horizontally hinged sectional doors with a single row of fenestration shall have an assembly *U*-factor less than or equal to 0.440 in Climate Zones 0 through 6 and less than or equal to 0.360 in Climate Zones 7 and 8, provided the fenestration area is at least 14 percent and not more than 25 percent of the total door area.

Exception: Other doors shall comply with the provisions of Section C402.4.3 for vertical fenestration.

Reason: Based on cost data gathered from industry partners and thermal performance from ASHRAE research project 1236 the optimal *U*-factor for these doors was determined. The performance of doors is more accurately reflected using *U*-factors. Additionally, the industry is moving towards assembly *U*-factors rather than *R*-values for these products. In the event that other proposals introduce Climate Zone 0 the current values for Climate Zone 1 should be used for Climate Zone 0 as well.

Bibliography: ASHRAE, "Heat Transfer through Roll-Up Doors, Revolving Doors and Opaque Nonresidential Swinging, Sliding and Rolling Doors", ASHRAE International, Atlanta, GA, Research Project 1236, July, 2006. McBride, M., "Development of Economic Scalar Ratios for ASHRAE Standard 90.1 R", ASHRAE, USDOE, ORNL, Building Envelope Conference-Thermal Envelopes VI, Clearwater FL, December, 1991.

Cost Impact: The code change proposal will increase the cost of construction Using national energy costs of \$1.22/therm for natural gas, \$.0939 for electricity, and a 40 year life time, as expressed in the formula $LLC = (U \cdot SR_h \cdot H_{coef} \cdot HDD \cdot P_h) + (U \cdot SR_c \cdot ((C_{coef1} \cdot CDD) + C_{coef2} \cdot P_c))$, the proposed door criteria have the lowest Life Cycle Cost as indicated in the table below. For an explanation of the formula above, see Development of Economic Scalar Ratios for ASHRAE Standard 90.1.

Swinging Doors

ILP Description	Cost U-factor
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NonSwinging Doors

ILP Description	Cost
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Description	Uvalue	LCC
uninsulated	0.00	0.7000
1 3/8 polyurethane	0.50	0.3700
1 3/4 polyurethane	4.08	0.3400
frame and door	9.17	0.3100

Description	Uvalue
uninsulated	0.00
1 3/8 inch	4.46
2 inch	5.36
3 inch #1	10.27
3 inch #2	20.54

	Description	Uvalue	LCC
CZ 8	uninsulated	0.700	50.89
	1 3/8 polyurethane	0.370	27.40
	1 3/4 polyurethane	0.340	28.80
	frame and door	0.310	31.71
CZ 7	uninsulated	0.700	37.65
	1 3/8 polyurethane	0.370	20.40
	1 3/4 polyurethane	0.340	22.37
	frame and door	0.310	25.84
CZ 6	uninsulated	0.700	30.74
	1 3/8 polyurethane	0.370	16.75
	1 3/4 polyurethane	0.340	19.01
	frame and door	0.310	22.78
CZ 5	uninsulated	0.700	24.73
	1 3/8 polyurethane	0.370	13.57
	1 3/4 polyurethane	0.340	16.09
	frame and door	0.310	20.12
CZ 4	uninsulated	0.700	20.47
	1 3/8 polyurethane	0.370	11.32
	1 3/4 polyurethane	0.340	14.02
	frame and door	0.310	18.24
CZ 3	uninsulated	0.700	14.21
	1 3/8 polyurethane	0.370	8.01
	1 3/4 polyurethane	0.340	10.98
	frame and door	0.310	15.46
CZ 2	uninsulated	0.700	11.02
	1 3/8 polyurethane	0.370	6.32
	1 3/4 polyurethane	0.340	9.43
	frame and door	0.310	14.05
CZ 1	uninsulated	0.700	10.75
	1 3/8 polyurethane	0.370	6.18
	1 3/4 polyurethane	0.340	9.30
	frame and door	0.310	13.93

	Description	Uvalue
CZ 8	uninsulated	1.450
	1 3/8 inch	0.360
	2 inch	0.310
	3 inch #1	0.270
	3 inch #2	0.240
CZ 7	uninsulated	1.450
	1 3/8 inch	0.360
	2 inch	0.310
	3 inch #1	0.270
	3 inch #2	0.240
CZ 6	uninsulated	1.450
	1 3/8 inch	0.360
	2 inch	0.310
	3 inch #1	0.270
	3 inch #2	0.240
CZ 5	uninsulated	1.450
	1 3/8 inch	0.360
	2 inch	0.310
	3 inch #1	0.270
	3 inch #2	0.240
CZ 4	uninsulated	1.450
	1 3/8 inch	0.360
	2 inch	0.310
	3 inch #1	0.270
	3 inch #2	0.240
CZ 3	uninsulated	1.450
	1 3/8 inch	0.360
	2 inch	0.310
	3 inch #1	0.270
	3 inch #2	0.240
CZ 2	uninsulated	1.450
	1 3/8 inch	0.360
	2 inch	0.310
	3 inch #1	0.270
	3 inch #2	0.240
CZ 1	uninsulated	1.450
	1 3/8 inch	0.360
	2 inch	0.310
	3 inch #1	0.270

Proposal # 4917

CE70-19

CE71-19

IECC: C402.1.4.1 (New), C402.1.4.2 (New), C402.1.4.3 (New), C402.2.1, C402.2.1.1, C402.2.1.1 (New), C402.2.1.2 (New), C402.2.1.3 (New), C402.2.1.4 (New)

Proponent: Darren Meyers, P.E., IECC_LLC representing the National Roofing Contractors Association, representing the National Roofing Contractors Association (dmeyers@ieccode.com)

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C402.1.4 Assembly *U*-factor, *C*-factor or *F*-factor-based method. Building thermal envelope opaque assemblies shall meet the requirements of Sections C402.2 and C402.4 based on the climate zone specified in Chapter 3. Building thermal envelope opaque assemblies intended to comply on an assembly *U*-, *C*- or *F*-factor basis shall have a *U*-, *C*- or *F*-factor not greater than that specified in Table C402.1.4. Commercial buildings or portions of commercial buildings enclosing *Group R* occupancies shall use the *U*-, *C*- or *F*-factor from the “*Group R*” column of Table C402.1.4. Commercial buildings or portions of commercial buildings enclosing occupancies other than *Group R* shall use the *U*-, *C*- or *F*-factor from the “All other” column of Table C402.1.4

Add new text as follows:

C402.1.4.1 Roof/Ceiling Assembly. The maximum, roof/ceiling assembly *U*-factor shall not exceed that specified in Table C402.1.4 based on construction materials used in the roof/ceiling assembly.

C402.1.4.1.1 Tapered, above-deck insulation based on thickness. Where used as a component of a maximum roof/ceiling assembly *U*-factor calculation, the sloped roof insulation *R*-value contribution to that calculation shall use either the arithmetic average thickness or the volumetric average thickness in inches (mm) along with the material *R*-value-per-inch (per-mm) solely for *U*-factor compliance as prescribed in Section C402.1.4.

C402.1.4.1.2 Suspended ceilings. Insulation installed on suspended ceilings having removable ceiling tiles shall not be considered part of the minimum thermal resistance (*R*-value) of roof insulation or assembly *U*-factor of the roof/ceiling construction.

C402.1.4.1.3 Joints staggered. Continuous insulation board shall be installed in not less than two layers and the edge joints between each layer of insulation shall be staggered, except where insulation tapers to the roof deck at a gutter edge, roof drain or scupper.

Revise as follows:

C402.2.1 Roof assembly. The minimum thermal resistance (*R*-value) of the insulating material installed either between the roof framing or continuously on the roof assembly shall be as specified in Table C402.1.3, based on construction materials used in the roof assembly. ~~Insulation installed on a suspended ceiling having removable ceiling tiles shall not be considered as part of the minimum thermal resistance of the roof insulation. Continuous insulation board shall be installed in not less than 2 layers and the edge joints between each layer of insulation shall be staggered.~~

Exceptions:

- ~~1. Continuously insulated roof assemblies where the thickness of insulation varies 1 inch (25 mm) or less and where the area-weighted *U*-factor is equivalent to the same assembly with the *R*-value specified in Table C402.1.3.~~
- ~~2. Where tapered insulation is used with insulation entirely above deck, the *R*-value where the insulation thickness varies 1 inch (25 mm) or less from the minimum thickness of tapered~~

- insulation shall comply with the *R*-value specified in Table C402.1.3.
3. ~~Two layers of insulation are not required where insulation tapers to the roof deck, such as at roof drains.~~

Add new text as follows:

C402.2.1.1 Tapered, above-deck insulation based on thickness. Where used as a component of a maximum roof/ceiling assembly R-value calculation, the sloped roof insulation R-value contribution to that calculation shall use either the arithmetic average thickness or the volumetric average thickness in inches (mm) along with the material R-value-per-inch (per-mm) solely for R-value compliance as prescribed in Section C402.1.4.

C402.2.1.2 Minimum thickness, lowest point. The minimum thickness of tapered, above-deck roof insulation at its lowest point, gutter edge, roof drain or scupper, shall be no less than 1 inch (25 mm).

C402.2.1.3 Suspended ceilings. Insulation installed on suspended ceilings having removable ceiling tiles shall not be considered part of the minimum thermal resistance (R-value) of roof insulation or assembly U-factor of the roof/ceiling construction.

C402.2.1.4 Joints staggered. Continuous insulation board shall be installed in not less than two layers and the edge joints between each layer of insulation shall be staggered, except where insulation tapers to the roof deck at a gutter edge, roof drain or scupper.

Revise as follows:

~~C402.2.1.4~~ **C402.2.1.5 Skylight curbs.** Skylight curbs shall be insulated to the level of roofs with insulation entirely above the deck or R-5, whichever is less.

Exception: Unit skylight curbs included as a component of a skylight listed and labeled in accordance with NFRC 100 shall not be required to be insulated.

Reason: The primary objective of this proposal is to repair and preserve the intent in original change EC31-03/04 (AM PC) by New Buildings Institute which correctly added a “first-ever” use of an R-value equivalent, area-weighted average U-factor option in lieu of an “R-value Only” compliance option. This change also addresses confusing code syntax suggested by NRCA’s own follow-on proposal several cycles later CE115-13 (AS) to provide guidance as to how code users use the first three rows of Table C402.1.4.

The clear intent of the “charging” paragraph to Section C402.2 is to limit the following sub-sections (C402.2.1 Roofs, C402.2.2 Walls, C402.2.3 Floors, etc.) solely to the R-value compliance method by way of Table C402.1.3. Accordingly, this proposal is limited solely to correctly relocating the appropriate U-factor alternative as a New! subsection to C402.1.4 where it belongs; for roof/ceiling installations only. With this proposal, NRCA is leaving it to others to clean the remaining instances throughout C402.2 where R-value compliance and U-factor compliance are mixed and matched.

To begin, NBI’s EC31-03/04 correctly proposed a “first-ever” option to allow the use of R-value equivalent, area-weighted average U-factors in lieu of “R-values only.” At the time the 2003 IECC offered an “R-values only” compliance path. Note, an “Equivalent U-factor” compliance path did not first appear until the 2009 IECC Edition. So then, while EC31-03/04 was innovative in allowing the accepted engineering practice of an area-weighted calculation, it did not provide the level of specificity on which to base or how to perform the calculation. Nonetheless, it should be recognized that EC31-03/04 clearly passed as an endorsement that *approved*, area-weighted average U-factor calculations are to be recognized in the IECC. Notwithstanding such endorsement, EC31-03/04 left many in the industry without a code-enforceable solution.

802.2.4 Roof assembly. The minimum thermal resistance (*R*-value) of the insulating material installed either between the roof framing or continuously on the roof assembly shall be as specified in Table 802.2.(1), based on construction materials used in the roof assembly.

Exception: Continuously insulated roof assemblies where the thickness of insulation varies 1 inch (25.4 mm) or less and where the area weighted U-factor is equivalent to the same assembly with the R-value specified in Table 802.2.2(1).

Sometime later, and well after the 2009 IECC was improved to allow an “Equivalent U-factor” methodology, CE115-13 was proposed by the NRCA. In the reason to CE115-13, the NRCA admitted its members had become confused with regard to NBI’s original intent for the lone exception to Section 802.2.4; but also, that it was the intent of the NRCA to “clarify the use and application of slope-to-drain insulation in roofing projects.” Regrettably, the NRCA suggested solution (i.e., the coexistence of Section 402.2.1, Exceptions 1 and 2 as they read today) did not reflect the historical evidence and eventual evolution of the 2009 IECC thereon to recognize the accepted engineering practice of an area-weighted calculation.

The proposal preserves the independent expressions of 1) minimum thickness, 2) staggered joints, 3) back-loaded, suspended ceilings and 4) skylight curbs along with 5) tapered insulation system designs that are consistent with *The NRCA Roofing Manual for Membrane Roof Systems* written in code-enforceable language. *The NRCA Roofing Manual for Membrane Roof Systems-2019 Ed.*, is a continuation of a long-standing series of publications from the National Roofing Contractors Association (NRCA) intended to provide in-depth, expert and best industry practices concerning the design, materials and installation of quality membrane roof systems.

It is unnecessary to preserve the minimum “skylight curb” provision of C402.2.1.1 as the Assembly U-factor, C-factor or F-factor-based method provides the user with maximum flexibility toward achieving assembly U-factor, C-factor or F-factor-based compliance in accordance with Table C402.1.4 and accepted engineering practices.

For the utility of future users, the following excerpts and figures from *The NRCA Roofing Manual for Membrane Roof Systems-2015 Ed.*, could be used as explanatory commentary:

1. For one- and two-way, sloped roof insulation systems the arithmetic average thickness shall be calculated in accordance with Equation 4-W and as indicated in Figure 4-4. For more complex sloped configurations, the tapered layout shall be broken down into one- and two-way slope regions.

Arithmetic average thickness = $LP + [\frac{1}{2} \times (HP - LP)]$ (Equation 4-W)

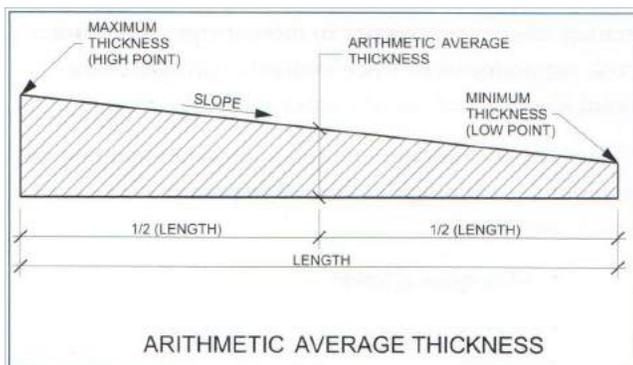


Figure 4-4: Arithmetic average thickness

2. For symmetrical square, four-way sloped roof insulation systems the volumetric average thickness shall be calculated in accordance with Equation 4-X or 4-Y, and as indicated in Equations 4-5 or 4-6, respectively.

Volumetric average thickness = $LP + [\frac{2}{3} \times (HP - LP)]$ (Equation 4-X)

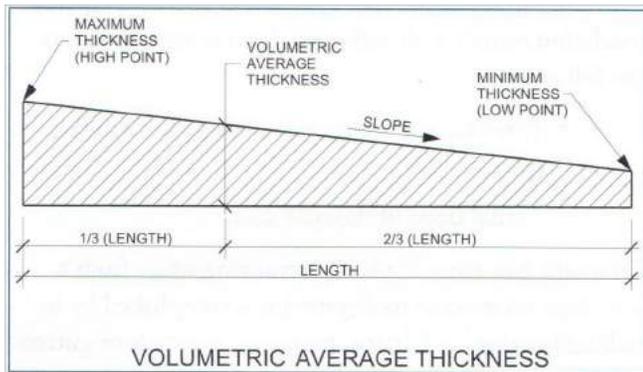


Figure 4-5: Volumetric average thickness

Volumetric average thickness = Volume of insulation / Roof surface area (Equation 4-Y)

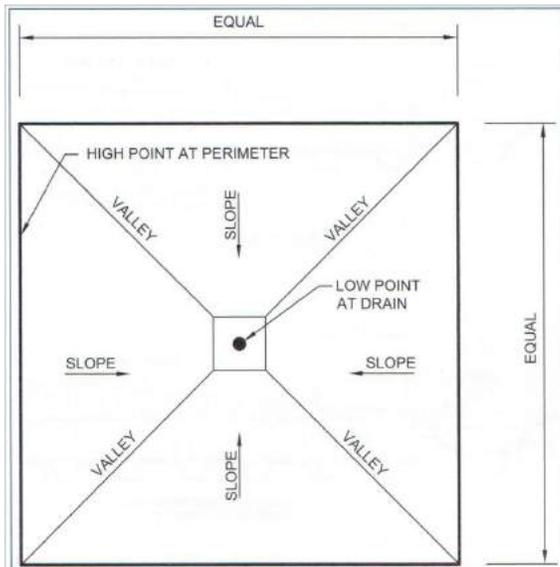


Figure 4-6: Symmetrical four-way slope

3. For all other sloped roof insulation systems, the volumetric average thickness shall be calculated in accordance with Equation 4-Z and as indicated in Figure 4-7.

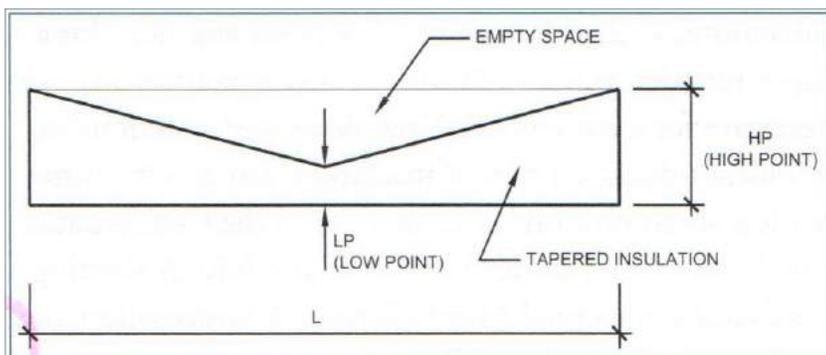


Figure 4-7: Volumetric average thickness, second method

Volumetric average thickness = (Volume of insulation – Volume anticipated waste) / Roof surface area

(Equation 4-Z)

where:

LP = Lowest point, or insulation system minimum thickness.

HP = Highest point, or insulation system maximum thickness.

L = Length, one side of square roof surface area.

Volume of solid insulation = $HP \times L^2$

Volume of empty space = $\frac{1}{3} \times L \times (HP - LP)$

Volume of insulation = $(HP \times L^2) - \frac{1}{3} \times L \times (HP - LP)$

The proposal is product neutral and inclusive of all rigid board insulation types including, cellular glass, expanded and extruded polystyrene, faced and fiber-reinforced gypsum board, stone wool, perlite board, polyisocyanurate, high-density polyisocyanurate, wood fiber board and composite board.

Bibliography: *NRCA Roofing Manual for Membrane Roof Systems* - 2019 Ed., National Roofing Contractors Association, 10255 W. Higgins Road, suite 600, rosemont, IL 60018-5607.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code change proposal will not increase or decrease the cost of construction, as the provisions of **C402.1.4, Assembly U-factor, C-factor or F-factor-based methodolog[ies]**, remain a design option addressing constructability issues in new construction and *reroofing* projects even without the change, and where a newly proposed or existing roof deck does not provide adequate slope for positive drainage.

Proposal # 5313

CE71-19

CE72-19

IECC: C402.1.4.1 (New), C402.1.4.2 (New), C402.1.4.3 (New), C402.2.1

Proponent: Darren Meyers, P.E., IECC_LLCC representing the National Roofing Contractors Association, representing the National Roofing Contractors Association (dmeyers@ieccode.com)

2018 International Energy Conservation Code

Revise as follows:

C402.1.4 Assembly *U*-factor, *C*-factor or *F*-factor-based method. Building thermal envelope opaque assemblies shall meet the requirements of Sections C402.2 and C402.4 based on the climate zone specified in Chapter 3. Building thermal envelope opaque assemblies intended to comply on an assembly *U*-, *C*- or *F*-factor basis shall have a *U*-, *C*- or *F*-factor not greater than that specified in Table C402.1.4. Commercial buildings or portions of commercial buildings enclosing *Group R* occupancies shall use the *U*-, *C*- or *F*-factor from the “*Group R*” column of Table C402.1.4. Commercial buildings or portions of commercial buildings enclosing occupancies other than *Group R* shall use the *U*-, *C*- or *F*-factor from the “All other” column of Table C402.1.4

Add new text as follows:

C402.1.4.1 Tapered, above-deck insulation based on thickness. Continuously insulated roof assemblies where the thickness of insulation varies 1 inch (25 mm) or more and where the area-weighted *U*-factor is equivalent to the same assembly with the *U*-factor specified in Table C402.1.4.

C402.1.4.2 Suspended ceilings Insulation installed on suspended ceilings having removable ceiling tiles shall not be considered part of the minimum thermal resistance (*R*-value) of roof insulation or assembly *U*-factor of the roof/ceiling construction.

C402.1.4.3 Joints staggered Continuous insulation board shall be installed in not less than two (2) layers and the edge joints between each layer of insulation shall be staggered, except where insulation tapers to the roof deck at a gutter edge, roof drain or scupper.

Revise as follows:

C402.2.1 Roof assembly. The minimum thermal resistance (*R*-value) of the insulating material installed either between the roof framing or continuously on the roof assembly shall be as specified in Table C402.1.3, based on construction materials used in the roof assembly. Insulation installed on a suspended ceiling having removable ceiling tiles shall not be considered as part of the minimum thermal resistance of the roof insulation. Continuous insulation board shall be installed in not less than 2 layers and the edge joints between each layer of insulation shall be staggered.

Exceptions:

1. ~~Continuously insulated roof assemblies where the thickness of insulation varies 1 inch (25 mm) or less and where the area-weighted *U*-factor is equivalent to the same assembly with the *R*-value specified in Table C402.1.3.~~
 2. ~~1.~~ Where tapered insulation is used with insulation entirely above deck, the *R*-value where the insulation thickness varies 1 inch (25 mm) or ~~less~~ more from the minimum thickness of tapered insulation shall comply with the *R*-value specified in Table C402.1.3.
 3. ~~2.~~ Two layers of insulation are not required where insulation tapers to the roof deck, such as at roof drains.

Reason: The goal of this proposal is to repair and preserve the intent in original proposal EC31-03/04 (AM PC) by New Buildings Institute which correctly added a “first-ever” use of an R-value equivalent, area-weighted average U-factor option in lieu of an “R-value only” compliance option.

The clear intent in the “charging” paragraph of Section C402.2 is to limit its following sub-sections (C402.2.1 Roofs, C402.2.2 Walls, C402.2.3 Floors, etc.) solely to R-value compliance by way of Table C402.1.3. Accordingly, this proposal is limited solely to correctly distinctly separating and relocating the appropriate U-factor alternative as a subsection to C402.1.4 where it belongs. NRCA proposed this for roof/ceiling installations only as roofing and related professions is our charge. We leave it to others, then, to clean the remaining instances throughout C402.2 where R-value compliance and U-factor compliance are mixed and co-matched inappropriately within C402.2.

The proposal preserves the independent expressions of 1) minimum thickness, 2) staggered joints and 3) back-loaded, suspended ceilings from C402.2.1, as appropriate.

It is unnecessary to preserve the minimum “skylight curb” provision of C402.2.1.1 as the Assembly U-factor, C-factor or F-factor-based method provides the user with maximum flexibility toward achieving assembly U-factor, C-factor or F-factor-based compliance in roof/ceiling construction in accordance with Table C402.1.4, accepted engineering and architectural practice.

The proposal is product neutral and inclusive of all rigid board insulation types including, cellular glass, expanded and extruded polystyrene, faced and fiber-reinforced gypsum board, stone wool, perlite board, polyisocyanurate, high-density polyisocyanurate, wood fiber board and composite board.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code change proposal will not increase or decrease the cost of construction, as the provisions of **C402.1.4, Assembly U-factor, C-factor or F-factor-based methodolog[ies]**, remain a design option addressing constructability issues in new construction and reroofing projects even without the change, and where a newly proposed or existing roof deck does not provide adequate slope for positive drainage.

Proposal # 5308

CE72-19

CE73-19

IECC: TABLE C402.1.4

Proponent: Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, representing BCAP-IBTS (mguttpgh@aol.com)

2018 International Energy Conservation Code

Revise as follows:

TABLE C402.1.4
OPAQUE THERMAL ENVELOPE ASSEMBLY MAXIMUM REQUIREMENTS, U-FACTOR METHOD^{a, b}

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		All other	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R		
Roofs																
Insulation entirely above roof deck	U-0.048	U-0.039	U-0.039	U-0.039	U-0.039	U-0.039	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.028	U-0.028	U-0.028
Metal buildings	U-0.044 U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.031	U-0.031	U-0.029	U-0.029	U-0.029
Attic and other	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021

For SI: 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.

ci = Continuous insulation, NR = No Requirement, LS = Liner System.

- a. Where assembly *U*-factors, *C*-factors, and *F*-factors are established in ANSI/ASHRAE/IESNA 90.1 Appendix A, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table, and provided that the construction, excluding the cladding system on walls, complies with the appropriate construction details from ANSI/ASHRAE/IESNA 90.1 Appendix A.
- b. Where *U*-factors have been established by testing in accordance with ASTM C1363, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table. The *R*-value of continuous insulation shall be permitted to be added to or subtracted from the original tested design.
- c. Where heated slabs are below grade, below-grade walls shall comply with the *U*-factor requirements for above-grade mass walls.
- d. "Mass floors" shall be in accordance with Section C402.2.3.
- e. These *C*-, *F*- and *U*-factors are based on assemblies that are not required to contain insulation.
- f. The first value is for perimeter insulation and the second value is for full slab insulation.
- g. "Mass walls" shall be in accordance with Section C402.2.2.

Reason: The purpose of this code change proposal is to correct the U-factor for roof insulation for All Other metal buildings in climate zone 1. Even though the R-values in Table C402.1.3 for both Group R and All Other metal buildings in climate zone 1 are R-19+R 11 LS, the U-factor table applies a higher U-factor for All Other metal buildings. This proposal adopts the U-factor from Group R for both building types in climate zone 1, since it is closest to the R-19+R-11 LS U-factor equivalent in Table A2.3.3 in ASHRAE Standard 90.1 Normative Appendix A. The building envelope typically remains the same for many years after construction and it is particularly important to “get it right” at the time of construction. After all, the intent of the IECC (C101.3) is to “regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building.”

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The current metal building roof U-factor for All Other buildings is an error and is inconsistent with the R-value equivalent in Table C402.1.3.

Proposal # 4207

CE73-19

CE74-19

IECC: TABLE C402.1.4

Proponent: Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, representing BCAP-IBTS (mguttpgh@aol.com)

2018 International Energy Conservation Code

Revise as follows:

TABLE C402.1.4

OPAQUE THERMAL ENVELOPE ASSEMBLY MAXIMUM REQUIREMENTS, *U*-FACTOR METHOD^{a, b}

Portions of table not shown remain unchanged.

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		All other
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	
Walls, above grade															
Mass ^g	U-0.151	U-0.151	U-0.151	U-0.123	U-0.123	U-0.104	U-0.104	U-0.090	U-0.090	U-0.080	U-0.080	U-0.071	U-0.071	U-0.071	U-0.06 0.06 U-0.03 0.03
Metal building	U-0.079	U-0.079	U-0.079	U-0.079	U-0.079	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.039	U-0.05 0.05
Metal framed	U-0.077	U-0.077	U-0.077	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.052	U-0.06 0.06
Wood framed and other ^c	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.051	U-0.051	U-0.051	U-0.03 0.03

For SI: 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.

ci = Continuous insulation, NR = No Requirement, LS = Liner System.

- a. Where assembly *U*-factors, *C*-factors, and *F*-factors are established in ANSI/ASHRAE/IESNA 90.1 Appendix A, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table, and provided that the construction, excluding the cladding system on walls, complies with the appropriate construction details from ANSI/ASHRAE/ISNEA 90.1 Appendix A.
- b. Where *U*-factors have been established by testing in accordance with ASTM C1363, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table. The *R*-value of continuous insulation shall be permitted to be added to or subtracted from the original tested design.
- c. Where heated slabs are below grade, below-grade walls shall comply with the *U*-factor requirements for above-grade mass walls.
- d. "Mass floors" shall be in accordance with Section C402.2.3.

- e. These *C*-, *F*- and *U*-factors are based on assemblies that are not required to contain insulation.
- f. The first value is for perimeter insulation and the second value is for full slab insulation.
- g. “Mass walls” shall be in accordance with Section C402.2.2.

Reason: The purpose of this code change proposal is to correct an apparent error in the U-factor for above-grade mass walls in climate zone 8. Table C402.1.3 of the 2018 IECC requires R-25 continuous insulation for both Group R and All Other building types, but the U-factor is significantly higher than what would be considered equivalent in Normative Appendix A of ASHRAE Standard 90.1-2016. Revising the U-factor to 0.037 for climate zone 8 will apply a consistent set of requirements across the R-value and U-factor tables. The building envelope typically remains the same for many years after construction and it is particularly important to “get it right” at the time of construction. After all, the intent of the IECC (C101.3) is to “regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building.”

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The current above grade mass wall U-factor for climate zone 8 is an error and is inconsistent with the R-value equivalent in Table C402.1.3.

Proposal # 4212

CE74-19

CE75-19

IECC: TABLE C402.1.4

Proponent: Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, representing BCAP-IBTS (mguttpgh@aol.com)

2018 International Energy Conservation Code

Revise as follows:

TABLE C402.1.4

OPAQUE THERMAL ENVELOPE ASSEMBLY MAXIMUM REQUIREMENTS, U-FACTOR METHOD^{a, b}

Portions of table not shown remain unchanged.

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		All other
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	
Walls, above grade															
Mass ⁹	U-0.151	U-0.151	U-0.151	U-0.123	U-0.123	U-0.104	U-0.104	U-0.090	U-0.090	U-0.080	U-0.080	U-0.071	U-0.071	U-0.071	U-0.064
Metal building	U-0.079	U-0.079	U-0.079	U-0.079	U-0.079	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.039	U-0.052
Metal framed	U-0.077	U-0.077	U-0.077	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.052	U-0.064
Wood framed and other ^c	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.051	U-0.051	U-0.051	U-0.051	U-0.031

For SI: 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.

ci = Continuous insulation, NR = No Requirement, LS = Liner System.

- a. Where assembly *U*-factors, *C*-factors, and *F*-factors are established in ANSI/ASHRAE/IESNA 90.1 Appendix A, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table, and provided that the construction, excluding the cladding system on walls, complies with the appropriate construction details from ANSI/ASHRAE/IESNA 90.1 Appendix A.
- b. Where *U*-factors have been established by testing in accordance with ASTM C1363, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table. The *R*-value of continuous insulation shall be permitted to be added to or subtracted from the original tested design.
- c. Where heated slabs are below grade, below-grade walls shall comply with the *U*-factor requirements for above-grade mass walls.

- d. “Mass floors” shall be in accordance with Section C402.2.3.
- e. These *C*-, *F*- and *U*-factors are based on assemblies that are not required to contain insulation.
- f. The first value is for perimeter insulation and the second value is for full slab insulation.
- g. “Mass walls” shall be in accordance with Section C402.2.2.

Reason: The purpose of this code change proposal is to correct two errors in the U-factor for wall insulation in climate zones 5 and 7. In both cases, the U-factor does not match the corresponding R-value of the IECC. The proposal above not only brings the U-factor into alignment with the IECC R-value, but also brings it into alignment with the applicable U-factors and R-values in ASHRAE Standard 90.1-2016.

In climate zone 7, Group R metal-framed walls are required to be insulated to R-13+R-15.6 c.i. in both the IECC and ASHRAE Standard 90.1. ASHRAE Standard 90.1 includes an equivalent U-factor of 0.042, which corresponds with the R-value according to Standard 90.1 Normative Appendix A. However, the 2018 IECC includes an equivalent U-factor of 0.052, which is inconsistent. We believe the IECC U-factor is an error and should be changed to 0.042.

In climate zone 5, Group R wood-framed walls are required to be insulated to R-13+R-7.5 c.i., or R-20+R-3.8 c.i., but the U-factor equivalent clearly does not match up. ASHRAE Standard 90.1 specifies a U-factor of 0.051, which not only corresponds with the R-value, but also corresponds with the U-factor requirements in climate zones 6 and 7 (which also require R-13+5 + R-7.5 c.i., or R-20+R-3.8 c.i.). Here again, we believe the IECC U-factor is an error, and should be changed to 0.051.

The building envelope typically remains the same for many years after construction and it is particularly important to “get it right” at the time of construction. After all, the intent of the IECC (C101.3) is to “regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building.”

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The current U-factor equivalents for metal-framed walls in climate zone 7 and wood-framed walls in climate zone 5 are errors and are inconsistent with the R-value equivalent in Table C402.1.3.

Proposal # 5224

CE75-19

CE76-19

IECC: TABLE C402.1.4

Proponent: Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council

2018 International Energy Conservation Code

Revise as follows:

TABLE C402.1.4
OPAQUE THERMAL ENVELOPE ASSEMBLY MAXIMUM REQUIREMENTS, U-FACTOR METHOD^{a, b}

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Roofs														
Insulation entirely above roof deck	U-0.048	U-0.039	U-0.039	U-0.039	U-0.039	U-0.039	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.028	U-0.028
Metal buildings	U-0.044	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.031	U-0.031	U-0.029	U-0.029
Attic and other	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021
Walls, above grade														
Mass ^{g, f}	U-0.151	U-0.151	U-0.151	U-0.123	U-0.123	U-0.104	U-0.104	U-0.090	U-0.090	U-0.080	U-0.080	U-0.071	U-0.071	U-0.071
Metal building	U-0.079	U-0.079	U-0.079	U-0.079	U-0.079	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052
Metal framed	U-0.077	U-0.077	U-0.077	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064
Wood framed and other ^c	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.051	U-0.051	U-0.051	U-0.051
Walls, below grade														
Below-grade wall ^c	C-1.140 ^e	C-0.119	C-0.119	C-0.119	C-0.119	C-0.119	C-0.119	C-0.119	C-0.092					
Floors														
Mass ^d	U-0.322 ^e	U-0.322 ^e	U-0.107	U-0.087	U-0.076	U-0.076	U-0.076	U-0.074	U-0.074	U-0.064	U-0.064	U-0.064	U-0.055	U-0.055
Joist/framing	U-0.066 ^e	U-0.066 ^e	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033
Slab-on-grade floors														

Unheated slabs	F-0.73 ^e	F-0.54	F-0.54	F-0.54	F-0.54	F-0.54	F-0.52	F-0.40	F-0.40					
Heated slabs ^f	F-1.02 0.74 0.69	F-1.02 0.74 0.69	F-1.02 0.74 0.69	F-1.02 0.74 0.69	F-0.90 0.74 0.66	F-0.90 0.74 0.66	F-0.86 0.64 0.62	F-0.86 0.64 0.62	F-0.79 0.64 0.62	F-0.79 0.64 0.62	F-0.79 0.55 0.62	F-0.69 0.55 0.602	F-0.69 0.55 0.602	F-0.69 0.55 0.602
Opaque doors														
Swinging door	U-0.61	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37							
Garage door <14% glazing	U-0.31	U-0.31	U-0.31											

For SI: 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.

ci = Continuous insulation, NR = No Requirement, LS = Liner System.

- a. Where assembly *U*-factors, *C*-factors, and *F*-factors are established in ANSI/ASHRAE/IESNA 90.1 Appendix A, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table, and provided that the construction, excluding the cladding system on walls, complies with the appropriate construction details from ANSI/ASHRAE/ISNEA 90.1 Appendix A.
- b. Where *U*-factors have been established by testing in accordance with ASTM C1363, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table. The *R*-value of continuous insulation shall be permitted to be added to or subtracted from the original tested design.
- c. Where heated slabs are below grade, below-grade walls shall comply with the *U*-factor requirements for above-grade mass walls.
- d. "Mass floors" shall be in accordance with Section C402.2.3.
- e. These *C*-, *F*- and *U*-factors are based on assemblies that are not required to contain insulation.
- f. ~~The first value is for perimeter insulation and the second value is for full slab insulation.~~
- g. "Mass walls" shall be in accordance with Section C402.2.2.

Reason: The F-factors for heated slabs in Table C402.1.4 are currently shown as two separate factors for the two insulation components. This is technically incorrect and has caused confusion for the following reasons:

1. F-factors are like U-factors in that they represent the net effect of all insulation materials applied to an assembly. Thus, there should only be one F-factor representing the R-value of any and all insulation materials used on the slab construction. In this case, one F-factor should be used to represent the combined effect of perimeter and full slab insulation R-values required in Table C402.1.3 for heated slabs.
2. For evaluating alternative insulation solutions (such as by using COMcheck), one must apply a single F-factor to the slab construction. Without this corrected in the code, making alternative solutions to the R-value table will become confused and potentially non-compliant or unavailable. For example, the revised F-factors as proposed are consistent with F-factors in the ASHRAE 90.1 standard's Appendix A (pending final approval of Addendum bx) which is referenced in footnote 'a' of this Table C402.1.4. This consistency is important for code compliance and flexibility to determine alternate solutions. It is also for this reason that some of the F-factors have two significant digits while others have three – exactly as done in ASHRAE 90.1 Appendix A as already referenced in footnote 'a'.

3. The current “dual” F-factors was the inadvertent outcome of last code cycle in attempting to do the best that could be done at that time to make a needed improvement to the code while reasonably resolving several competing proposals and public comments (see proposal CE61-16 (AMPC2) from last code cycle).

4. Footnote ‘f’ was developed as a “patch” for the 2018 code until a better F-factor solution could be developed as done in this current proposal. Thus, with the F-factor corrections in this proposal, footnote ‘f’ is no longer needed to give direction for appropriate use of a single F-factor to determine equivalent R-value requirements when insulation is used in multiple locations (e.g., at perimeter and fullslab). The means to determine alternative F-factors is already addressed in footnote ‘a’ referencing ASHRAE 90.1 Appendix A data.

This proposal resolves all of the above issues and will provide greater flexibility for compliance by providing a means to use a single F-factor to determine a variety of alternative R-values for any combination of perimeter and full-slab insulation, not just those shown in the R-value Table C402.1.3.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal is a correction to the heated slab F-factors to ensure appropriate use, consistency with the R-value requirements (which combine perimeter and full-slab insulation), and to allow alternatives to be determined using tools like COMcheck and ASHRAE 90.1 Appendix A. It does not change the stringency of the requirements.

Proposal # 4515

CE76-19

CE77-19

IECC: TABLE C402.1.4

Proponent: Joseph Hetzel, representing Door & Access Systems Manufacturers Association
(Jhetzel@thomasamc.com)

2018 International Energy Conservation Code

Revise as follows:

TABLE C402.1.4
OPAQUE THERMAL ENVELOPE ASSEMBLY MAXIMUM REQUIREMENTS, U-FACTOR METHOD^{a, b}

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Roofs														
Insulation entirely above roof deck	U-0.048	U-0.039	U-0.039	U-0.039	U-0.039	U-0.039	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.028	U-0.028
Metal buildings	U-0.044	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.031	U-0.031	U-0.029	U-0.029
Attic and other	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021
Walls, above grade														
Mass ^g	U-0.151	U-0.151	U-0.151	U-0.123	U-0.123	U-0.104	U-0.104	U-0.090	U-0.090	U-0.080	U-0.080	U-0.071	U-0.071	U-0.071
Metal building	U-0.079	U-0.079	U-0.079	U-0.079	U-0.079	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.039
Metal framed	U-0.077	U-0.077	U-0.077	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.052
Wood framed and other ^c	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.051	U-0.051	U-0.051	U-0.051
Walls, below grade														
Below-grade wall ^c	C-1.140 ^e	C-0.119	C-0.119	C-0.119	C-0.119	C-0.119	C-0.119	C-0.092	C-0.092					
Floors														
Mass ^d	U-0.322 ^e	U-0.322 ^e	U-0.107	U-0.087	U-0.076	U-0.076	U-0.076	U-0.074	U-0.074	U-0.064	U-0.064	U-0.064	U-0.055	U-0.051
Joist/framing	U-0.066 ^e	U-0.066 ^e	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033
Slab-on-grade floors														

Unheated slabs	F-0.73 ^e	F-0.54	F-0.54	F-0.54	F-0.54	F-0.54	F-0.52	F-0.40	F-0.40					
Heated slabs ^f	F-1.02 0.74	F-1.02 0.74	F-1.02 0.74	F-1.02 0.74	F-0.90 0.74	F-0.90 0.74	F-0.86 0.64	F-0.79 0.64	F-0.79 0.64	F-0.79 0.64	F-0.79 0.55	F-0.69 0.55	F-0.69 0.55	F-0.69 0.55
Opaque doors														
Swinging door	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37
Garage door <14% glazing ^h	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31

For SI: 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.

ci = Continuous insulation, NR = No Requirement, LS = Liner System.

- a. Where assembly *U*-factors, *C*-factors, and *F*-factors are established in ANSI/ASHRAE/IESNA 90.1 Appendix A, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table, and provided that the construction, excluding the cladding system on walls, complies with the appropriate construction details from ANSI/ASHRAE/ISNEA 90.1 Appendix A.
- b. Where *U*-factors have been established by testing in accordance with ASTM C1363, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table. The *R*-value of continuous insulation shall be permitted to be added to or subtracted from the original tested design.
- c. Where heated slabs are below grade, below-grade walls shall comply with the *U*-factor requirements for above-grade mass walls.
- d. "Mass floors" shall be in accordance with Section C402.2.3.
- e. These *C*-, *F*- and *U*-factors are based on assemblies that are not required to contain insulation.
- f. The first value is for perimeter insulation and the second value is for full slab insulation.
- g. "Mass walls" shall be in accordance with Section C402.2.2.
- h. Garage doors having a single row of fenestration shall have an assembly U-factor less than or equal to 0.44 in Climate Zones 1 through 6 and less than or equal to 0.36 in Climate Zones 7 and 8, provided that the fenestration area is not less than 14 percent and not more than 25 percent of the total door area.

Reason: This proposal clarifies U-factor requirements for garage doors with glazing making up between 14% and 25% of the door area. This footnote will complete the garage door U-factor requirements in the code, allowing for non-glazed (<14% glazing), vision lights or one row of glazing (14% - 25% glazing), or fenestration (>50% glazing.) Garage doors are not designed with glazing constituting between 25% and 50% of the door area. The U-factor values in the proposed footnote are based on DASMA research involving one row of glazing in sectional doors.

Cost Impact: The code change proposal will decrease the cost of construction. The code change proposal will decrease the cost of construction. Currently, there is no prescriptive means of determining the maximum U-factor requirement for garage doors with between 14% and 25% glazing. If the U-factor requirement is obtained from the chart for garage doors with less than 14% glazing, or is obtained from the fenestration (greater than 50% glazing) charts, the values are unrealistically conservative. The proposed U-factors are based on sound testing, and the clarified requirements would theoretically lower

construction costs.

Proposal # 3959

CE77-19

CE78-19 Part I

PART I — IECC: C402.2.4, C402.2.4.1(New)

PART II — IECC: R402.2.10 (IRC N1102.2.10), R402.2.10.1 [IRC N1102.2.10.1] (New)

Proponent: William Warlick, representing Self (william.warlick@slcgov.com); Don Davies (don.davies@slcgov.com)

2018 International Energy Conservation Code

Revise as follows:

~~**C402.2.4 Slabs-on-grade perimeter insulation- Slab-on-grade floors (Mandatory).** Where the slab on grade is in contact with the ground, the minimum thermal resistance (*R*-value) of the insulation around the perimeter of unheated or heated slab-on-grade floors. A slab-on-grade floor designed in accordance with the *R*-value method of Section C402.1.3 shall be as specified in Table C402.1.3. The perimeter insulation shall be placed on the outside of the foundation or on the inside of the foundation wall. The perimeter insulation shall extend downward from the top of the slab for the minimum distance shown in the table or to the top of the footing, whichever is less, or downward to not less than the bottom of the slab and then horizontally to the interior or exterior for the total distance shown in the table. Insulation extending away from the building shall be protected by pavement or by not less than of 10 inches (254 mm) of soil. insulated in accordance with this section and Table C402.1.3.~~

Exception: Where the slab-on-grade floor is greater than 24 inches (61 mm) below the finished exterior grade perimeter insulation is not required.

Add new text as follows:

C402.2.4.1 Construction. The insulation shall be placed around the foundation perimeter on the outside of the foundation or on the inside of the foundation wall. The perimeter insulation shall extend downward from the top of the slab for downward the minimum distance shown in Table C402.1.3 or to the top of the footing, whichever is less, or downward to not less than the bottom of the slab and then horizontally to the interior or exterior for the total distance shown in the table. Insulation extending away provided in Table C402.1.3 by any combination of vertical placement, extending under the slab or extending out from the building. Insulation extending out from the building shall be protected by pavement or by not less than of 10 inches (254 mm) of soil.

Exceptions:

1. In vertical placement the insulation shall be permitted to extend downward the distance shown in the table or to the top of the footing.
2. Preservative-treated wood or other approved thermal break material shall be permitted to substitute for the top 3-1/2 inches of insulation between the foundation wall and the edge of the floor slab.
3. Except at heated slabs or in a Group R occupancy, a thermal break of minimum 1/2 inch isolation joint material shall be permitted to substitute for the insulation between the foundation wall and the edge of the floor slab.

Proposal # 5603

CE78-19 Part I

CE78-19 Part II

IECC: R402.2.10 (IRC N1102.2.10), R402.2.10.1 [IRC N1102.2.10.1] (New)

Proponent: William Warlick, representing Self (william.warlick@slcgov.com); Don Davies (don.davies@slcgov.com)

2018 International Energy Conservation Code

Revise as follows:

R402.2.10 (IRC N1102.2.10) Slab-on-grade floors (Mandatory). Slab-on-grade floors with a floor surface less than 12 inches (305 mm) below grade. A slab-on-grade floor shall be insulated in accordance with this section and Table R402.1.2. The insulation shall extend downward from the top of the slab on the outside or inside of the foundation wall. Insulation located below grade shall be extended the distance provided in Table R402.1.2 by any combination of vertical insulation, insulation extending under the slab or insulation extending out from the *building*. Insulation extending away from the *building* shall be protected by pavement or by not less than 10 inches (254 mm) of soil. The top edge of the insulation installed between the *exterior wall* and the edge of the interior slab shall be permitted to be cut at a 45-degree (0.79 rad) angle away from the *exterior wall*. Slab-edge insulation is not required in

Exceptions:

1. Where the slab-on-grade floor is greater than 12 inches (30 mm) below the finished exterior grade.
2. In jurisdictions designated by the *code official* as having a very heavy termite infestation.

Add new text as follows:

R402.2.10.1 (IRC N1102.2.10.1) Construction. The insulation shall be placed around the foundation perimeter grade shall be insulated in accordance with Table R402.1.2. The insulation shall extend downward from the top of the slab on the outside or inside of the foundation wall. Insulation located below grade shall be extended The insulation shall extend from the top of the slab downward the distance provided in Table R402.1.2 by any combination of vertical insulation placement, insulation extending under the slab or insulation extending out from the *building*. building. Insulation extending away out from the building shall be protected by pavement or by not less than 10 inches (254 mm) of soil.

Exceptions:

1. The top edge of the insulation installed between the exterior wall and the edge of the interior slab shall be permitted to be cut at a 45-degree (0.79 rad) angle away from the exterior wall.
2. Preservative-treated wood or other approved thermal break material shall be permitted to substitute for the top 1-1/2 inches of insulation between the foundation wall and the edge of the floor slab.

Slab-edge insulation shall not be required in jurisdictions designated by the *code official* as having a very heavy termite infestation.

Reason: The intent of this code change proposal is to: (1) make the insulation of slab-on-grade floors mandatory; (2) provide alternative construction solutions for insulation run inside a foundation wall; and (3) simplify and harmonize the code language.

During the life expectancy of a building insulation can readily be added to most envelope portions of the building at times, but one envelope element which will not be upgraded is the slab-on-grade insulation. Therefore, it is

important to get this insulation done right when a new building is built.

While making slab-on-grade floor insulation mandatory could entail some construction problems, this code change offers practical solutions. And while the 45-degree angle cut option provided for residential buildings has proven to be impractical in some situations, the code change offers construction options to this. Where insulation is run inside the foundation wall the joint between the slab and the foundation can be covered by preservative-treated wood. In limited applications where occupant comfort will not be critical, this insulation can be substituted by simply a thermal break.

In addition to making these substantive changes, we propose new text to simplify and clarify the code language, and to harmonize the structure of this section across the IRC and IECC Commercial and Residential sections.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Will not increase the cost of construction. Insulation provided at slab-on-grade floors would substitute for insulation at other elements of the thermal envelope, so the Mandatory provision would not add to the cost of construction.

Proposal # 5616

CE78-19 Part II

CE79-19

IECC: C402.2.4, C402.2.4.1 (New)

Proponent: Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council

2018 International Energy Conservation Code

~~**C402.2.4 Slabs-on-grade perimeter insulation. Slabs-on-grade. (Prescriptive)** Where the slab on-grade is in contact with the ground, the The minimum thermal resistance (R -value) of the insulation around the perimeter of for unheated or heated slab-on-grade floors designed in accordance with the R -value method of Section C402.1.3 shall be as specified in Table C402.1.3. The perimeter insulation shall be placed on the outside of the foundation or on the inside of the foundation wall. The perimeter insulation shall extend downward from the top of the slab for the minimum distance shown in the table or to the top of the footing, whichever is less, or downward to not less than the bottom of the slab and then horizontally to the interior or exterior for the total distance shown in the table. Insulation extending away from the building shall be protected by pavement or by not less than of 10 inches (254 mm) of soil. **Exception:** Where the slab-on-grade floor is greater than 24 inches (61 mm) below the finished exterior grade, perimeter insulation is not required.~~

Add new text as follows:

C402.2.4.1 Insulation installation (Mandatory). Where installed, the perimeter insulation shall be placed on the outside of the foundation or on the inside of the foundation wall. The perimeter insulation shall extend downward from the top of the slab for the minimum distance shown in the table or to the top of the footing, whichever is less, or downward to not less than the bottom of the slab and then horizontally to the interior or exterior for the total distance shown in the table. Insulation extending away from the building shall be protected by pavement or by not less than of 10 inches (254 mm) of soil. Where installed, full slab insulation shall be continuous under the entire area of the slab-on-grade floor, except at structural column locations and service penetrations. Insulation required at the heated slab perimeter shall not be required to extend below the bottom of the heated slab and shall be continuous with the full slab insulation.
Exception: Where the slab-on-grade floor is greater than 24 inches (61 mm) below the finished exterior grade, perimeter insulation is not required.

Reason: In the last code cycle, provisions for full-slab insulation were added to Table C402.1.3 for heated slabs. However, Section C402.2.4 only addresses perimeter insulation of slabs. This proposal makes coordinating changes to Section C402.2.4 such that installation of both perimeter insulation and full-slab insulation are addressed in a manner consistent with the intent of Table C402.1.3. The designation of [Prescriptive] and [Mandatory] in the titles is used because the R -values are prescriptive, but the installation requirements should apply to any and all compliance approaches (i.e., mandatory). This approach is also intended to be consistent with a larger proposal expected from SEHPCAC which addresses the prescriptive vs. mandatory matter in other sections of the code.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal adds installation provisions for fullslab insulation in a manner consistent with Table C402.1.3. The installation provisions provided for full slab insulation may reduce cost for typical slab-on-grade floor construction by explicitly not requiring insulation under structural column footings (although this is possible using high density and compressive strength foam insulating sheathing boards as commonly done for cryogenic facilities and infrastructure frost protection).

Staff Analysis: Please note that the majority of the change is relocating existing text from Section C402.2.4 into C402.2.4.1. Because of the requirements of the cdpACCESS system, the text removed from C402.2.4 must be

shown as deleted and then underlined when it reappears in Section C402.2.4.1

Proposal # 4516

CE79-19

CE80-19

IECC: C401.2, C402.2.7, C407.2

Proponent: David Collins, SEHPCAC, representing SEHPCAC (SEHPCAC@iccsafe.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Energy Conservation Code

Revise as follows:

C401.2 Application. Commercial buildings shall comply with one of the following:

1. The requirements of ANSI/ASHRAE/IESNA 90.1.
2. The requirements of Sections C402 through C405 and C408. In addition, commercial buildings shall comply with Section C406 and tenant spaces shall comply with Section C406.1.1.
3. The requirements of Sections ~~C402.2.7~~, C402.5, C403.2, C403.3 through C403.3.2, C403.4 through C403.4.2.3, C403.5.5, C403.7, C403.8.1 through C403.8.4, C403.10.1 through C403.10.3, C403.11, C403.12, C404, C405, C407 and C408. The building energy cost shall be equal to or less than 85 percent of the standard reference design building.

~~C402.2.7 Airspaces. Airspaces (Mandatory).~~ Where the thermal properties of airspaces are used to comply with this code ~~R-value of an airspace is used for compliance~~ in accordance with Section ~~C401.2~~, such airspaces ~~C402.1~~ the airspace shall be enclosed in an unventilated cavity constructed to minimize airflow into and out of the enclosed airspace. Airflow shall be deemed minimized where the enclosed airspace is located on the interior side of the continuous air barrier and is bounded on all sides by building components.

Exception: The thermal resistance of airspaces located on the exterior side of the continuous air barrier and adjacent to and behind the exterior wall-covering material shall be determined in accordance with ASTM C1363 modified with an airflow entering the bottom and exiting the top of the airspace at an air movement rate of not less than 70 mm/second.

C407.2 Mandatory requirements. Compliance with this section requires compliance with Sections ~~C402.2.7~~, C402.5, C403.2, C403.3 through C403.3.2, C403.4 through C403.4.2.3, C403.5.5, C403.7, C403.8.1 through C403.8.4, C403.10.1 through C403.10.3, C403.11, C403.12, C404 and C405.

Reason: When C402.2.7 was added in the 2018 edition of the code it required compliance with C401.2, but did not exclude the ASHRAE 90.1 compliance path.. Imposing the airspace requirement on designs which do not use Chapter 4, but use ASHRAE 90.1 prevents the 90.1 path from being a standalone path as intended. This is an opportunity for conflict and confusion and complicates training for both the IECC and the 90.1. The reference "in accordance with Section C401.2" could be read to imply that this requirement overlays those of ASHRAE 90.1. The IECC does not make modifications to the ASHRAE 90.1.

Airspaces are proposed to be non-tradeable (mandatory) in the performance path because the IECC's provisions do not include performance metrics, indicating there is no tradable value.

Instead, the IECC's requirements for airspaces are installation related – 'how to do an airspace'- which apply to all installations, prescriptive and performance, which makes the provision mandatory.

While identified as "Mandatory", if the elimination of the use of the labels "prescriptive" and "mandatory" is approved, we understand this label would not be added and it would instead the provision be added to Table C407.2 to indicate its application to the Total Building Performance compliance option.

This proposal is submitted by the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at:

<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>

(<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>)

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This change does not increase or decrease code provisions nor impact construction methods. It clarifies language and provisions already contained in the code.

Proposal # 4182

CE80-19

CE81-19

IECC: C402.2, C402.2.8 (New)

Proponent: Eric Makela, New Buildings Institute, representing New Buildings Institute
(ericM@newbuildings.org)

2018 International Energy Conservation Code

Revise as follows:

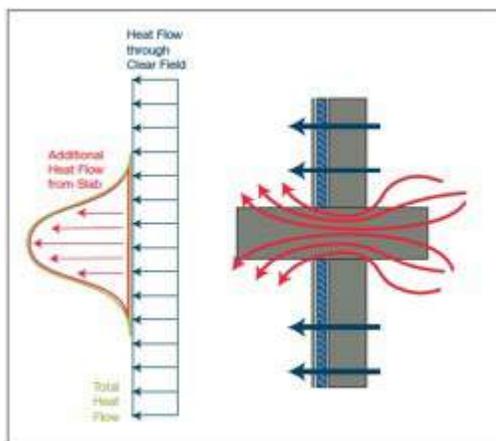
C402.2 Specific building thermal envelope insulation requirements (Prescriptive). Insulation in building thermal envelope opaque assemblies shall comply with Sections C402.2.1 through ~~C402.2.7~~ C402.2.8 and Table C402.1.3.

Add new text as follows:

C402.2.8 Concrete slab floors. Concrete floor slabs that penetrate the building thermal envelope shall be provided with either continuous insulation having a minimum thermal resistance of R-3 or a minimum R-3 thermal break located where the concrete slab penetrates the building thermal envelope.

Reason: The requirements for overall assembly insulation have been well-addressed in the code. However, the existing requirements do not adequately address significant thermal bridging issues.

Thermal bridges are created when a relatively high thermally conductive material “bridges” through the insulating materials in the thermal envelope. Whether they penetrate all the way from the exterior to the interior of the building or only partially through the thermal envelope, thermal bridges make it easier for heat to travel in or out of the building. The impact of thermal bridges has a greater energy impact than a simple weighted U-factor calculation would suggest. Weighted U-factor calculations assume that heat travels in parallel paths through an assembly. In reality, heat also moves laterally, resulting in additional heat transmission through the assembly.



This has an impact on the heating and cooling loads of the building, as well as on the perceived comfort of space occupants. Humans perceive heat primarily through conduction, then radiation, then convection. So the presence of hot or cold surfaces due to thermal bridges can have a significant impact on thermal comfort. When the thermal envelope has hot or cold spots from thermal bridges, occupants are more likely to feel uncomfortable and respond by over-conditioning the air in the space, creating another source of energy loss.

The common practices of leaving concrete slab floor edges un-insulated and extending structural slabs through the thermal envelope to create balconies are particularly problematic and significant thermal bridges. This proposal addresses this significant issue by requiring that the thermal bridges created by concrete floor slabs

that penetrate the building thermal envelope be addressed either by providing them with thermal breaks or by encapsulating them in continuous insulation. There are products available on the market that can be used to provide a thermal break within a continuously poured slab that extends to create a balcony. Alternately, balconies can utilize alternate structural configurations that do not require turning the building into a huge radiator.

Cost Impact: The code change proposal will increase the cost of construction
This will increase the cost of construction. Cost impact will vary depending on the approach taken.

Proposal # 5177

CE81-19

CE83-19

IECC: 202 (New), C402.3

Proponent: Darren Meyers, P.E., IECC_LLCC representing the National Roofing Contractors Association, representing the National Roofing Contractors Association (dmeyers@ieccode.com)

2018 International Energy Conservation Code

Add new definition as follows:

VEGETATIVE ROOF. An assembly of interacting components designed to waterproof a building's top surface that includes, by design, vegetation and related landscape elements.

Revise as follows:

C402.3 Roof solar reflectance and thermal emittance. Low-sloped roofs directly above cooled conditioned spaces in *Climate Zones* 1, 2 and 3 shall comply with one or more of the options in Table C402.3.

Exceptions: The following roofs and portions of roofs are exempt from the requirements of Table C402.3:

1. Portions of the roof that include or are covered by the following:
 - 1.1. Photovoltaic systems or components.
 - 1.2. Solar air or water-heating systems or components.
 - 1.3. Vegetative roofs, roof gardens or landscaped roofs.
 - 1.4. Above-roof decks or walkways.
 - 1.5. Skylights.
 - 1.6. HVAC systems and components, and other opaque objects mounted above the roof.
2. Portions of the roof shaded during the peak sun angle on the summer solstice by permanent features of the building or by permanent features of adjacent buildings.
3. Portions of roofs that are ballasted with a minimum stone ballast of 17 pounds per square foot [74 kg/m²] or 23 psf [117 kg/m²] pavers.
4. Roofs where not less than 75 percent of the roof area complies with one or more of the exceptions to this section.

Reason: The purpose of this proposal is to maintain consistency in terminology throughout the ICC Family of International Codes. The term vegetative roof is used and defined in the 2018 IBC Ch. 2, 15, 16 and the 2018 IECC Appendix CA, entitled Solar-Ready Zone—Commercial. The proposal retains the terms roof garden and landscaped roof consistent with similar retentions in the aforementioned I-Code references.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. There is no cost implication aligned with this proposal. Rather, it is an exercise steeped in clarification and consistency across DEFINITIONS used in the ICC Family of International Codes. No change to stringency is proposed.

Proposal # 5291

CE83-19

CE84-19

IECC: TABLE C402.4

Proponent: Thomas Culp, representing the Glazing Industry Code Committee and the Aluminum Extruders Council (culp@birchpointconsulting.com); Jeff Inks, Representing the Window and Door Manufacturers Association, representing Window and Door Manufacturers Association (jinks@wdma.com); Jennifer Hatfield, representing American Architectural Manufacturers Association (jen@jhatfieldandassociates.com); Chris Mathis (chris@mathisconsulting.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE C402.4
BUILDING ENVELOPE FENESTRATION MAXIMUM U-FACTOR AND SHGC REQUIREMENTS**

CLIMATE ZONE	1	2	3	4 EXCEPT MARINE	5 AND MARINE 4	6	7	8								
Vertical fenestration																
U-factor																
Fixed fenestration	0.50	0.50 <u>0.45</u>	0.46 <u>0.42</u>	0.38 <u>0.36</u>	0.38 <u>0.36</u>	0.36 <u>0.34</u>	0.29	0.29 <u>0.26</u>								
Operable fenestration	0.65 <u>0.62</u>	0.65 <u>0.60</u>	0.60 <u>0.54</u>	0.45	0.45	0.43 <u>0.42</u>	0.37 <u>0.36</u>	0.37 <u>0.32</u>								
Entrance doors	1.10 <u>0.83</u>	0.83 <u>0.77</u>	0.77 <u>0.68</u>	0.77 <u>0.63</u>												
SHGC																
Orientation ^a	SEW	N	SEW	N	SEW	N										
PF < 0.2	0.25 <u>0.23</u>	0.33 <u>0.31</u>	0.25	0.33	0.25	0.33	0.36	0.48	0.38	0.51	0.40 <u>0.38</u>	0.53 <u>0.51</u>	0.45 <u>0.40</u>	NR	0.45 <u>0.40</u>	N <u>0.53</u>
0.2 ≤ PF < 0.5	0.30 <u>0.28</u>	0.37 <u>0.34</u>	0.30	0.37	0.30	0.37	0.43	0.53	0.46	0.56	0.48 <u>0.46</u>	0.58 <u>0.56</u>	NR	NR	NR	NR
PF ≥ 0.5	0.40 <u>0.37</u>	0.40 <u>0.37</u>	0.40	0.40	0.40	0.40	0.58	0.58	0.61	0.61	0.64 <u>0.61</u>	0.64 <u>0.61</u>	NR	NR	NR	NR
Skylights																
U-factor	0.75 <u>0.70</u>	0.65	0.55	0.50	0.50	0.50	0.50	0.50	0.50 <u>0.44</u>	0.50 <u>0.41</u>						
SHGC	0.35 <u>0.30</u>	0.35 <u>0.30</u>	0.35 <u>0.30</u>	0.40	0.40	0.40	NR	NR								

NR = No Requirement, PF = Projection Factor.

- a. "N" indicates vertical fenestration oriented within 45 degrees of true north. "SEW" indicates orientations other than "N." For buildings in the southern hemisphere, reverse south and north. Buildings located at less than 23.5 degrees latitude shall use SEW for all orientations.

Reason: The purpose of this proposal is to update the fenestration criteria based on a recent comprehensive analysis, providing additional energy savings in every zone while remaining cost-effective and practical. This

proposal will also provide consistency with the criteria approved for ASHRAE 90.1-2019 in Addendum AW, which passed with broad consensus and support of both industry groups and energy efficiency advocates. The fenestration energy performance indices (U-factor, SHGC), incremental costs, and energy savings associated with a total of 319 fenestration assemblies using different glazing, frame, spacer, and gas fill technologies were calculated to determine what performance levels showed positive life cycle energy savings in each zone using a heating scalar of 25.2 and a cooling scalar of 22.1, consistent with ASHRAE 90.1 methodology. Energy savings for different combinations of U and SHGC were calculated using the medium office and midrise apartment prototype building models developed by Pacific Northwest National Laboratory. Incremental cost data for each product combination was reviewed in consultation with the ASHRAE 90.1 Envelope Subcommittee, industry representatives, and other stakeholders. Practical considerations of potential limitations of different technologies in different applications, distinctions between product categories, product costs, supply and distribution were also used in shaping the final proposed requirements. This analysis resulted in the comprehensive update to ASHRAE 90.1 in Addendum AW, and those same values are adapted into IECC's different table format in this proposal.

Depending on zone, U-factors are reduced by 0-14% for fixed and operable vertical fenestration, 7-25% for entrance doors, and 0-18% for skylights; SHGC requirements for vertical fenestration and skylights are reduced by 0-14%. Overall, this proposal provides the next step in energy efficiency while relying on commercially available and cost-effective technologies, including increased use of new low-e glass coatings, high performance thermally broken or composite frames, argon gas fill, and warm edge spacers. Additionally, consistency between IECC and ASHRAE 90.1 will improve use and compliance of both standards for the design community, fenestration industry, and building code officials.

Cost Impact: The code change proposal will increase the cost of construction

As described above, the ASHRAE 90.1 fenestration workgroup and envelope subcommittee assessed the incremental cost, energy savings, and life cycle cost effectiveness for 319 fenestration assemblies using a wide range of commercially available technologies: 37 different glazing assemblies (double, triple glazing with different low-e products), 4 levels of frame performance, 3 levels of spacer performance, and 2 different gas fills. Incremental cost data for each product combination was reviewed in consultation with the ASHRAE 90.1 Envelope Subcommittee, industry representatives, and other stakeholders. Life cycle energy savings were assessed in the PNNL medium office and midrise apartment prototype building models in each climate zone using a heating scalar of 25.2 and a cooling scalar of 22.1, and the proposed changes showed positive life cycle energy savings in accordance with ASHRAE 90.1 methodology.

Life cycle analysis was the primary method for determination of cost effectiveness. Nonetheless, simple payback periods for the PNNL medium office building typically ranges from 0-16 years in zones 1-7, and approximately 24 years in zone 8 where the jump from double to triple glazing in the model building increases the apparent payback period. In reality, triple glazing is already common in this extremely cold region (e.g. north slope of Alaska).

Proposal # 4764

CE84-19

CE85-19

IECC: TABLE C402.4

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

**TABLE C402.4
BUILDING ENVELOPE FENESTRATION MAXIMUM U-FACTOR AND SHGC REQUIREMENTS**

CLIMATE ZONE	1	2	3	4 EXCEPT MARINE	5 AND MARINE 4	6	7	8								
Vertical fenestration																
U-factor																
Fixed fenestration	0.50	0.50 0.45	0.46 0.42	0.38 0.36	0.38 0.36	0.36 0.34	0.29	0.29 0.26								
Operable fenestration	0.65 0.62	0.65 0.60	0.60 0.54	0.45	0.45	0.43 0.42	0.37 0.36	0.37 0.32								
Entrance doors	1.10 0.83	0.83 0.77	0.77 0.68	0.77 0.63												
SHGC																
Orientation ^a	SEW	N	SEW	N	SEW	N	SEW	N	SEW	N	SEW	N	SEW	N	SEW	N
PF < 0.2	0.25	0.33	0.25	0.33	0.25	0.33	0.36	0.48	0.38	0.51	0.40	0.53	0.45	NR	0.45	N
0.2 ≤ PF < 0.5	0.30	0.37	0.30	0.37	0.30	0.37	0.43	0.53	0.46	0.56	0.48	0.58	NR	NR	NR	NR
PF ≥ 0.5	0.40	0.40	0.40	0.40	0.40	0.40	0.58	0.58	0.61	0.61	0.64	0.64	NR	NR	NR	NR
Skylights																
U-factor	0.75	0.65	0.55	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
SHGC	0.35	0.35	0.35	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	NR	NR	NR	NR

NR = No Requirement, PF = Projection Factor.

- a. "N" indicates vertical fenestration oriented within 45 degrees of true north. "SEW" indicates orientations other than "N." For buildings in the southern hemisphere, reverse south and north. Buildings located at less than 23.5 degrees latitude shall use SEW for all orientations.

Reason: The purpose of this code change proposal is to upgrade and improve U-factors for fixed and operable vertical fenestration and entrance doors in order to save energy and reduce energy cost and peak demand, consistent with the recently approved Addendum *aw* to ASHRAE Standard 90.1-2016, which will be part of ASHRAE Standard 90.1-2019. This proposal will improve efficiency in every climate zone, resulting in additional cost-effective energy cost savings for owners and lessors of commercial buildings and improving comfort for occupants of these buildings.

Beginning with the 2012 IECC, and continuing through subsequent editions of the code, the IECC has set U-factor requirements that properly apply irrespective of frame material type. Instead, the IECC distinguishes only between fixed and operable vertical fenestration U-factors, regardless of frame material. This change led to several positive outcomes in the IECC: (1) It improved efficiency overall in commercial buildings; (2) it greatly simplified compliance; and (3) it eliminated the unfairness from differing requirements depending on frame material type that fueled opposition by some in the window industry. Over that same period, ASHRAE continued to set U-factors specific to framing material: one set of U-factors for metal-framed products and one set for nonmetal-framed products. This has led to conflicting requirements and confusion at the state level, since the vast majority of states adopt the IECC as the primary commercial energy code, but allow compliance with ASHRAE Standard 90.1 as an alternative.

Addendum *aw*, which will become part of ASHRAE Standard 90.1-2019, will finally bring ASHRAE into general alignment with the IECC on this front by eliminating requirements that vary by framing material in favor of material-neutral “fixed” and “operable” requirements consistent with the approach already used in the IECC. This will not only help reduce confusion among design professionals, builders and code enforcement officials, but will also provide more consistent efficiency targets to fenestration manufacturers and contractors. It will also make it easier to promote the adoption of the latest model energy codes in state and local jurisdictions by removing these conflicting provisions from ASHRAE Standard 90.1. Given the recent improvement in ASHRAE values and the role of ASHRAE Standard 90.1 in the DOE commercial energy code determination process, it is now very important to improve IECC U-factors to at least match improved ASHRAE values. As a result, approving this code change proposal will help ensure consistency between the ASHRAE and IECC vertical fenestration U-factor tables for the first time since 2012 while making sure the IECC meets or exceeds ASHRAE fenestration requirements.

This proposal will also improve energy savings in commercial buildings by adopting Addendum *aw*'s moderate improvements to fenestration U-factors. These improvements are the result of significant cost and economic analyses undertaken as part of ASHRAE's process, and Addendum *aw* was approved with broad support from manufacturers, efficiency advocates, and other stakeholders in commercial building efficiency. Improvements to the thermal envelope are a critical part of the IECC's drive toward more efficient buildings. The efficiency of the building thermal envelope is, for the most part, set at construction, and the impact of decisions made regarding the thermal envelope will affect the building's performance for decades. While the energy savings of this update will vary somewhat based on product type and climate zone, the overall impact on energy and cost savings from this proposal is clearly positive as found by ASHRAE.

Cost Impact: The code change proposal will increase the cost of construction

Given the broad range of building types within the scope of the IECC, as well as the many products available to meet or exceed these U-factors, the cost impact will vary somewhat from one project to the next. Overall, we expect the cost impact to be very small. In some cases, it may simply be a matter of selecting a different product already available, with no cost difference at all. Our understanding is that each U-factor selected by ASHRAE for Addendum *aw* has gone through a rigorous energy-savings and cost-effectiveness analysis, so even in cases where construction costs are increased, the improvements will be cost-effective and beneficial over the useful life of the product.

Proposal # 4112

CE85-19

CE86-19

IECC: TABLE C402.4

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

**TABLE C402.4
BUILDING ENVELOPE FENESTRATION MAXIMUM U-FACTOR AND SHGC REQUIREMENTS**

CLIMATE ZONE	1	2	3	4 EXCEPT MARINE	5 AND MARINE 4	6	7	8								
Vertical fenestration																
U-factor																
Fixed fenestration	0.50	0.50	0.46	0.38	0.38	0.36	0.29	0.29								
Operable fenestration	0.65	0.65	0.60	0.45	0.45	0.43	0.37	0.37								
Entrance doors	1.10	0.83	0.77	0.77	0.77	0.77	0.77	0.77								
SHGC																
Orientation ^a	SEW	N	SEW	N	SEW	N	SEW	N	SEW	N	SEW	N	SEW	N	SEW	N
PF < 0.2	0.25	0.33	0.25	0.33	0.25	0.33	0.36	0.48	0.38	0.51	0.40	0.53	0.45	NR	0.45	N
0.2 ≤ PF < 0.5	0.30	0.37	0.30	0.37	0.30	0.37	0.43	0.53	0.46	0.56	0.48	0.58	NR	NR	NR	NR
PF ≥ 0.5	0.40	0.40	0.40	0.40	0.40	0.40	0.58	0.58	0.61	0.61	0.64	0.64	NR	NR	NR	NR
Skylights																
U-factor	0.75	0.70	0.65	0.55	0.50	0.50	0.50 0.47	0.50 0.44	0.50 0.41							
SHGC	0.35	0.35	0.35	0.40	0.40	0.40	NR	NR								

NR = No Requirement, PF = Projection Factor.

- a. "N" indicates vertical fenestration oriented within 45 degrees of true north. "SEW" indicates orientations other than "N." For buildings in the southern hemisphere, reverse south and north. Buildings located at less than 23.5 degrees latitude shall use SEW for all orientations.

Reason: The purpose of this code change proposal is to improve skylight U-factors in the IECC consistent with recent changes to be incorporated into ASHRAE Standard 90.1-2019 and to bring additional cost-effective energy savings to owners of commercial buildings with skylights in climate zones 1 and 6 through 8. The U-factors in this proposal reflect those approved for Addendum aw to ASHRAE Standard 90.1-2016, which will be part of the published Standard 90.1-2019 (which we expect will be referenced as an acceptable compliance option in the 2021 IECC section C401.2). Establishing consistency with ASHRAE's skylight U-factors will not only

reduce confusion among design professionals and building officials but will also provide building owners with more efficient skylights determined to be cost-effective through ASHRAE's process.

Cost Impact: The code change proposal will increase the cost of construction

While we believe that many skylights currently being installed will already meet or exceed these U-factor requirements, in some cases, the lower U-factors will require the selection of a more efficient skylight or the incorporation of other energy efficient measures in the IECC's performance-based compliance options, either of which may increase costs. Although these improvements in skylight U-factors may increase costs in climate zones 1 and 6-8, we do not expect the cost increases to be significant. Our understanding is that each U-factor selected by ASHRAE for Addendum *aw* has gone through a rigorous energy-savings and cost-effectiveness analysis, so even in cases where construction costs are increased, the improvements will be cost-effective over the useful life of the product.

Proposal # 4195

CE86-19

CE87-19

IECC: TABLE C402.4

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

**TABLE C402.4
BUILDING ENVELOPE FENESTRATION MAXIMUM U-FACTOR AND SHGC REQUIREMENTS**

CLIMATE ZONE	1	2	3	4 EXCEPT MARINE	5 AND MARINE 4	6	
Vertical fenestration							
U-factor							
Fixed fenestration	0.50	0.50	0.46	0.38	0.38	0.36	
Operable fenestration	0.65	0.65	0.60	0.45	0.45	0.43	
Entrance doors	1.10	0.83	0.77	0.77	0.77	0.77	
SHGC							
Orientation ^a	SEW	N	SEW	N	SEW	N	SEW
	Fixed	Operable	Fixed	Operable	Fixed	Operable	Fixed
PF < 0.2	0.25 <u>0.23</u>	0.33 <u>0.21</u>	0.25	0.33 <u>0.23</u>	0.25	0.33 <u>0.23</u>	0.36
							0.48
							0.38
0.2 ≤ PF < 0.5	0.30 <u>0.28</u>	0.37 <u>0.25</u>	0.30	0.37 <u>0.28</u>	0.30	0.37 <u>0.28</u>	0.43
							0.53
							0.46
PF ≥ 0.5	0.40 <u>0.37</u>	0.40 <u>0.34</u>	0.40	0.40 <u>0.37</u>	0.40	0.40 <u>0.37</u>	0.58
							0.58
							0.61
Skylights							
U-factor	0.75	0.65	0.55	0.50	0.50	0.50	
SHGC	0.35	0.35	0.35	0.40	0.40	0.40	

NR = No Requirement, PF = Projection Factor.

a. "N" indicates vertical fenestration oriented within 45 degrees of true north. "SEW" indicates orientations other than "N." For buildings in the southern hemisphere, reverse south and north. Buildings located at less than 23.5 degrees latitude shall use SEW for all orientations.

Reason: The purpose of this code change proposal is to save energy, reduce energy costs and peak demand, and enhance occupant comfort by improving commercial fenestration SHGCs and making the IECC's treatment reasonably consistent with Addendum *aw* to ASHRAE Standard 90.1-2016, which will be part of the published Standard 90.1-2019. The proposal also greatly simplifies compliance with the prescriptive fenestration SHGC requirements in the IECC by adopting ASHRAE's "fixed" and "operable" approach to setting SHGC requirements, in lieu of requiring the user to determine the orientation of each fenestration product in the building in order to apply the IECC's current orientation-specific SHGCs. This proposal also maintains projection factor adjustments that are consistent with the current IECC approach but adjusts them according to the new "fixed" and "operable" distinction. These changes will result in energy savings and peak demand savings in every climate zone, and in many cases may reduce the size of cooling equipment. The proposal will also bring greater consistency between IECC and ASHRAE SHGC requirements while reducing unnecessary confusion. The commercial IECC's prescriptive approach of incorporating orientation into its SHGC requirement has been unnecessarily complicated in recent years, and it has not provided any real efficiency or compliance benefits. The residential IECC prescriptive path has always applied a single SHGC to fenestration in each climate zone, irrespective of orientation, leaving more sophisticated design choices to the performance path, where it is more appropriate. By contrast, recent editions of the IECC have established orientation-specific SHGCs in the commercial prescriptive path by increasing the SHGC (and reducing efficiency) for northern orientations. The current SHGC division between South/East/West on one hand, and North-facing fenestration on the other, is unnecessary, less efficient, and too complicated for a prescriptive path that is most often used for simple commercial and multifamily buildings. To the extent that design professionals want to incorporate a more sophisticated solar design into a building, a performance compliance approach is a far more appropriate compliance path for such a design. The current orientation-specific SHGCs promote the idea that a design professional should incorporate a higher SHGC on the north-facing walls – an approach that is not only unlikely in practice, but potentially risky, since the wrong windows may be installed on the wrong side of the building. (Note that higher SHGCs on the north side are also less efficient; while a low SHGC is more beneficial on the other orientations, lower SHGCs provide benefits on north orientations as well.)

A better approach has been charted by ASHRAE in Addendum *aw*. ASHRAE sets SHGC requirements based on whether the fenestration is fixed or operable, since operable fenestration typically has larger frames and lower unit SHGCs as a result. ASHRAE does not differentiate the prescriptive SHGC requirements by orientation and has not set an artificially high and unrealistic SHGC for north-facing fenestration, recognizing that the lower SHGC is cost-effective on any side of the building. This approach has the added benefit of improving north-oriented fenestration SHGCs; these lower SHGCs were found by ASHRAE to be cost-effective (there is likely no additional cost associated with the improved SHGCs given the U-factor requirements).

While we would prefer even lower SHGCs in some climate zones, this proposal improves the SHGCs in every climate zone to varying degrees and is a step in the right direction. Low-SHGC fenestration is critically important in commercial buildings because of high daytime occupancy rates and higher internal thermal loads. Reducing solar heat gain will improve occupant comfort and may allow for the installation of smaller cooling equipment, which will not only save building owners money at construction, but again every time the equipment is replaced. Widespread use of low-SHGC fenestration (and the accompanying peak reduction) will also help reduce the need for utilities to build peaking plants or purchase peak electric power, which will ultimately benefit all utility ratepayers.

Cost Impact: The code change proposal will increase the cost of construction

While we believe that many windows currently being installed will already meet or exceed these SHGC requirements, in some cases, the lower SHGCs will require the selection of a more efficient window or the incorporation of other energy efficient measures in the IECC's performance-based compliance options, either of which may increase costs. However, since the SHGC is largely just the result of the choice of low-e coating, there may be no additional cost in most cases. Moreover, any increased glass costs may be more than offset by reduced cooling equipment costs in many cases. In any event, these SHGC values have all been thoroughly

considered in ASHRAE's energy and cost-effectiveness analyses. To the extent that the lower SHGCs increase construction costs, based on ASHRAE's work, we expect that these improvements are cost-effective over the useful life of the building.

Proposal # 4197

CE87-19

CE88-19

IECC: TABLE C402.4

Proponent: Eric Makela, New Buildings Institute, representing New Buildings Institute
(ericM@newbuildings.org)

2018 International Energy Conservation Code

Revise as follows:

**TABLE C402.4
BUILDING ENVELOPE FENESTRATION MAXIMUM U-FACTOR AND SHGC REQUIREMENTS**

CLIMATE ZONE	1	2	3	4 EXCEPT MARINE	5 AND MARINE 4	6	7	8								
Vertical fenestration																
<u>U-factor for curtain walls, storefront, and site-built fenestration products</u>																
Fixed fenestration	0.50	0.50	0.46	0.38	0.38	0.36	0.29	0.29								
Operable fenestration	0.65	0.65	0.60	0.45	0.45	0.43	0.37	0.37								
<u>U-factor for Entrance Doors</u>																
Entrance doors	1.10	0.83	0.77	0.77	0.77	0.77	0.77	0.77								
<u>U-factor for all other vertical fenestration</u>																
	0.65	0.40	0.32	0.32	0.30	0.30	0.30	0.30								
SHGC																
Orientation ^a	SEW	N	SEW	N	SEW	N	SEW	N	SEW	N	SEW	N	SEW	N	SEW	N
PF < 0.2	0.25	0.33	0.25	0.33	0.25	0.33	0.36	0.48	0.38	0.51	0.40	0.53	0.45	NR	0.45	N
0.2 ≤ PF < 0.5	0.30	0.37	0.30	0.37	0.30	0.37	0.43	0.53	0.46	0.56	0.48	0.58	NR	NR	NR	NR
PF ≥ 0.5	0.40	0.40	0.40	0.40	0.40	0.40	0.58	0.58	0.61	0.61	0.64	0.64	NR	NR	NR	NR
Skylights																
U-factor	0.75	0.65	0.55	0.50	0.50	0.50	0.50	0.50								
SHGC	0.35	0.35	0.35	0.40	0.40	0.40	NR	NR								

NR = No Requirement, PF = Projection Factor.

- a. "N" indicates vertical fenestration oriented within 45 degrees of true north. "SEW" indicates orientations other than "N." For buildings in the southern hemisphere, reverse south and north. Buildings located at less than 23.5 degrees latitude shall use SEW for all orientations.

Reason: The proposal modifies the fenestration table by separating requirements for "punched opening" type windows that go in a framed opening from other fenestration types such as metal curtain walls, storefront fenestration and site-build fenestration. Punched opening windows can achieve better U-factors more easily and cost-effectively than the other fenestration types, but U-factor code requirements for this window type have been held back by the technological and cost effectiveness limitations of curtain wall fenestration systems, store fronts and site-built products.

The 2018 IECC currently allows a 4 story multifamily building to install a less efficient window than an otherwise identical 3-story multifamily building. The only difference in the buildings from an energy standpoint is the number of floors, yet less efficient windows are allowed to be installed in the mid-rise building. This is a critical issue for midrise multifamily buildings where punched opening type windows are common, but is also an issue for other low- and mid-rise commercial buildings where they are also common.

This proposal is meant to close this loophole. It retains existing U-factor requirements for curtain walls, storefront fenestration, site-built fenestration and entrance doors (the types for which U-factor advancements are more difficult) and introduces a new category for all other fenestration that captures punched opening windows. The U-factor requirements for this category are drawn from the residential section of the code since punched opening requirements are the standard fenestration type in residential construction.

It is important to note that this proposal has been structured in a way so that it will be compatible with any other proposal that changes the existing U-factors. This proposal changes the headings and leaves the actual U-factors in place, allowing them to be modified by another proposal.

There may be some specialized circumstances where these requirements could cause technical challenges, especially high-rise buildings that are utilizing punched openings or other high-wind areas. However, this table sets the minimum for performance and these projects have other compliance paths (both modeling in the IECC and ASHRAE 90.1) to give them flexibility for these specialized circumstances, and it does not make sense to hold back the performance of the entire new construction building market for a handful of rare cases that still have other compliance options.

When these requirements were modeled relative to IECC-2015 (which has essentially the same window requirements), using the mid-rise prototype that the Pacific Northwest National Lab developed for national code determination studies, the savings ranged from 1.0-2.9% depending on climate zone (climate zone 1 is effectively the same).

Cost Impact: The code change proposal will increase the cost of construction

This proposal will only increase cost for projects utilizing punched opening type fenestration. All other fenestration will be unaffected. Additionally, this proposal utilizes the values for punched openings from the residential energy code requirements where these values have been negotiated through the ICC hearing process and found cost effective in residential.

Proposal # 5163

CE88-19

CE89-19

IECC: C402.4.1.2, C402.4.2, C402.4.4, C405.2.3, C405.2.3.1, C405.2.3.2, FIGURE C405.2.3.2, C405.2.3.3, FIGURE C405.2.3.3(1)

Proponent: Jack Bailey, representing International Association of Lighting Designers (jbailey@oneluxstudio.com); Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers (glenn@lampartners.com)

2018 International Energy Conservation Code

Revise as follows:

C402.4 Fenestration (Prescriptive). Fenestration shall comply with Sections C402.4.1 through C402.4.5 and Table C402.4. Daylight responsive controls shall comply with this section and Section C405.2.3.1.

C402.4.1.2 Increased skylight area with daylight responsive controls. The skylight area shall be not more than 6 percent of the roof area provided that daylight responsive controls complying with Section C405.2.3.1 are installed in toplit daylight zones.

C402.4.2 Minimum skylight fenestration area. In an enclosed space greater than 2,500 square feet (232 m²) in floor area, directly under a roof with not less than 75 percent of the ceiling area with a ceiling height greater than 15 feet (4572 mm), and used as an office, lobby, atrium, concourse, corridor, storage space, gymnasium/exercise center, convention center, automotive service area, space where manufacturing occurs, nonrefrigerated warehouse, retail store, distribution/sorting area, transportation depot or workshop, the total toplit daylight zone shall be not less than half the floor area and shall provide one of the following:

1. A minimum skylight area to toplit daylight zone of not less than 3 percent where all skylights have a VT of not less than 0.40 as determined in accordance with Section C303.1.3.
2. A minimum skylight effective aperture of not less than 1 percent, determined in accordance with Equation 4-4.

$$\text{Skylight Effective Aperture} = \frac{0.85 \times \text{Skylight Area} \times \text{Skylight VT} \times \text{WF}}{\text{Toplit Zone}}$$

(Equation 4-4)

where:

Skylight area = Total fenestration area of skylights.

Skylight VT = Area weighted average visible transmittance of skylights.

WF = Area weighted average well factor, where well factor is 0.9 if light well depth is less than 2 feet (610 mm), or 0.7 if light well depth is 2 feet (610 mm) or greater.

Light well depth = Measure vertically from the underside of the lowest point of the skylight glazing to the ceiling plane under the skylight.

Exception: Skylights above daylight zones of enclosed spaces are not required in:

1. Buildings in Climate Zones 6 through 8.
2. Spaces where the designed general lighting power densities are less than 0.5 W/ft² (5.4 W/m²).

3. Areas where it is documented that existing structures or natural objects block direct beam sunlight on not less than half of the roof over the enclosed area for more than 1,500 daytime hours per year between 8 a.m. and 4 p.m.
4. Spaces where the daylight zone under rooftop monitors is greater than 50 percent of the enclosed space floor area.
5. Spaces where the total area minus the area of ~~sidelit~~ ~~sidelit~~ daylight zones is less than 2,500 square feet (232 m²), and where the lighting is controlled in accordance with Section C405.2.3.

C402.4.4 Daylight zones. Daylight zones referenced in Sections C402.4.1.1 through C402.4.3.2 shall comply with Sections C405.2.3.2 and C405.2.3.3, as applicable. Daylight zones shall include toplit daylight zones and sidelit daylight zones.

C405.2.3 Daylight-responsive controls. Daylight-responsive controls complying with Section C405.2.3.1 shall be provided to control the electric lights within daylight zones in the following spaces:

1. Spaces with a total of more than 150 watts of ~~general~~ ~~general~~ lighting within sidelit daylight zones complying with Section C405.2.3.2 General lighting does not include lighting that is required to have specific application control in accordance with Section C405.2.4.
2. Spaces with a total of more than 150 watts of general lighting within toplit daylight zones complying with Section C405.2.3.3.

Exceptions: Daylight responsive controls are not required for the following:

1. Spaces in health care facilities where patient care is directly provided.
2. Lighting that is required to have specific application control in accordance with Section C405.2.4.
3. Sidelit daylight zones on the first floor above grade in Group A-2 and Group M occupancies.
4. New buildings where the total connected lighting power calculated in accordance with Section C405.3.1 is not greater than the adjusted interior lighting power allowance (LPA_{adj}) calculated in accordance with Equation 4-9

$$LPA_{adj} = \frac{[LPA_{norm} \times (1.0 - 0.4 \times UDZFA / TBFA)]}{TBFA}$$

(Equation 4-9)

where:

LPA_{adj} = Adjusted building interior lighting power allowance in watts.

LPA_{norm} = Normal building lighting power allowance in watts calculated in accordance with Section C405.3.2 and reduced in accordance with Section C406.3 where Option 2 of Section C406.1 is used to comply with the requirements of Section C406.

UDZFA = Uncontrolled daylight zone floor area is the sum of all sidelit and toplit zones, calculated in accordance with Sections C405.2.3.2 and C405.2.3.3, that do not have daylight responsive controls.

TBFA = Total building floor area is the sum of all floor areas included in the lighting power allowance calculation in Section C405.3.2.

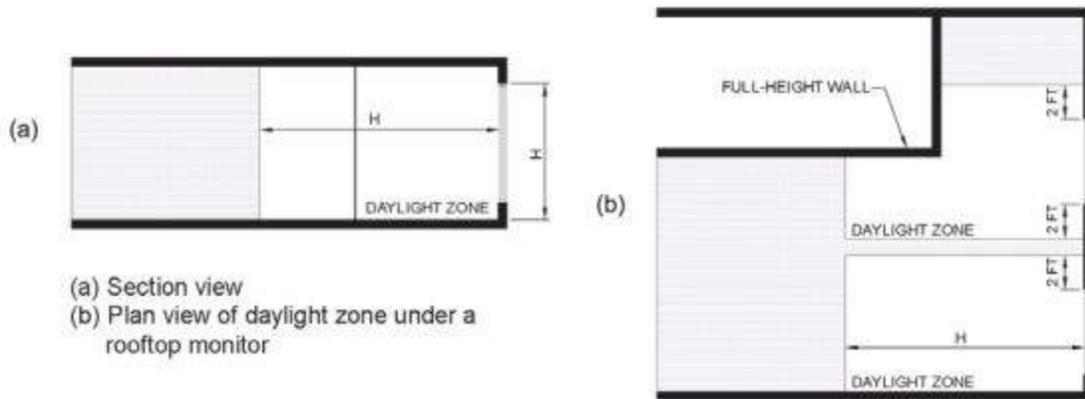
C405.2.3.1 Daylight-responsive control function. Where required, daylight-responsive controls shall be provided within each space for control of lights in that space and shall comply with all of the following:

1. Lights in toplit daylight zones in accordance with Section C405.2.3.3 shall be controlled independently of lights in sidelit daylight zones in accordance with Section C405.2.3.2.
2. Daylight responsive controls within each space shall be configured so that they can be calibrated from within that space by authorized personnel.
3. Calibration mechanisms shall be in a location with ready ~~access~~ access.
4. Where located in offices, classrooms, laboratories and library reading rooms, daylight responsive controls shall dim lights continuously from full light output to 15 percent of full light output or lower.
5. Daylight responsive controls shall be configured to completely shut off all controlled lights.
6. Lights in sidelit daylight zones in accordance with Section C405.2.3.2 facing different cardinal orientations [within 45 degrees (0.79 rad) of due north, east, south, west] shall be controlled independently of each other.

Exception: Up to 150 watts of lighting in each space is permitted to be controlled together with lighting in a daylight zone facing a different cardinal orientation.

C405.2.3.2 Sidelit daylight zone. The sidelit daylight zone is the floor area adjacent to vertical fenestration that complies with all of the following:

1. Where the fenestration is located in a wall, the sidelit daylight zone shall extend laterally to the nearest full-height wall, or up to 1.0 times the height from the floor to the top of the fenestration, and longitudinally from the edge of the fenestration to the nearest full-height wall, or up to 2 feet (610 mm), whichever is less, as indicated in Figure ~~C405.2.3.2~~ C405.2.3.2.
2. The area of the fenestration is not less than 24 square feet (2.23 m²).
3. The distance from the fenestration to any building or geological formation that would block access to daylight is greater than the height from the bottom of the fenestration to the top of the building or geologic formation.
4. The visible transmittance of the fenestration is not less than 0.20.



**FIGURE C405.2.3.2
 SIDELIT DAYLIGHT ZONE**

C405.2.3.3 Toplit daylight zone. The toplit daylight zone is the floor area underneath a roof fenestration assembly that complies with all of the following:

1. The toplit daylight zone shall extend laterally and longitudinally beyond the edge of the roof fenestration assembly to the nearest obstruction that is taller than 0.7 times the ceiling height, or up to 0.7 times the ceiling height, whichever is less, as indicated in Figure C405.2.3.3(1).
2. Where the fenestration is located in a rooftop monitor, the toplit zone shall extend laterally to the nearest obstruction that is taller than 0.7 times the ceiling height, or up to 1.0 times the height from the floor to the bottom of the fenestration, whichever is less, and longitudinally from the edge of the fenestration to the nearest obstruction that is taller than 0.7 times the ceiling height, or up to 0.25 times the height from the floor to the bottom of the fenestration, whichever is less, as indicated in Figures C405.2.3.3(2) and C405.2.3.3(3).
3. Direct sunlight is not blocked from hitting the roof fenestration assembly at the peak solar angle on the summer solstice by buildings or geological formations.
4. The product of the visible transmittance of the roof fenestration assembly and the area of the rough opening of the roof fenestration assembly divided by the area of the toplit zone is not less than 0.008.

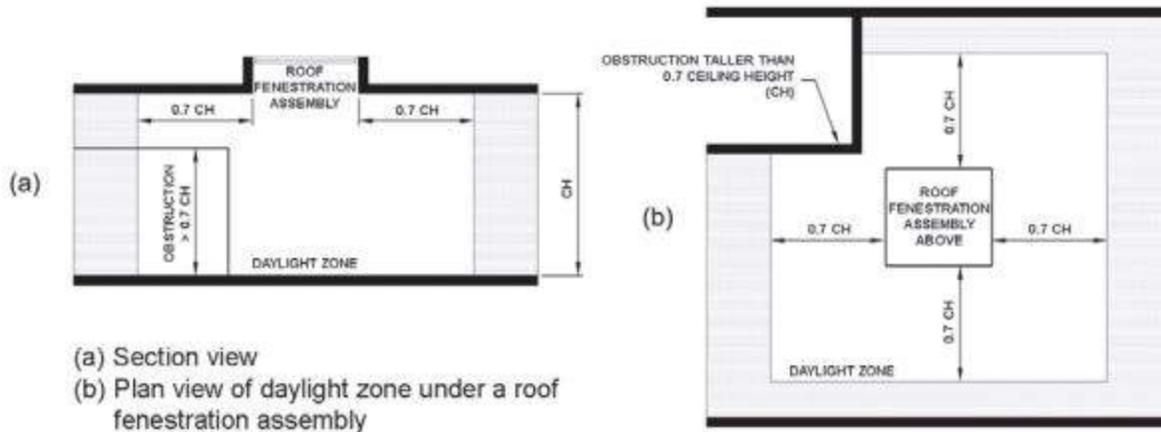


FIGURE C405.2.3.3(1)
TOPLIT DAYLIGHT ZONE

Reason: *Daylight zone* and *daylight responsive control* are defined terms.

Sidelit and toplit describe different types of *daylight zones*, but are not themselves defined terms and should not be italicized.

“Access” is a defined term, but is used in Section C405.2.3.2 for its’ common English meaning and should not be italicized.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal is entirely editorial.

Proposal # 4990

CE89-19

CE90-19

IECC: C402.4, C402.4.1.1, C402.4.1.2, C402.4.2.1

Proponent: Jack Bailey, representing International Association of Lighting Designers (jbailey@oneluxstudio.com); Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers (glenn@lampartners.com)

2018 International Energy Conservation Code

Revise as follows:

C402.4 Fenestration (Prescriptive). Fenestration shall comply with Sections C402.4.1 through C402.4.5 and Table C402.4. Daylight responsive controls shall comply with this section and Section ~~C405.2.3.1~~ C405.2.3.

C402.4.1.1 Increased vertical fenestration area with daylight responsive controls. In Climate Zones 1 through 6, not more than 40 percent of the gross above-grade wall area shall be vertical fenestration, provided that all of the following requirements are met:

1. In buildings not greater than two stories above grade, not less than 50 percent of the net floor area is within a daylight zone.
2. In buildings three or more stories above grade, not less than 25 percent of the net floor area is within a daylight zone.
3. Daylight responsive controls ~~complying with Section C405.2.3.1~~ are installed in daylight zones.
4. Visible transmittance (VT) of vertical fenestration is not less than 1.1 times solar heat gain coefficient (SHGC).

Exception: Fenestration that is outside the scope of NFRC 200 is not required to comply with Item 4.

C402.4.1.2 Increased skylight area with daylight responsive controls. The skylight area shall be not more than 6 percent of the roof area provided that daylight responsive controls ~~complying with Section C405.2.3.1~~ are installed in toplit zones.

C402.4.2.1 Lighting controls in toplit daylight zones. Daylight responsive controls ~~complying with Section C405.2.3.1~~ shall be provided to control all electric lights within ~~toplit zones~~ in toplit daylight zones.

Reason: These revisions correct the section reference number from C405.2.3.1 Daylight Responsive Controls Function to C405.2.3 Daylight responsive controls. This clarifies that the list of exceptions under C405.2.3 is applicable here.

Under C402.4.2.1 the phrase “to control all electric lights” is redundant when the section reference is updated from C405.2.3.1 to C405.2.3.

In general we have found these references to lighting controls requirements in the envelope section to be problematic in the past, where they seem to require that daylight responsive controls are required in applications which are exempt from daylight responsive controls in the lighting controls section.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This change is editorial

Proposal # 4793

CE90-19

CE91-19

IECC: C402.4.1.2, C402.4.2

Proponent: Jennifer Hatfield, representing American Architectural Manufacturers Association (jen@jhatfieldandassociates.com)

2018 International Energy Conservation Code

Revise as follows:

C402.4.1.2 Increased skylight area with daylight responsive controls. ~~The~~ ~~Where daylight responsive controls complying with Section C405.2.3.1 are provided in toplit zones, the allowed skylight area shall be not more than 6 percent of the gross roof area provided that daylight responsive controls complying with Section C405.2.3.1 are installed in toplit zones, or that required for compliance with Section C402.4.2, whichever is greater.~~

C402.4.2 Minimum skylight fenestration area. ~~In an enclosed space~~ ~~Skylights shall be provided in enclosed spaces~~ greater than 2,500 square feet (232 m²) in floor area, directly under a roof with not less than 75 percent of the ceiling area with a ceiling height greater than 15 feet (4572 mm), and used as an office, lobby, atrium, concourse, corridor, storage space, gymnasium/exercise center, convention center, automotive service area, space where manufacturing occurs, nonrefrigerated warehouse, retail store, distribution/sorting area, transportation depot or workshop, ~~the~~ ~~The~~ total toplit daylight zone shall be not less than half the floor area and shall ~~provide~~ ~~comply with~~ one of the following:

1. A minimum skylight area to toplit daylight zone of not less than 3 percent where all skylights have a VT of not less than 0.40 as determined in accordance with Section C303.1.3.
2. A minimum skylight effective aperture of not less than 1 percent, determined in accordance with Equation 4-4.

$$\text{Skylight Effective Aperture} = \frac{0.85 \times \text{Skylight Area} \times \text{Skylight VT} \times \text{WF}}{\text{Toplit Zone}}$$

(Equation 4-4)

where:

Skylight area = Total fenestration area of skylights.

Skylight VT = Area weighted average visible transmittance of skylights.

WF = Area weighted average well factor, where well factor is 0.9 if light well depth is less than 2 feet (610 mm), or 0.7 if light well depth is 2 feet (610 mm) or greater.

Light well depth = Measure vertically from the underside of the lowest point of the skylight glazing to the ceiling plane under the skylight.

Exception: Skylights above daylight zones of enclosed spaces are not required in:

1. Buildings in Climate Zones 6 through 8.
2. Spaces where the designed general lighting power densities are less than 0.5 W/ft² (5.4 W/m²).
3. Areas where it is documented that existing structures or natural objects block direct beam sunlight on not less than half of the roof over the enclosed area for more than 1,500 daytime

- hours per year between 8 a.m. and 4 p.m.
4. Spaces where the daylight zone under rooftop monitors is greater than 50 percent of the enclosed space floor area.
 5. Spaces where the total area minus the area of sidelight daylight zones is less than 2,500 square feet (232 m²), and where the lighting is controlled in accordance with Section C405.2.3.

Reason: In both sections being modified, the proposal provides clearer and more direct language for the user. In section C402.4.1.2 the 6% limit remains but also allows for compliance with the minimum skylight fenestration area in C402.4.2, whichever is greater. There is no substantive change in C402.4.2, changes are being offered for clarity only.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The intent of the proposal is to coordinate the provisions for maximum and minimum skylights and to provide clarity in the language for the user. The clarity may result in more or fewer skylights in certain designs, but should not affect the cost of construction.

Proposal # 4416

CE91-19

CE92-19

IECC: C402.4.2, Chapter 6CE (New)

Proponent: Marc Levitan, representing the ICC 500 Storm Shelter Development Committee; Benchmark Harris representing the National Storm Shelter Association (NSSA) (bharris@huckabee-inc.com)

2018 International Energy Conservation Code

Revise as follows:

C402.4.2 Minimum skylight fenestration area. In an enclosed space greater than 2,500 square feet (232 m²) in floor area, directly under a roof with not less than 75 percent of the ceiling area with a ceiling height greater than 15 feet (4572 mm), and used as an office, lobby, atrium, concourse, corridor, storage space, gymnasium/exercise center, convention center, automotive service area, space where manufacturing occurs, nonrefrigerated warehouse, retail store, distribution/sorting area, transportation depot or workshop, the total *toplit daylight zone* shall be not less than half the floor area and shall provide one of the following:

1. A minimum skylight area to *toplit daylight zone* of not less than 3 percent where all skylights have a VT of not less than 0.40 as determined in accordance with Section C303.1.3.
2. A minimum skylight effective aperture of not less than 1 percent, determined in accordance with Equation 4-4.

$$\text{Skylight Effective Aperture} = \frac{0.85 \times \text{Skylight Area} \times \text{Skylight VT} \times \text{WF}}{\text{Toplit Zone}}$$

(Equation 4-4)

where:

Skylight area = Total fenestration area of skylights.

Skylight VT = Area weighted average visible transmittance of skylights.

WF = Area weighted average well factor, where well factor is 0.9 if light well depth is less than 2 feet (610 mm), or 0.7 if light well depth is 2 feet (610 mm) or greater.

Light well depth = Measure vertically from the underside of the lowest point of the skylight glazing to the ceiling plane under the skylight.

Exception: Skylights above *daylight zones* of enclosed spaces are not required in:

1. Buildings in *Climate Zones* 6 through 8.
2. Spaces where the designed *general lighting* power densities are less than 0.5 W/ft² (5.4 W/m²).
3. Areas where it is documented that existing structures or natural objects block direct beam sunlight on not less than half of the roof over the enclosed area for more than 1,500 daytime hours per year between 8 a.m. and 4 p.m.
4. Spaces where the *daylight zone* under rooftop monitors is greater than 50 percent of the enclosed space floor area.
5. Spaces where the total area minus the area of sidelight *daylight zones* is less than 2,500 square feet (232 m²), and where the lighting is controlled in accordance with Section C405.2.3.
6. Spaces designed as storm shelters complying with ICC 500.

Add new text as follows:



International Code Council, Inc.
500 New Jersey Avenue NW 6th
Floor
Washington DC 20001

ICC 500: ICC/NSSA Standard for the Design and Construction of Storm Shelters

Reason: This proposal is submitted by the National Storm Shelter Association (NSSA) and the ICC 500 Storm Shelter Standard Development committee.

The ICC 500 Standards Development committee is responsible for the development of the ICC/NSSA Standard for the Design and Construction of Storm Shelters. The committee is currently working on the development of the 2020 edition. In 2017 the ICC 500 committee held 7 open conference calls. In addition, there were numerous Working Group meetings and conference calls, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/standards-development/is-stm>.

NSSA was responsible for the development of the original standard for storm shelters in 2001, which ICC 500 replaced through an agreement between ICC and NSSA. Representing General, User and Producer interest categories, NSSA is a technical organization that is committed to promoting consistent quality in both residential and community storm shelters.

A popular style of storm shelter for schools is to use a practice gymnasium as a multi-purpose building that also functions as a tornado shelter. C402.4.2 currently has minimum skylight fenestration requirements for "gymnasium/exercise center" spaces (and other types of spaces). This is generally good because there is value in having skylight fenestration in these spaces. However, the special case when a gymnasium is also used as a storm shelter warrants an exception to C402.4.2. There is an elevated life-safety concern associated with storm shelters and any skylights must meet strict missile impact testing and pressure requirements or be protected upon activation of the shelter with shutters. Building officials have requested this change to clarify that the intent of C402.4.2 was not to require skylights in storm shelters.

Cost Impact: The code change proposal will decrease the cost of construction. If skylights are not required, then the number of openings requiring protectives will be decreased.

Analysis: The referenced standard, ICC 500-2014, is currently referenced in other 2018 I-codes.

Proposal # 4849

CE92-19

CE93-19 Part I

PART I — IECC: Part I: C402.4.3, Chapter 6CE (New)\
IECC: Part II: R402.5(N1102.5), Chapter 6RE (IRC Chapter 44) (New)

PART II — IECC: R402.5 (IRC N1102.5), ICC Chapter 06

Proponent: Marc Levitan, representing the ICC 500 Storm Shelter Development Committee; Benchmark Harris representing the National Storm Shelter Association (NSSA) (bharris@huckabee-inc.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

Revise as follows:

C402.4.3 Maximum *U*-factor and SHGC. The maximum *U*-factor and solar heat gain coefficient (SHGC) for fenestration shall be as specified in Table C402.4.

The window projection factor shall be determined in accordance with Equation 4-5.

$$PF = A/B$$

(Equation 4-5)

where:

PF = Projection factor (decimal).

A = Distance measured horizontally from the farthest continuous extremity of any overhang, eave or permanently attached shading device to the vertical surface of the glazing.

B = Distance measured vertically from the bottom of the glazing to the underside of the overhang, eave or permanently attached shading device.

Where different windows or glass doors have different *PF* values, they shall each be evaluated separately.

Exception: The maximum *U*-factor and solar heat gain coefficient (SHGC) for fenestration shall not be required in storm shelters complying with ICC 500.

Add new standard(s) as follows:

ICC

International Code Council, Inc.
500 New Jersey Avenue NW 6th
Floor
Washington DC 20001

ICC 500: ICC/NSSA Standard for the Design and Construction of Storm Shelters

Proposal # 4851

CE93-19 Part I

CE93-19 Part II

IECC: R402.5 (IRC N1102.5), ICC Chapter 06

Proponent: Benchmark Harris, representing National Storm Shelter Association (bharris@huckabee-inc.com)

2018 International Energy Conservation Code

Revise as follows:

R402.5 (IRC N1102.5) Maximum fenestration *U*-factor and SHGC (Mandatory). The area-weighted average maximum fenestration *U*-factor permitted using tradeoffs from Section R402.1.5 or R405 shall be 0.48 in *Climate Zones* 4 and 5 and 0.40 in *Climate Zones* 6 through 8 for vertical fenestration, and 0.75 in *Climate Zones* 4 through 8 for skylights. The area-weighted average maximum fenestration SHGC permitted using tradeoffs from Section R405 in *Climate Zones* 1 through 3 shall be 0.50.

Exception: The maximum *U*-factor and solar heat gain coefficient (SHGC) for fenestration shall not be required in storm shelters complying with ICC 500.

Add new standard(s) as follows:

ICC

International Code Council, Inc.
500 New Jersey Avenue NW 6th
Floor
Washington DC 20001

ICC 500: ICC/NSSA Standard for the Design and Construction of Storm Shelters

Reason: This proposal is submitted by the National Storm Shelter Association (NSSA) and the ICC 500 Storm Shelter Standard Development committee.

The ICC 500 Standards Development committee is responsible for the development of the ICC/NSSA Standard for the Design and Construction of Storm Shelters. The committee is currently working on the development of the 2020 edition. In 2017 the ICC 500 committee held 7 open conference calls. In addition, there were numerous Working Group meetings and conference calls, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/standards-development/is-stm>.

NSSA was responsible for the development of the original standard for storm shelters in 2001, which ICC 500 replaced through an agreement between ICC and NSSA. Representing General, User and Producer interest categories, NSSA is a technical organization that is committed to promoting consistent quality in both residential and community storm shelters.

Storm windows have a limited availability with the *U* values required in Section R402.3 and R402.5. There is an elevated life-safety concern associated with storm shelters and any window must meet strict missile impact testing and pressure requirements or be protected upon activation of the shelter with shutters.

Cost Impact: The code change proposal will decrease the cost of construction
This modification will increase design options.

Analysis: The referenced standard, ICC 500-2014, is currently referenced in other 2018 I-codes.

Proposal # 5752

CE94-19

IECC C402.4.3.4(New); Chapter 6CE (New)

Proponent: Erika Burns, D+R International, representing Attachments Energy Rating Council (AERC)
(aerc316@gmail.com)

2018 International Energy Conservation Code

Add new text as follows:

C402.4.3.4 Automated Dynamic Shades Where interior or exterior shades, blinds, louvers, or drapes are used to improve the overall SHGC of the fenestration system, the combined performance calculated in accordance with Appendix B of AERC 1 and multiplied by 1.1 shall be permitted to satisfy the SHGC requirements found in Table C402.4 provided the shading device complies with all of the following:

1. The shading device is permanently attached.

2. The shading device is automatically controlled and capable of automatically modulating the amount of solar gain and light transmitted into the space in multiple steps in response to daylight levels or solar intensity.

3. The shading device is capable of providing not less than 90 percent coverage of the fenestration in the closed position.

4. Any manual control of the shading device shall not override automatic operation for longer than 4 hours per actuation.

AERC

Attachments Energy Rating
Council
355 Lexington Avenue
New York New York 10017
US

Add new standard(s) as follows:

AERC

Attachments Energy Rating
Council
355 Lexington Avenue
New York New York 10017
US

AERC 1-2018: Procedures for Determining Energy Performance Properties of Fenestration Attachments

Reason: Window and skylight shading systems can provide significant improvement in SHGC of fenestration systems. The only way to guarantee that these systems block solar heat gain when needed is through automatic control based on light or heat at the façade.

There already is an allowance for dynamic glazing (C402.4.3.3 Dynamic Glazing) to be allowed to help comply with SHGC. This proposal is similar but for permanent automated window shading devices. These automated shading devices are typically permanently attached to the interior or exterior of the wall or roof, are hardwired into the building and are as permanent as any luminaire.

The combined SHGC for the combination of the selected shading system with any window or skylight system is

readily available from the shading manufacturers or computed in free validated software such as WINDOW from Lawrence Berkeley National Laboratory.

There are industry standards that are used to measure the combined SHGC performance of windows with shading devices. Performance tests for Solar Heat Gain Coefficient SHGC (G-Value), Solar Transmittance (Ts), Solar Reflectance (Rs), Solar Absorptance (As), Visible Light Transmission VLT (Tv) can be conducted in accordance with EN 14501:2005, ASTM E891, and ASTM E903-96. Glass performance tests can be conducted using the Lawrence Berkeley National Laboratory Window NFRC certified software.

An example study showing how automated shading systems with high solar reflectance fabrics (example from Mermet : <http://www.mermetusa.com/transparent/t-screen-with-koolblack-3-5.html>) save significant cooling energy can be found at: <http://performanceshadingadvisor.com/#thermalmanagement>

In addition to solar heat gain improvement, this technology inherently saves other energy. When the shade is open, there will be more savings on the electric lighting side due to daylight dimming. Automation closes the shade when there is glare or increased solar energy, but opens the shade to allow more natural light when glare or solar heat gain is not a problem.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal does not require use of dynamic shading; it just allows combined SHGC to be used if a project is already using dynamic shades.

Analysis: A review of the standard proposed for inclusion in the code, AERC 1, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 4991

CE94-19

CE95-19

IECC: C403.2.2

Proponent: Kevin Duerr-Clark, NYS Department of State, representing NYS Department of State (kevin.duerr-clark@dos.ny.gov); Joseph Hill, representing NYSDOS (joseph.hill@dos.ny.gov)

2018 International Energy Conservation Code

Revise as follows:

C403.2.2 Ventilation (Mandatory). Ventilation, either natural or mechanical, shall be provided in accordance with the commercial building provisions of Chapter 4 of the International Mechanical Code. Where mechanical ventilation is provided, the system shall provide the capability to reduce the outdoor air supply to the minimum required by Chapter 4 of the International Mechanical Code.

Reason: Section C403.2.2 "Ventilation" of the Energy Code references Chapter 4 of the Mechanical Code. However, Section 401.2 of the Mechanical Code includes a cross reference to a residential provision of the Energy Code: R402.4.1.2 pertaining to dwelling units. This may inadvertently and erroneously lead code users to believe that dwelling units in a commercial building, such as a multi-family building more than three stories in height, can be regulated by the residential provisions of the Energy Code.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal is simply a clarification of an existing code provision and does not carry a cost implication.

Proposal # 4483

CE95-19

CE96-19

IECC: C202 (New), C402.5, C402.5.1, C402.5.1.2, C402.5.1.2.3 (New)

Proponent: Gayathri Vijayakumar, representing Steven Winter Associates, Inc. (gayathri@swinter.com); Robert Schwarz, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Add new definition as follows:

TESTING UNIT ENCLOSURE AREA. The area sum of all the boundary surfaces that define the *dwelling unit, sleeping unit, or occupiable conditioned space* including top/ceiling, bottom/floor, and all side walls. This does not include interior partition walls within the *dwelling unit, sleeping unit, or occupiable conditioned space*. Wall height shall be measured from the finished floor of the *conditioned space* to the finished floor or roof/ceiling air barrier above.

Revise as follows:

C402.5 Air leakage—thermal envelope (Mandatory). The building thermal envelope of buildings shall comply with Sections C402.5.1 through C402.5.8, or the building thermal envelope shall be tested in accordance with ASTM E 779 at a pressure differential of 0.3 inch water gauge (75 Pa) or an equivalent method approved by the code official and deemed to comply with the provisions of this section when the tested air leakage rate of the building thermal envelope is not greater than 0.40 cfm/ft² (2.0 L/s • m²). Where compliance is based on such testing, the building shall also comply with Sections C402.5.5, C402.5.6 and C402.5.7.

C402.5.1 Air barriers. A continuous air barrier shall be provided throughout the building thermal envelope. The continuous air barriers shall be ~~permitted to be~~ located on the inside or outside of the building thermal envelope, located within the assemblies composing the building thermal envelope, or any combination thereof. The air barrier shall comply with Sections C402.5.1.1 and C402.5.1.2.

Exception: Air barriers are not required in buildings located in Climate Zone 2B.

C402.5.1.1 Air barrier construction. The continuous air barrier shall be constructed to comply with the following:

1. The air barrier shall be continuous for all assemblies that are the thermal envelope of the building and across the joints and assemblies.
2. Air barrier joints and seams shall be sealed, including sealing transitions in places and changes in materials. The joints and seals shall be securely installed in or on the joint for its entire length so as not to dislodge, loosen or otherwise impair its ability to resist positive and negative pressure from wind, stack effect and mechanical ventilation.
3. Penetrations of the air barrier shall be caulked, gasketed or otherwise sealed in a manner compatible with the construction materials and location. Sealing shall allow for expansion, contraction and mechanical vibration. Joints and seams associated with penetrations shall be sealed in the same manner or taped. Sealing materials shall be securely installed around the penetration so as not to dislodge, loosen or otherwise impair the penetrations' ability to resist positive and negative pressure from wind, stack effect and mechanical ventilation. Sealing of concealed fire sprinklers, where required, shall be in a manner that is recommended by the

manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.

4. Recessed lighting fixtures shall comply with Section C402.5.8. Where similar objects are installed that penetrate the air barrier, provisions shall be made to maintain the integrity of the air barrier.

C402.5.1.2 Air barrier compliance options. A continuous air barrier for the opaque building envelope shall comply with the following:

1. Buildings or portions of buildings including Group R and Group I occupancy shall meet the provisions of Section C402.5.1.2.3.
Exception: Buildings in Climate Zones 2B, 3C, and 5C.
2. Buildings or portions of buildings including Group R and Group I occupancy in Climate Zones 3C and 5C shall meet the provisions of Section C402.5.1.2.1 or C402.5.1.2.2.
3. Buildings or portions of buildings other than Group R and Group I occupancy shall meet the provisions of Section C402.5.1.2.1 or C402.5.1.2.2.

C402.5.1.2.1 Materials. Materials with an air permeability not greater than 0.004 cfm/ft² (0.02 L/s • m²) under a pressure differential of 0.3 inch water gauge (75 Pa) when tested in accordance with ASTM E2178 shall comply with this section. Materials in Items 1 through 16 shall be deemed to comply with this section, provided that joints are sealed and materials are installed as air barriers in accordance with the manufacturer's instructions.

1. Plywood with a thickness of not less than $\frac{3}{8}$ inch (10 mm).
2. Oriented strand board having a thickness of not less than $\frac{3}{8}$ inch (10 mm).
3. Extruded polystyrene insulation board having a thickness of not less than $\frac{1}{2}$ inch (12.7 mm).
4. Foil-back polyisocyanurate insulation board having a thickness of not less than $\frac{1}{2}$ inch (12.7 mm).
5. Closed-cell spray foam having a minimum density of 1.5 pcf (2.4 kg/m³) and having a thickness of not less than 1 $\frac{1}{2}$ inches (38 mm).
6. Open-cell spray foam with a density between 0.4 and 1.5 pcf (0.6 and 2.4 kg/m³) and having a thickness of not less than 4.5 inches (113 mm).
7. Exterior or interior gypsum board having a thickness of not less than $\frac{1}{2}$ inch (12.7 mm).
8. Cement board having a thickness of not less than $\frac{1}{2}$ inch (12.7 mm).
9. Built-up roofing membrane.
10. Modified bituminous roof membrane.
11. Fully adhered single-ply roof membrane.
12. A Portland cement/sand parge, or gypsum plaster having a thickness of not less than $\frac{5}{8}$ inch (15.9 mm).
13. Cast-in-place and precast concrete.
14. Fully grouted concrete block masonry.
15. Sheet steel or aluminum.
16. Solid or hollow masonry constructed of clay or shale masonry units.

C402.5.1.2.2 Assemblies. Assemblies of materials and components with an average air leakage not greater than 0.04 cfm/ft² (0.2 L/s • m²) under a pressure differential of 0.3 inch of water gauge (w.g.)(75 Pa) when tested in accordance with ASTM E2357, ASTM E1677 or ASTM E283 shall comply with this section. Assemblies listed in Items 1 through 3 shall be deemed to comply, provided that joints are sealed and the requirements of Section C402.5.1.1 are met.

1. Concrete masonry walls coated with either one application of block filler or two applications of a

- paint or sealer coating.
2. Masonry walls constructed of clay or shale masonry units with a nominal width of 4 inches (102 mm) or more.
 3. A Portland cement/sand parge, stucco or plaster not less than $\frac{1}{2}$ inch (12.7 mm) in thickness.

Add new text as follows:

C402.5.1.2.3 Dwelling and sleeping unit enclosure testing The building thermal envelope shall be tested in accordance with ASTM E 779, ANSI/RESNET/ICC 380, ASTM E1827 or an equivalent method approved by the code official. The measured air leakage shall not exceed 0.30 cfm/ft^2 ($1.5 \text{ L/s} \cdot \text{m}^2$) of the testing unit enclosure area at a pressure differential of 0.2 inch water gauge (50 Pa). Where multiple dwelling units or sleeping units or other occupiable conditioned spaces are contained within one building thermal envelope, each unit shall be considered an individual testing unit and the building air leakage shall be the weighted average of all testing unit results, weighted by each testing unit's testing unit enclosure area. Units shall be tested separately with an unguarded blower door test as follows:

1. Where buildings have fewer than eight testing units, each testing unit shall be tested.
2. For buildings with eight or more testing units the greater of seven units or 20 percent of the testing units in the building shall be tested including a top floor unit, a ground floor unit, and a unit with the largest testing unit enclosure area. Where any tested unit exceeds the maximum air leakage rate, an additional 20 percent of units shall be tested, including a mixture of testing unit types and locations.

Reason: Air leakage can be a significant source of energy waste in buildings, contributing to higher heating and cooling costs for building owners and occupants, and increasing risk related to comfort and durability. Air tightness testing can result in more attention to air barrier sealing and significantly reduced building leakage. Currently, the residential energy code requires air tightness testing for residential buildings three stories and less in height to ensure proper tightness and a controlled indoor environment. However, in the commercial energy code there is no testing requirement for residential buildings four stories or more in height (e.g., apartments, dormitories, hotel guest rooms). Industry standards affecting these buildings have historically relied upon visual verification, as well as material and assembly requirements. Providing adequate control over air leakage can also allow many benefits, including reduced HVAC equipment sizing, better building pressurization, and energy savings due to reduced heating and cooling of infiltrated outside air. In moist climates, ensuring lower leakage through testing can also result in better humidity control and reduced risk of durability issues. Air barrier testing saves energy by reducing infiltration of outside air into and out of the building. Most of the time, outside air is hotter or colder than the comfort temperature being maintained in the residence by the heating and cooling systems. Therefore, reducing the infiltration will reduce energy use for heating and cooling. This proposal would require that blower door testing be applied to a sample of units or occupiable spaces in a multiple unit residential construction project. The equipment and staff required are the same as are needed in current air leakage testing required under the residential energy code.

Why is building leakage testing superior to other approaches?

While it is important that the materials and assemblies have limited leakage, specification by individual materials and assemblies does not necessarily equate to an air-tight building. Recent research (Wiss 2014) shows that 40% of buildings constructed without an envelope consultant have air leakage exceeding the current optional test standard of 0.40 cfm/ft^2 at 75 Pa, while buildings with envelope consultants had leakage below 0.25 cfm/ft^2 at 75 Pa. Requiring testing will ensure that the goal of this section of the code—limiting unintended air infiltration in buildings—is achieved.

What strategies are considered to minimize compliance burdens in the field?

To manage testing cost, a testing approach is proposed that requires only 20% of the units (with a seven-unit

minimum) to be tested in the building. The testing method is also an unguarded test of individual units that reduces cost significantly compared to whole building testing or guarded unit testing. To motivate high-quality air sealing, additional testing of an additional 20% of the units would be required if any unit exceeds the leakage limit. Then the weighted average of tested units is used for comparison to the required leakage limit. While the testing requirement is slightly less stringent than the residential code, it matches current optional commercial requirements and is an improvement over the current condition of no testing requirements in the commercial code. It also provides a more reasonable target than air changes per hour for these units, which are typically smaller and have less total leakage than detached residences.

Are there existing codes and standards that require similar testing measures?

This proposal is similar to the residential air leakage provisions in the 2018 IECC in that it also requires the use of ASTM E 779. The proposal is similar to air leakage testing that is required by the State of Washington and City of Seattle commercial building energy codes as well as procedures followed by the U.S. Department of Defense for testing of commercial buildings. The City of Seattle requirements have been in place since 2009 and hundreds of commercial buildings have been tested under that code, including many large buildings. Additionally, thousands of dwelling units have successfully been tested and achieved this metric through the USGBC's LEED for Homes Multifamily Mid-Rise program and the EPA's ENERGY STAR Multifamily High Rise program. It will also be a required test in ASHRAE 62.2-2019.

Bibliography: Hart R and B Liu. 2015. *Methodology for Evaluating Cost-effectiveness of Commercial Energy Code Changes*. Pacific Northwest National Laboratory for U.S. Department of Energy; Energy Efficiency & Renewable Energy. PNNL-23923, Rev. 1. <https://www.energycodes.gov/development/commercial/methodology>
Hart R and M Tyler. 2018. *Envelope Air Tightness for Sleeping and Dwelling Units*. Pacific Northwest National Laboratory for U.S. Department of Energy. PNNL-28337.
http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-28337.pdf

Wiss J. 2014. *ASHRAE 1478-RP Measuring Airtightness of Mid- and High-Rise Non-Residential Buildings*. Elstner Associates, Inc. for ASHRAE. <https://web.ornl.gov/sci/buildings/conf-archive/2013%20B12%20papers/186-Brennan.pdf>

Cost Impact: The code change proposal will increase the cost of construction PNNL performed a cost-effectiveness analysis to identify the net impacts associated with the proposal using the established DOE methodology (Hart and Liu 2015). Results of the cost-effectiveness analysis indicate that the average savings-to-investment ratio (SIR) and simple payback (SPP) for unguarded dwelling unit testing with a limit of 0.30 cfm/ft² (1.5 L/s · m²) at a pressure differential of 0.2 inch water gauge (50 Pa) in mid-rise apartment buildings were:

- SIR: 7.8; cost-effective if greater than 1.0
- SPP: 5.3 years; cost-effective if less than 40 year life

A measure is cost-effective when the SIR is greater than 1.0, indicating that the present value of savings is greater than the incremental cost. The cost for individual unguarded unit testing is expected to be significantly lower than the cost for whole building testing, especially with the sampling protocol provided. Results of the cost-effectiveness analysis were taken into account when developing this proposal (i.e., the recommended language only targets building types and climate zones where the testing requirement was determined to be cost-effective).

For buildings already conducting whole-building testing as their compliance option, this may decrease the cost of construction. For buildings not conducting testing, this is an increase in costs to perform the tests. This

proposal however does not require more than what is currently required in the residential IECC for similar types of commercial buildings 3 stories and lower.

Proposal # 4873

CE96-19

CE97-19

IECC: C402.5, C402.5.1, C402.5.1.2, C402.5.1.2.3 (New)

Proponent: Eric Makela, New Buildings Institute, representing Northwest Energy Codes Group (ericM@newbuildings.org)

2018 International Energy Conservation Code

Revise as follows:

C402.5 Air leakage—thermal envelope (Mandatory). ~~The building thermal envelope of buildings shall comply with Sections C402.5.1 through C402.5.8, or the building thermal envelope shall be tested in accordance with ASTM E 779 at a pressure differential of 0.3 inch water gauge (75 Pa) or an equivalent method approved by the code official and deemed to comply with the provisions of this section when the tested air leakage rate of the building thermal envelope is not greater than 0.40 cfm/ft² (2.0 L/s · m²).~~ with Section C402.5.1.2.3. Where compliance is based on such testing, the building shall also comply with Sections C402.5.5, C402.5.6 and C402.5.7.

C402.5.1 Air barriers. A continuous air barrier shall be provided throughout the building thermal envelope. The air barriers shall be ~~permitted to be~~ located on the inside or outside of the building thermal envelope, located within the assemblies composing the ~~building thermal~~ envelope, or any combination thereof. The air barrier shall comply with Sections C402.5.1.1 and C402.5.1.2.

Exception: Air barriers are not required in buildings located in Climate Zone 2B.

C402.5.1.2 Air barrier ~~compliance options:~~ compliance. A continuous air barrier for the opaque building envelope shall comply with ~~the following:~~

1. ~~Buildings or portions of buildings including group R and group I occupancy shall meet the provisions of Section C402.5.1.2.1 or C402.5.1.2.2.~~
2. ~~Buildings or portions of buildings of other than group R and group I occupancy shall meet the provisions of Section C402.5.1.2.3.~~

Exceptions:

1. ~~Buildings in Climate Zones 2B, 3B, 3C, and 5C.~~
 2. ~~Buildings larger than 5000 square feet floor area in Climate Zones 0B, 1, 2A, 4B, and 4C.~~
 3. ~~Buildings between 5000 and 50,000 square feet floor area in Climate Zones 0A, 3A and 5B.~~
3. ~~Buildings or portions of buildings other than group R and group 1 occupancy that do not complete air barrier testing shall meet the provisions of Section C402.5.1.2.1 or C402.5.1.2.2.~~

Add new text as follows:

C402.5.1.2.3 Non-residential building thermal envelope testing ~~The building thermal envelope shall be tested in accordance with ASTM E 779 or an equivalent method approved by the code official. The measured air leakage shall not exceed 0.40 cfm/ft² (2.0 L/s · m²) of the building thermal envelope area at a pressure differential of 0.3 inch water gauge (75 Pa). Alternatively, portions of the building shall be tested and the measured air leakages shall be area-weighted by the surface areas of the building envelope in each portion. The weighted average test results shall not exceed the whole building leakage limit. In the alternative approach, the following portions of the building shall be tested:~~

1. The entire envelope area of all stories that have any spaces directly under a roof,
2. The entire envelope area of all stories that have a building entrance, exposed floor, or loading dock, or are below grade, and
3. Representative above-grade sections of the building totaling at least 25 percent of the wall area enclosing the remaining conditioned space.

Exception: Where the measured air leakage rate exceeds 0.40 cfm/ft² (2.0 L/s•m²) but does not exceed 0.60 cfm/ft² (3.0 L/s•m²), a diagnostic evaluation using smoke tracer or infra-red imaging shall be conducted while the building is pressurized along with a visual inspection of the air barrier. Any leaks noted shall be sealed where such sealing can be made without destruction of existing building components. An additional report identifying the corrective actions taken to seal leaks shall be submitted to the code official and the building owner, and shall be deemed to comply with satisfy the requirements of this section.

Reason: Air leakage can be a significant source of energy waste in buildings, contributing to higher heating and cooling costs for building owners and occupants, and increasing risk related to comfort and durability. Air tightness testing can result in more attention to envelope assembly air barrier sealing and significantly reduced building leakage. Currently Section C402.5 Air Leakage – thermal envelope, allows air tightness testing as an alternative to meeting material or assembly selection and installation method requirements to ensure proper tightness and a controlled indoor environment. Adequate control over air leakage can provide many benefits, including reduced HVAC equipment sizing, better building pressurization, and energy savings due to reduced heating and cooling of infiltrated outside air. In moist climates, ensuring lower air leakage through whole-building testing can also result in better humidity control and reduced risk of durability issues.

While it is important that the materials and assemblies have limited leakage, that alone does not guarantee a low leakage building. Recent research (Wiss 2014) shows that 40% of buildings constructed *without* an envelope consultant have air leakage exceeding the currently optional test standard requirements, while buildings with envelope consultants all had leakage below 0.25 cfm/ft². Testing is the most reliable means of ensuring that the intent of this code section—limiting unintended energy waste in buildings due to air infiltration—will be achieved.

The measure retains the current IECC optional compliance path test limit of 0.40 cfm/ft² at 75 Pa. Since mandatory—rather than optional—testing would be a new requirement, it is appropriate to retain the current and higher limit of 0.4 cfm/ft² for improved building industry acceptance. Durston and Heron’s review (2012) of the more stringent requirements by the U.S. Department of Defense (DOD) shows that without testing, the range of building leakage can exceed the requirement by more than double (0.9 cfm/ft²). However, with testing included as part of the construction process, the average leakage of buildings was determined to be well below the 0.4 cfm/ft² limit. Therefore, based on the DOD findings, the test limit of 0.40 cfm/ft² is considered a realistic and achievable goal. In addition, the target is well established in the IECC, and aligns with similar optional requirements contained in Standard 90.1.

Intent of the Code Change Proposal

This code change proposal will require

- The leakage testing thresholds are the same as current optional testing thresholds.
- Proposed requirements for testing vary by climate zone and building size and are based on industry-accepted cost-effectiveness analysis methods.
- As outlined in the optional compliance path, portions of buildings could be tested on a sampling basis.
- Commercial buildings under 5000 square feet can be tested using residential methods, technicians, and

equipment with the maximum leakage rate set at 0.30 cfm/ft² (1.5 L/s · m²) at 0.2 in. w.g. (50 Pa). This testing pressure differential is common for residential testing, and is equivalent to a leakage rate of 0.40 cfm/ft² (1.5 L/s · m²) at 0.3 in. w.g. (75 Pa), the current alternative commercial test limit. Yet, implementing the residential procedure can dramatically reduce testing costs for these smaller buildings.

- Since this would be a new requirement, a backup exception is provided so that if a building fails the 0.40 cfm/ft² test, the building can still pass the requirement as long as the tested value is below 0.60 cfm/ft² and additional diagnostics are performed.

Climate Zones 0A and 0B are included in the code change proposal assuming that a code change proposal submitted by SEHPCAC to update the climate zones is submitted and approved. These climate zone designations can be removed from the proposal with no impact if the climate zones are not updated.

What strategies are considered to minimize compliance burdens in the field?

Three specific strategies are applied to minimize the impact of testing on building project costs:

- Testing is only required for certain building types and climate zones where analysis indicates it is cost-effective and the savings justifies the cost. Based on that analysis, size thresholds by climate zone are provided for non-residential buildings.

- It is also prudent to provide some flexibility in the test standard to allow for building industry acceptance and a transition to meeting a fixed testing requirement. Specifically, when the building envelope is complete and testing occurs, access to the air barrier for repairs is difficult. Thus, an exception is included that allows the tested leakage rate to be no more than 0.6 cfm/ft² as long as specific remediation efforts are made. This exception is meant to provide a modest relaxation of the requirement, but only if significant corrective actions are taken that may reduce the air leakage.

- As an additional strategy, the measure allows representative portions or a sample of spaces in the building to be tested instead of the whole building. This alternative supports more economical testing of large buildings, which can help reduce the compliance burden and is consistent with similar requirements in ASHRAE 90.1-2016.

Existing Codes and Standards that Require Similar Testing Measures

The measure is consistent with air leakage testing requirements and thresholds required by the State of Washington and City of Seattle commercial building energy codes (SDCI Community Engagement 2012), as well as procedures followed by the DOD for testing of commercial buildings referenced above. The City of Seattle requirements have been in place since 2009, and hundreds of commercial buildings have been tested under that code, including many large buildings. The proposed measure is less stringent than the current DOD requirements (0.25 cfm/ft²), and case studies (Durstun and Heron 2012) have shown that much lower leakage levels—in the range of 0.15 cfm/ft²—can be achieved.

Energy Savings

An analysis of energy impact shows that annual energy savings from air barrier improvement resulting from testing due to the measure ranges from \$5.07 to \$71.88 per thousand square feet of floor area in offices in climate zones where testing is recommended. More details are found in the cost-effectiveness analysis referenced in the Appendix.

Cost-effectiveness: Pacific Northwest National Laboratory performed a cost-effectiveness analysis using the established DOE methodology (Hart and Liu 2015). Results of the analysis indicate that the average savings-to-investment ratio (SIR) and simple payback period (SPP) for commercial building testing with a limit of 0.40 cfm/ft² (1.5 L/s · m²) at a pressure differential of 0.3 inch w.g. (50 Pa) in office buildings vary by size, as shown in the table below.

Building size range, floor area square feet	<5000	5000 to 50,000	>50,000
Average SIR	7.3	2.2	3.2
Average SPP (years)	7.1	13.1	10.2

A measure is cost-effective when the SIR is greater than 1.0, indicating that the present value of savings is greater than the incremental cost. Under ASHRAE 90.1 criteria, cost-effectiveness is proven when the simple payback is shorter than the scalar threshold of 22.2 years. Based on the cost-effectiveness analysis results, air barrier testing is specified for buildings that have both an SIR greater than 1 and a simple payback that is less than the 90.1 scalar threshold based on climate zone and building size.

As a result of breaks in cost assumptions, most climate zones qualify for testing for buildings below 5000 square feet, with fewer climate zones requiring testing for buildings larger than 50,000 square feet, and the fewest climate zones requiring testing for buildings between 5000 and 50,000 square feet.

Bibliography: TechBrief-ComBldgAirLeakageTesting_PNNL-28367
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Durston JL and M Heron. 2012. *Summary and Analysis of Large Building Air Leakage Testing for the U.S. Department of Defense*. Atlanta, GA.
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SDCI Community Engagement. 2012. "Air Barriers and Pressure Testing." *Building Connections*, March 12, 2012. <http://buildingconnections.seattle.gov/2012/03/01/air-barriers-and-pressure-testing/>.

Background References

NEEC. 2011. *Air Barrier Management Fact Sheet*. <https://neec.net/wp-content/uploads/2009/04/NREC-Air-Barrier-07-2011.pdf>.

Air Barrier Association of America. 2018. *ABAA Energy Savings Calculator*. <http://www.airbarrier.org/technical-information/energy-savings-calculator/>.

Cost Impact: The code change proposal will increase the cost of construction. This measure will increase the cost of construction of new commercial buildings as whole building air leakage testing will be required except for primarily residential buildings (Group R and I building occupancies). Based on a survey of professional commercial building air barrier testing companies, it was determined that the cost of air

leakage testing fell into three ranges:

- \$350 or \$0.12 to \$0.07 per square foot for buildings up to 5000 square feet
- \$0.50 to \$0.15 per square foot for buildings between 5000 and 50,000 square feet
- \$0.15 to \$0.09 per square foot for buildings between 50,000 and 100,000 square feet, with decreasing costs for larger buildings.

As demand for air leakage testing in commercial buildings increases, more companies will enter the market to provide these services. Therefore, a gradual decrease in cost is expected as more companies are available to do the testing.

Proposal # 5146

CE97-19

CE98-19

IECC: C402.5, Chapter 6CE (New)

Proponent: Theresa Weston, representing Air Barrier Association of America (ABAA)
(theresa.a.weston@dupont.com)

2018 International Energy Conservation Code

Revise as follows:

C402.5 Air leakage—thermal envelope (Mandatory). The *thermal envelope* of buildings shall comply with Sections C402.5.1 through C402.5.8, or the building *thermal envelope* shall be tested in accordance with ASTM E779 at a pressure differential of 0.3 inch water gauge (75 Pa), ASTM E3158 or an equivalent method approved by the code official and deemed to comply with the provisions of this section when the tested air leakage rate of the building thermal envelope is not greater than 0.40 cfm/ft² (2.0 L/s • m²). Where compliance is based on such testing, the building shall also comply with Sections C402.5.5, C402.5.6 and C402.5.7.

Add new standard(s) as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken, PA 19428-
2959

ASTM E3158-18: Test Method for Measuring the Air Leakage Rate of a Large or Multizone Building

Reason: This proposal adds an option for the test method used to test a building's air leakage. The method was developed with significant input for industry testing professionals and will be especially beneficial for large and multi-zone buildings.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. No cost effect as it does not change requirements only provides more options to the testing details.

Analysis: A review of the standard proposed for inclusion in the code, ASTM E3158, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 4953

CE98-19

CE99-19

IECC: C103.2, C402.5.1, C402.5.1.3 (New)

Proponent: Eric Makela, New Buildings Institute, representing Northwest Energy Codes Group (ericM@newbuildings.org)

2018 International Energy Conservation Code

Revise as follows:

C103.2 Information on construction documents. Construction documents shall be drawn to scale on suitable material. Electronic media documents are permitted to be submitted where *approved* by the *code official*. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the building, systems and equipment as herein governed. Details shall include, but are not limited to, the following as applicable:

1. Insulation materials and their *R*-values.
2. Fenestration *U*-factors and solar heat gain coefficients (SHGCs).
3. Area-weighted *U*-factor and solar heat gain coefficient (SHGC) calculations.
4. Mechanical system design criteria.
5. Mechanical and service water heating systems and equipment types, sizes and efficiencies.
6. Economizer description.
7. Equipment and system controls.
8. Fan motor horsepower (hp) and controls.
9. Duct sealing, duct and pipe insulation and location.
10. Lighting fixture schedule with wattage and control narrative.
11. Location of *daylight* zones on floor plans.
12. Air ~~sealing details~~: barrier and air sealing details, including the location of the air barrier.

C402.5.1 Air barriers. A continuous air barrier shall be provided throughout the building thermal envelope. The air barriers shall be permitted to be located on the inside or outside of the building envelope, located within the assemblies composing the envelope, or any combination thereof. The air barrier shall comply with Sections C402.5.1.1, C402.5.1.2 and ~~C402.5.1.2~~: C402.5.1.3.

Exception: Air barriers are not required in buildings located in *Climate Zone 2B*.

Add new text as follows:

C402.5.1.3 Building envelope performance verification. The installation of the continuous air barrier shall be verified by a registered design professional or approved agency in accordance with the following:

1. A review of the construction documents and other supporting data shall be conducted to assess compliance with the requirements in Sections C402.5.1.
2. Inspection of continuous air barrier components and assemblies shall be conducted during construction while the air barrier is still accessible for inspection and repair to verify compliance with the requirements of Sections C402.5.1.1 and C402.5.1.
3. A final commissioning report shall be completed by the registered design professional or approved agency and provided to the building owner or owner's authorized agent and the code official. The report shall identify deficiencies found during the review of the construction documents and inspection and details of corrective measures used.

Reason: The testing path for infiltration in the IECC requires a leakage rate of 0.40 CFM/sf @ 75PA. However, according to "Achieving the 30% Goal: Energy and Cost Savings Analysis of ASHRAE Standard 90.1-2010"

prepared by the Pacific Northwest National Lab, the prescriptive air barrier requirements currently used in the IECC only achieve 1.0 CFM/sf @ 75Pa. The prescriptive path is therefore not achieving the level of performance achieved by the testing path. The code requires that air barrier materials meet 0.40 CFM/sf @ 75Pa, so the issue must be with installation and not the materials themselves. This proposal narrows that gap by requiring verification of the air barrier during construction and reporting back to the owner and code official in a manner similar to existing acceptance testing requirements, thereby ensuring better air barrier installation without actually requiring testing.

The proposal includes a sequence of requirements to ensure both effectiveness, ease of implementation and ease of enforcement. Key among these is a requirement that the inspection occur while remediation of errors can still be remedied. Submission of the report to the code official and the owner will ensure that the process has been followed.

The proposal also modifies the charging language in C402.5 and the construction documentation requirements in C103 to enable the new requirements.

According to Evan Mills, PhD, a researcher at Lawrence Berkeley National Laboratory, savings associated with using BECx from both maintenance and energy savings average about 16% for existing buildings and 13% for new construction (“Calculating the ROI of building enclosure commissioning.” *Building Design + Construction*. June 28, 2013.)

Cost Impact: The code change proposal will increase the cost of construction

Evan Mills, PhD, a researcher at Lawrence Berkeley National Laboratory studied the benefits of BECx, noting that commissioning only costs about \$1.16/sf for new construction and \$0.30/sf for existing buildings on average, with a payback period of as little as 14 months.

Proposal # 5158

CE99-19

CE100-19

IECC: C402.5.1.2

Proponent: Laverne Dalglish, Building Professionals, representing Air Barrier Association of America (ldalglish@airbarrier.org)

2018 International Energy Conservation Code

Revise as follows:

C402.5.1.2 Air barrier compliance options. A continuous air barrier for the opaque building envelope shall comply with Section C402.5.1.2.1 ~~or~~ and C402.5.1.2.2.

Reason: The option of simply conducting a air leakage rate test on a one square meter (aproximately 39 inches square) of material does not mean that using the material in a building will result in a building that does not have excessive air leakage. The material needs to be put together into an air barrier assembly with the use of air barrier accessories. These accessories include but not limited to tapes, caulks, strips, sheets, etc. By putting an air barrier assembly together and then testing the air leakage rate of the assembly, will provide the building contractor with guidance with how the material needs to be installed on the building and what air barrier accessories are required to seal the pieces of materials together and to the terminations and penetrations.

There are many materials that will meet the requirments of this building code when tested as a material, but will not reduce the air leakage rate of the whole building. Materials like Jello and peanut butter to very rigid materials like ceramics will not perform when subjected to the loads imposed on the material installed in a building. Other materials will simply not stay in place after installation.

Please consider the Air Permeance Comparison Report (10-06-M0027) for Building Professionals at the ABAA website: <http://www.airbarrier.org/technical-information/abaa-articles-standards/>

An example would be a self-adhered material that does not stick to the substrate after installation.

Cost Impact: The code change proposal will increase the cost of construction. There is no increase to the site construction cost. For many manufacturers who have already conducted an air barrier assembly air leakage test, there is no additional costs to them. If a manufacturer has not conducted an air barrier assemebly air leakage test on their materials, they would have to conduct this test. The test can run from \$5,000 to \$20,000 for the test, depending on how complex their installation instructions are.

The test is an initial type test which means that the manufacturer conducts the test once for the sales life of the material. An air barrier material can be produced with millions of dollars of sales each year and some material have been on the market for over ten years.

Proposal # 5646

CE100-19

CE101-19

IECC: C402.5.1.2.2, ASTM Chapter 06 (New)

Proponent: Laverne Dalglish, representing Air Barrier Association of America (ldalglish@airbarrier.org)

2018 International Energy Conservation Code

Revise as follows:

C402.5.1.2.2 Assemblies. Assemblies of materials and ~~components~~ assemblies with an average air leakage not greater than 0.04 cfm/ft² (0.2 L/s • m²) under a pressure differential of 0.3 inch of water gauge (w.g.) (75 Pa) when tested in accordance with ASTM E2357, or ASTM E1677 for walls, ASTM D8052 for low slope roofs or ASTM E283 for fenestrations shall comply with this section. Assemblies listed in Items 1 through 3 shall be deemed to comply, provided that joints between materials, penetrations and terminations are sealed and the requirements of Section C402.5.1.1 are met.

1. Concrete masonry walls coated with either one application of block filler or two applications of a paint or sealer coating.
2. Masonry walls constructed of clay or shale masonry units with a nominal width of 4 inches (102 mm) or more.
3. A Portland cement/sand parge, stucco or plaster not less than 1/2 inch (12.7 mm) in thickness.

Add new text as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428-
2959

D8052/D8052M-2017: Standard Test Method for Quantification of Air Leakage in Low-Sloped Membrane Roof Assemblies

Reason: The air barrier industry uses the terms "air barrier material" to be combined with an "air barrier accessory" to form an "air barrier assembly". The term "air barrier component" is used to refer to pre-manufactured elements like doors, windows and skylights, etc. where a separate test is used to determine their air leakage rate.

The test method to determine the air leakage rate of a low sloped roof should be referenced as the existing test methods are not appropriate to test low sloped roofs.

It is important to identify the building assembly that the test method is appropriate for, otherwise people will use the wrong test method for testing their building assembly.

The addition of penetrations and terminations to the areas where joints need to be sealed is to bring to the attention of the reader that all joints need to be sealed.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal simply clarifies the intent of this part of the building code.

Proposal # 5657

CE101-19

CE102-19

IECC: C402.5.1.2.1

Proponent: Darren Meyers, P.E., IECC_LLCC representing the National Roofing Contractors Association, representing the National Roofing Contractors Association (dmeyers@ieccode.com)

2018 International Energy Conservation Code

Revise as follows:

C402.5.1.2.1 Materials. Materials with an air permeability not greater than 0.004 cfm/ft² (0.02 L/s • m²) under a pressure differential of 0.3 inch water gauge (75 Pa) when tested in accordance with ASTM E2178 shall comply with this section. Materials in Items 1 through 16 shall be deemed to comply with this section, provided that joints are sealed and materials are installed as air barriers in accordance with the manufacturer's instructions.

1. Plywood with a thickness of not less than $\frac{3}{8}$ inch (10 mm).
2. Oriented strand board having a thickness of not less than $\frac{3}{8}$ inch (10 mm).
3. Extruded polystyrene insulation board having a thickness of not less than $\frac{1}{2}$ inch (12.7 mm).
4. Foil-back polyisocyanurate insulation board having a thickness of not less than $\frac{1}{2}$ inch (12.7 mm).
5. Closed-cell spray foam having a minimum density of 1.5 pcf (2.4 kg/m³) and having a thickness of not less than 1 $\frac{1}{2}$ inches (38 mm).
6. Open-cell spray foam with a density between 0.4 and 1.5 pcf (0.6 and 2.4 kg/m³) and having a thickness of not less than 4.5 inches (113 mm).
7. Exterior or interior gypsum board having a thickness of not less than $\frac{1}{2}$ inch (12.7 mm).
8. Cement board having a thickness of not less than $\frac{1}{2}$ inch (12.7 mm).
9. Built-up roofing membrane.
10. Modified bituminous roof membrane.
11. ~~Fully adhered~~ single-ply roof membrane.
12. A Portland cement/sand parge, or gypsum plaster having a thickness of not less than $\frac{5}{8}$ inch (15.9 mm).
13. Cast-in-place and precast concrete.
14. Fully grouted concrete block masonry.
15. Sheet steel or aluminum.
16. Solid or hollow masonry constructed of clay or shale masonry units.

Reason: The NRCA's intent here is to provide clarity consistent with ASHRAE Standard 90.1-2013, Addendum 'ay', ASHRAE Standard 90.1-2016, Section 5.4.3.1.3, Item 'b' (7), and language used by roofing industry professionals.

ASHRAE 90.1-2016, Section 5.4.3.1.3, **Testing, Acceptable Materials, and Assemblies**, reads:

- b. Materials that have an air permeance not exceeding 0.004 cfm/ft² under a pressure differential of 0.3 in. of water (1.57 psf) when tested in accordance with ASTM E2178. The following materials meet these requirements:
1. Plywood—minimum 3/8 in.
 2. Oriented strand board—minimum 3/8 in.
 3. Extruded polystyrene insulation board—minimum 1/2 in.
 4. Foil-faced urethane insulation board—minimum 1/2 in.
 5. Exterior gypsum sheathing or interior gypsum board—minimum 1/2 in.
 6. Cement board—minimum 1/2 in.
 7. Built-up roofing membrane
 8. Modified bituminous *roof* membrane
 9. Single-ply *roof* membrane
 10. A Portland cement/sand parge, stucco, or gypsum plaster—minimum 1/2 in. thick
 11. Cast-in-place and precast concrete
 12. Sheet metal
 13. Closed-cell 2 lb/ft³ nominal density spray polyurethane foam—minimum 1 in.

Please see Molleti S., “Evaluation of Air Leakage Properties of Seam-Fastened Mechanically Attached Single-ply and Polymer Modified Bitumen Roof Membrane Assemblies,” NRCC Report No. A1-004336.1, Ottawa, Canada, Sept. 8, 2014. Therein, see the Air Movement Impacts on Roof Systems (AIR) Study, Table 1 “AIR Phase 1 Results,” and Table 2 “AIR Phase 2 Results,” from NRCA “Guidelines for Air Retarders in roof Assemblies.” <https://www.nrca.net/store/detail/nrca-guidelines-for-air-retarders-in-roof-assemblies/1612>

Bibliography: Evaluation of Air Leakage Properties of Seam-Fastened Mechanically Attached Single-ply and Polymer Modified Bitumen Roof Membrane Assemblies,” NRCC Report No. A1-004336.1, Ottawa, Canada, Sept. 8, 2014.

NRCA “Guidelines for Air Retarders in roof Assemblies”

Cost Impact: The code change proposal will decrease the cost of construction

The number of code-compliant, single-ply roofing material options available will increase; thereby subjecting local, state, regional, and national markets to competitive pricing pressures.

Proposal # 5210

CE102-19

CE103-19 Part I

PART I — IECC: C402.5.3, C402.5.3.1 (New), BPI Chapter 6

PART II — IECC: R402.4.4.1 (IRC N1102.4.4.1) (New), BPI Chapter 6

Proponent: Darren Meyers, P.E., International Energy Conservation Consultants LLC, representing Self (dmeyers@ieccode.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

Revise as follows:

C402.5.3 Rooms containing fuel-burning appliances- Combustion and Solid-Fuel Burning Appliances. Combustion and solid-fuel burning appliances must be provided with adequate combustion and ventilation air and installed in accordance with manufacturers' installation instructions; NFPA 54/ANSI Z223.1, *National Fuel Gas Code* ; NFPA 31, *Standard for the Installation of Oil-Burning Equipment* ; or NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid-Fuel Burning Appliances* , or other equivalent code approved by the code official .In ~~Glimate Zones 3 through 8~~, where combustion air is supplied through openings in an exterior wall to a room or space containing a space-conditioning fuel-burning appliance, one of the following shall apply:

- ~~1. The room or space containing the appliance shall be located outside of the *building thermal envelope*.~~
- ~~2. The room or space containing the appliance shall be enclosed and isolated from conditioned spaces in-side the building thermal envelope. Such rooms shall comply with all of the following:~~
 - ~~2.1. The walls, floors and ceilings that separate the enclosed room or space from conditioned spaces shall be insulated to be not less than equivalent to the insulation requirement of below-grade walls as specified in Table C402.1.3 or C402.1.4.~~
 - ~~2.2. The walls, floors and ceilings that separate the enclosed room or space from conditioned spaces shall be sealed in accordance with Section C402.5.1.1.~~
 - ~~2.3. The doors into the enclosed room or space shall be shall be fully gasketed.~~
 - ~~2.4. Water lines and ducts in the enclosed room or space shall be insulated in accordance with Section C403.~~
 - ~~2.5. Where an air duct supplying combustion air to the enclosed room or space passes through conditioned space, the duct shall be insulated to an *R*-value of not less than *R*-8.~~

Exception: ~~Fireplaces and stoves complying with Sections 901 through 905 of the International Mechanical Code, and Section 2111.14 of the International Building Code.~~

Add new text as follows:

C402.5.3.1 Testing. Where atmospherically vented combustion appliances or solid-fuel burning appliances are located inside the pressure boundary of the *building thermal envelope*, the total net exhaust flow of the two largest exhaust fans (not including a summer cooling fan(s) intended to be operated only when windows or other air inlets are open) shall not exceed 15 cfm per 100 ft² (75 L/s per 100 m²) of occupiable space when in operation at full capacity.

Where the designed total net flow exceeds this limit, the net exhaust flow must be reduced by reducing the exhaust flow or providing compensating outdoor air. Gravity or barometric dampers in non-powered exhaust

makeup air systems shall not be used to provide compensating outdoor air. Atmospherically-vented combustion appliances do not include direct-vent appliances. Combustion appliances that pass safety testing performed in accordance with BPI-1200, shall be deemed as complying with Section C402.5.3.

Add new standard(s) as follows:

BPI

Building Performance Institute,
Inc.
107 Hermes Road, Suite 210
Malta NY 12020
US

BPI-1200-S-2017: Standard Practice for Basic Analysis of Buildings

Proposal # 5651

CE103-19 Part I

CE103-19 Part II

IECC: R402.4.4.1 (IRC N1102.4.4.1) (New), BPI Chapter 6

Proponent: Darren Meyers, P.E., International Energy Conservation Consultants LLC, representing Self (dmeyers@ieccode.com)

2018 International Energy Conservation Code

Revise as follows:

R402.4.4 (IRC N1102.4.4) Rooms containing fuel-burning appliances. In *Climate Zones* 3 through 8, where open combustion air ducts provide combustion air to open combustion fuel burning appliances, the appliances and combustion air opening shall be located outside the *building thermal envelope* or enclosed in a room that is isolated from inside the thermal envelope. Such rooms shall be sealed and insulated in accordance with the envelope requirements of Table R402.1.2, where the walls, floors and ceilings shall meet not less than the *basement wall R-value* requirement. The door into the room shall be fully gasketed and any water lines and ducts in the room insulated in accordance with Section R403. The combustion air duct shall be insulated where it passes through *conditioned space* to an Rvalue of not less than R-8.

Exceptions:

1. Direct vent appliances with both intake and exhaust pipes installed continuous to the outside.
2. Fireplaces and stoves complying with Section R402.4.2 and Section R1006 of the International Residential Code.

Add new text as follows:

R402.4.4.1 (IRC N1102.4.4.1) Testing. Where atmospherically vented combustion appliances or solid-fuel burning appliances are located inside the pressure boundary of the *building thermal envelope*, the total net exhaust flow of the two largest exhaust fans (not including a summer cooling fan(s) intended to be operated only when windows or other air inlets are open) shall not exceed 15 cfm per 100 ft² (75 L/s per 100 m²) of occupiable space when in operation at full capacity.

Where the designed total net flow exceeds this limit, the net exhaust flow must be reduced by reducing the exhaust flow or providing compensating outdoor air. Gravity or barometric dampers in non-powered exhaust makeup air systems shall not be used to provide compensating outdoor air. Atmospherically-vented combustion appliances do not include direct-vent appliances. Combustion appliances that pass safety testing performed in accordance with BPI-1200-S shall be deemed as complying with Section R402.4.4.

Add new standard(s) as follows:

BPI

Building Performance Institute,
Inc.
107 Hermes Road, Suite 210
Malta NY 12020
US

BPI-1200-S-2017: Standard Practice for Basic Analysis of Buildings.

Reason: Energy efficiency improvements often have a direct impact on the building pressure boundary affecting the safe operation of combustion equipment. Routinely sealing up buildings without looking at the combustion equipment risk sooner or later will result in harming someone with back-drafted flue gas conditions.

The current language requires thermal isolation and enclosure of the mechanical room. A "worst case" depressurization test would, at worst, be equal in estimated first cost.

This proposal is intended to provide clear guidance to builders, code officials and home performance contractors for worst-case testing of atmospheric venting systems where air-sealing techniques and air-leakage performance testing requirements of the 2018 IECC are employed. Worst case testing is used by home performance contractors to identify problems that weaken draft and restrict combustion air. Worst case vent testing uses the home's exhaust fans, air handling appliances and chimneys to create worst case depressurization in the combustion appliance zone.

Language that is proposed for R403.10 is basically a distilled version of predominant combustion safety test procedures for atmospherically vented appliances found in readily available home performance programs across the country. Specific reference is made to ANSI/BPI-1200, *Standard Practice for Basic Analysis of Buildings*.

Bibliography: ANSI Z223.1-2018, *National Fuel Gas Code*;
NFPA 31-2016, *Standard for the Installation of Oil-Burning Equipment*;

NFPA 211-2016, *Standard for Chimneys, Fireplaces, Vents, and Solid-Fuel Burning Appliances*; and

ANSI/BPI-1200-S-2017, *Standard Practice for Basic Analysis of Buildings*.

Cost Impact: The code change proposal will increase the cost of construction
The current language requires thermal isolation and enclosure of the mechanical room.

We suggest that "trading-off" those first costs with the \$200 - \$300 cost for a "worst case" depressurization test would, at worst, be equal.

Staff Analysis: A review of the standard proposed for inclusion in the code, ANSI/BPI-1200-S-2017, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 5760

CE103-19 Part II

CE104-19

IECC: C402.5.3

Proponent: donald sivigny, State of MN, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Energy Conservation Code

Delete without substitution:

~~**C402.5.3 Rooms containing fuel-burning appliances.** In *Climate Zones* 3 through 8, where combustion air is supplied through openings in an exterior wall to a room or space containing a space-conditioning fuel-burning appliance, one of the following shall apply:~~

- ~~1. The room or space containing the appliance shall be located outside of the *building thermal envelope*.~~
- ~~2. The room or space containing the appliance shall be enclosed and isolated from conditioned spaces inside the building thermal envelope. Such rooms shall comply with all of the following:~~
 - ~~2.1. The walls, floors and ceilings that separate the enclosed room or space from conditioned spaces shall be insulated to be not less than equivalent to the insulation requirement of below-grade walls as specified in Table C402.1.3 or C402.1.4.~~
 - ~~2.2. The walls, floors and ceilings that separate the enclosed room or space from conditioned spaces shall be sealed in accordance with Section C402.5.1.1.~~
 - ~~2.3. The doors into the enclosed room or space shall be fully gasketed.~~
 - ~~2.4. Water lines and ducts in the enclosed room or space shall be insulated in accordance with Section C403.~~
 - ~~2.5. Where an air duct supplying combustion air to the enclosed room or space passes through conditioned space, the duct shall be insulated to an *R*-value of not less than *R*-8.~~

~~**Exception:** Fireplaces and stoves complying with Sections 901 through 905 of the International Mechanical Code, and Section 2111.14 of the International Building Code.~~

Reason: The language in the IECC R402.5.3 is deleted in its entirety with no replacement language. Many of the appliances installed today due to Federal Energy Efficiency requirements and customer demands, are direct vent appliances with both intake and exhaust pipes continuous to the outside as listed in exception #1. The concern of this original code change is that the colder air that is installed as combustion air needs to be tempered or conditioned to the temperature of the rest of the building. The thought is that this will save money by not having to warm this colder air once it enters the building. There are advantages to having this open combustion air duct, in the area of the mechanicals in case any of the mechanical combustion appliances need additional air for proper combustion, this opening will supply it. This is a simple safety issue to make combustion air available. Remember, the code is not allowed to create a life safety issue. However the fallacy is in the thought process that this open duct is constantly bringing in cooler or warmer air into the building (depending on the season of the year and your climate zone,). This does not happen. There are some very simple and successful ways to prevent air from entering the building when it's not needed for combustion. With a 90 degree bend in the duct (the most common way) or placing the end of the duct in a pail or container etc. This can be done without the added costs of building walls around the mechanical room that meet the same requirements of the exterior walls of the home including air leakage, and R-values and U factors of the wall system. The average cost of framing a 10 foot wall is between \$150 and \$360 for labor and material, depending on location of the country you are building in. Add to that cost an additional \$50 to \$75 for insulation and another \$100 to \$150 for

air sealing and the costs add up very fast. These costs don't even include the average exterior type of door that is required to be gasketed and sealed. Add another \$250 to \$300 not including Labor. And an additional \$50 to \$75 for the hardware, frame and door knobs. So where are the savings for meeting this code change? The fact is that the additional costs to do this are between \$500.00 on the very low end, and \$900 or more, on the higher end. This makes no sense. This code section is trying to solve a problem that does not exist. Especially if the building meets the air tightness requirements of the code already. Also the temperature on both sides of this very expensive wall system is basically the same temperature, why the need for insulation then? Building Physics will dictate that air needs a pressure differential, and a hole, to move air through these walls. Without both a pressure differential and a hole, air will not move. There will not be walls that are separating outside unconditioned air from interior conditioned air, and there will be essentially very little, or no pressure difference from one side of these walls to the other side because there is not going to be a Delta T (Temperature difference). Both sides will be conditioned space. With the cost of housing growing so fast in our country today let's not keep code changes in the code that cost a lot of money, for no return on the investment (ROI)

Cost Impact: The code change proposal will decrease the cost of construction

The cost factor of doing all this work to isolate the room if and when a passive combustion air is brought into the space costs so much more than the language of the code will ever save in the first place.

Proposal # 5130

CE104-19

CE105-19

IECC: C402.5.7.1

Proponent: Dan Buuck, representing National Association of Home Builders (dbuuck@nahb.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com); Gene Boecker, representing Code Consultants, Inc. (geneb@codeconsultants.com); Marsha Mazz, representing United Spinal Association (m.mazz@verizon.net); Dawn Anderson, representing Mayor's Office on Disability (gonedawning@yahoo.com)

2018 International Energy Conservation Code

C402.5.7 Vestibules. Building entrances shall be protected with an enclosed vestibule, with all doors opening into and out of the vestibule equipped with self-closing devices. Vestibules shall be designed so that in passing through the vestibule it is not necessary for the interior and exterior doors to open at the same time. The installation of one or more revolving doors in the building entrance shall not eliminate the requirement that a vestibule be provided on any doors adjacent to revolving doors.

Exceptions: Vestibules are not required for the following:

1. Buildings in *Climate Zones* 1 and 2.
2. Doors not intended to be used by the public, such as doors to mechanical or electrical equipment rooms, or intended solely for employee use.
3. Doors opening directly from a *sleeping unit* or dwelling unit.
4. Doors that open directly from a space less than 3,000 square feet (298 m²) in area.
5. Revolving doors.
6. Doors used primarily to facilitate vehicular movement or material handling and adjacent personnel doors.
7. Doors that have an air curtain with a velocity of not less than 6.56 feet per second (2 m/s) at the floor that have been tested in accordance with ANSI/AMCA 220 and installed in accordance with the manufacturer's instructions. Manual or automatic controls shall be provided that will operate the air curtain with the opening and closing of the door. Air curtains and their controls shall comply with Section C408.2.3.

Add new text as follows:

C402.5.7.1 Vestibules and revolving doors. Revolving doors shall comply with Section 1010.1.4.1 of the International Building Code. Vestibules shall comply with Section 1010.1.8 of the International Building Code. Where a vestibule serves as part of an accessible route, the vestibule shall also comply Section 404 of ICC A117.1. Automatic doors shall be provided in accordance with Section 1105.1.1 of the International Building Code.

Reason: This is a necessary reference for the designer to fully understand the implications for the design of the vestibule given the new automatic door requirements in the IBC and the turning space requirements in the ICC A117.1.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is a pointer to aid the designer.

Proposal # 4401

CE105-19

CE106-19

IECC: C402.5.9(New), C402.5.9.1(New), C403.1.3(New)

Proponent: Hope Medina, representing Self (hmedina@coloradocode.net)

2018 International Energy Conservation Code

Add new text as follows:

C402.5.9 Operable openings interlocking. (Mandatory) Occupancies that utilize an operable opening larger than 40 square feet shall have the openings interlocked with the heating and cooling system to raise the cooling setpoint to 80 degrees or heating to 70 degrees when the operable opening is open in the exterior wall of the building.

Exceptions:

1. Food cooking and prep areas that contain equipment that contributes to the mechanical load calculations of a restaurant type occupancy that are zoned separately.
2. Warehouses that utilize overhead doors for the function of the occupancy, where approved by the code official.
3. The first entrance doors where located in the exterior wall and are part of a vestibule system.

C402.5.9.1 Operable controls (Mandatory) Controls shall comply with Section C403.13.

C403.13 Operable opening interlocking controls. (Mandatory) The heating and cooling systems shall have controls that will interlock these mechanical systems to the set temperatures of 80 degrees for cooling and 70 degrees for heating when the conditions of Section C402.5.9 exist. The controls shall configure to shut off the systems entirely when the outdoor temperatures are below 80 degrees or above 70 degrees.

Reason: It has become a frequent practice for large operable windows, roll up doors, and/or sliding or folding doors to be installed and open to take advantage of cross ventilation or wind to assist with cooling and ventilation of a space. The problem has become that the cooling and heating systems for these spaces are still running, which does not assist with the energy efficiency of a building or space. The intent of this proposal is to address this common practice with a practical approach that utilizes similar concepts in other standards and other jurisdictional amendments without “banning” this practice.

The exceptions are needed to address very specific situations this requirement would hinder the function of the space. When preparing food often the equipment utilized is going to increase the need for mechanical cooling, and it is not the intent to cause any discomfort. The exceptions allow for the food prep areas to still utilize the mechanical cooling system. The second exception acknowledges that many warehouses will utilize natural ventilation, and these doors are often opened for this reason. The third exception is to address when the entrance door is opened for people who are coming and going of the space.

The controls for these systems would not need to be on when the outdoor temperatures have reached the set temperatures.

Cost Impact: The code change proposal will increase the cost of construction While this requirement will have an increase of cost on the front end it should decrease the operation cost post construction.

Proposal # 5520

CE107-19

IECC: C403.1.1

Proponent: David Collins, representing SEHPCAC (SEHPCAC@iccsafe.org)

2018 International Energy Conservation Code

Revise as follows:

C403.1.1 Calculation of heating and cooling loads (Mandatory). Design loads associated with heating, ventilating and air conditioning of the building shall be determined in accordance with ANSI/ASHRAE/ACCA Standard 183 or by an *approved* equivalent computational procedure using the design parameters specified in Chapter 3. Heating and cooling loads shall be adjusted to account for load reductions that are achieved where energy recovery systems are utilized in the HVAC system in accordance with the ASHRAE *HVAC Systems and Equipment Handbook* by an approved equivalent computational procedure.

Reason:

C403.1.1 is currently called out in C403.3.1, which is labeled mandatory; prior to the reorganization in the 2018 code, it was under charging language 403.2 which was labeled mandatory.

While identified as "Mandatory", if the elimination of the use of the labels "prescriptive" and "mandatory" is approved, we understand this label would not be added and it would instead the provision be added to Table C407.2 to indicate its application to the Total Building Performance compliance option.

This proposal is submitted by the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at:
<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>
(<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>)

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Because this is a clarification and reaffirmation of the mandatory nature of this requirement, it should not increase or decrease costs of construction.

Proposal # 4183

CE107-19

CE108-19

IECC: C202, C202(New), C403.1, C403.1.2 (New), TABLE C403.1.2(1) (New), TABLE C403.1.2(2)(New), TABLE C403.3.2(9), C405.1, TABLE C405.3.2(2), Chapter 6CE (New)

Proponent: Nicholas O'Neil, Energy 350, representing Energy 350 (noneil@energy350.com)

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Revise as follows:

COMPUTER ROOM. A room whose primary function is to house equipment for the processing and storage of electronic data and that ~~which~~ has a design ~~electronic data total~~ ITE equipment power density of less than ~~or equal to~~ 20 watts per square foot (20 watts per 0.092 m²) of conditioned ~~floor-area~~ or a ~~connected~~ design ~~electronic data total~~ ITE equipment load of less than ~~or equal to~~ 10 kW.

Add new definition as follows:

DATA CENTER. A room, or series of rooms that share data center systems, whose primary function is to house equipment for the processing and storage of electronic data and which has a design total ITE equipment power density exceeding 20 watts per square foot of conditioned area and a total design ITE equipment load greater than 10 kW.

DATA CENTER SYSTEMS. HVAC systems and equipment, or portions thereof used to provide cooling or ventilation in a data center.

INFORMATION TECHNOLOGY EQUIPMENT (ITE) ITE includes computers, data storage devices, servers, and network/communication equipment.

Revise as follows:

C403.1 General. Mechanical systems and equipment serving the building heating, cooling, ventilating or refrigerating needs shall comply with this section.

Exception: Data center systems are exempt from the requirements of Sections C403.4 and C403.5.

Add new text as follows:

C403.1.2 Data Centers Data center systems shall comply with Sections 6 and 8 of ASHRAE 90.4 with the following changes:

1. Replace design MLC values in the ASHRAE 90.4 specified in Table 6.2.1.1 with the values in Table C403.1.2(1) as applicable in each climate zone.
2. Replace annualized MLC values in the ASHRAE 90.4 specified in Table 6.2.1.2 with the values in Table C403.1.2(2) as applicable in each climate zone.

C403.1.2(1)

Maximum Design Mechanical Load Component (Design MLC)

Climate Zones as Listed in ASHRAE Standard 169	Design MLC at 100% and at 50% ITE Load
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0A	0.24
0B	0.26
1A	0.23
2A	0.24
3A	0.23
4A	0.23
5A	0.22
6A	0.22
1B	0.28
2B	0.27
3B	0.26
4B	0.23
5B	0.23
6B	0.21
3C	0.19
4C	0.21
5C	0.19
7	0.20
8	0.19

C403.1.2(2)

Maximum Annualized Mechanical Load Component (Annualized MLC)

Climate Zones as Listed in ASHRAE Standard 169	HVAC Maximum Annualized MLC at 100% and at 50% ITE Load
0A	0.19
0B	0.20
1A	0.18
2A	0.19
3A	0.18
4A	0.17
5A	0.17
6A	0.17
1B	0.16
2B	0.18
3B	0.18
4B	0.18
5B	0.16
6B	0.17
3C	0.16

<u>4C</u>	<u>0.16</u>
<u>5C</u>	<u>0.16</u>
<u>7</u>	<u>0.16</u>
<u>8</u>	<u>0.16</u>

Revise as follows:

TABLE C403.3.2(9)
MINIMUM EFFICIENCY AIR CONDITIONERS AND CONDENSING UNITS SERVING COMPUTER ROOMS
AND DATA CENTERS

EQUIPMENT TYPE	NET SENSIBLE COOLING CAPACITY^a	MINIMUM SCOP-127^b EFFICIENCY DOWNFLOW UNITS / UPFLOW UNITS	TEST PROCEDURE
Air conditioners, air cooled	< 65,000 Btu/h	2.20 / 2.09	ANSI/ASHRAE 127
	≥ 65,000 Btu/h and < 240,000 Btu/h	2.10 / 1.99	
	≥ 240,000 Btu/h	1.90 / 1.79	
Air conditioners, water cooled	< 65,000 Btu/h	2.60 / 2.49	
	≥ 65,000 Btu/h and < 240,000 Btu/h	2.50 / 2.39	
	≥ 240,000 Btu/h	2.40 / 2.29	
Air conditioners, water cooled with fluid economizer	< 65,000 Btu/h	2.55 / 2.44	
	≥ 65,000 Btu/h and < 240,000 Btu/h	2.45 / 2.34	
	≥ 240,000 Btu/h	2.35 / 2.24	
Air conditioners, glycol cooled (rated at 40% propylene glycol)	< 65,000 Btu/h	2.50 / 2.39	
	≥ 65,000 Btu/h and < 240,000 Btu/h	2.15 / 2.04	
	≥ 240,000 Btu/h	2.10 / 1.99	
Air conditioners, glycol cooled (rated at 40% propylene glycol) with fluid economizer	< 65,000 Btu/h	2.45 / 2.34	
	≥ 65,000 Btu/h and < 240,000 Btu/h	2.10 / 1.99	
	≥ 240,000 Btu/h	2.05 / 1.94	

For SI: 1 British thermal unit per hour = 0.2931 W.

- a. Net sensible cooling capacity: the total gross cooling capacity less the latent cooling less the energy to the air movement system. (Total Gross – latent – Fan Power).
- b. Sensible coefficient of performance (SCOP-127): a ratio calculated by dividing the net sensible cooling capacity in watts by the total power input in watts (excluding reheaters and humidifiers)

at conditions defined in ASHRAE Standard 127. The net sensible cooling capacity is the gross sensible capacity minus the energy dissipated into the cooled space by the fan system.

C405.1 General (Mandatory). This section covers lighting system controls, the maximum lighting power for interior and exterior applications and electrical energy consumption. Dwelling units within multifamily buildings shall comply with Section R404.1. All other dwelling units shall comply with Section R404.1, or with Sections C405.2.4 and C405.3. Sleeping units shall comply with Section C405.2.4, and with Section R404.1 or C405.3. Lighting installed in walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with the lighting requirements of Section C403.10.1 or C403.10.2. Transformers, uninterruptable power supplies, motors and electrical power processing equipment in data center systems shall comply with Section 8 of ASHRAE 90.4 in addition to this code.

**TABLE C405.3.2(2)
INTERIOR LIGHTING POWER ALLOWANCES: SPACE-BY-SPACE METHOD**

COMMON SPACE TYPES^a	LPD (watts/sq.ft)
Atrium	
Less than 40 feet in height	0.03 per foot in total height
Greater than 40 feet in height	0.40 + 0.02 per foot in total height
Audience seating area	
In an auditorium	0.63
In a convention center	0.82
In a gymnasium	0.65
In a motion picture theater	1.14
In a penitentiary	0.28
In a performing arts theater	2.03
In a religious building	1.53
In a sports arena	0.43
Otherwise	0.43
Banking activity area	0.86
Breakroom (See Lounge/breakroom)	
Classroom/lecture hall/training room	
In a penitentiary	1.34
Otherwise	0.96
Computer room, <u>Data Center</u>	1.33
Conference/meeting/multipurpose room	1.07
Copy/print room	0.56
Corridor	
In a facility for the visually impaired (and not used primarily by the staff) ^b	0.92
In a hospital	0.92
In a manufacturing facility	0.29
Otherwise	0.66
Courtroom	1.39

Dining area	
In bar/lounge or leisure dining	0.93
In cafeteria or fast food dining	0.63
In a facility for the visually impaired (and not used primarily by the staff) ^b	2.00
In family dining	0.71
In a penitentiary	0.96
Otherwise	0.63
Electrical/mechanical room	0.43
Emergency vehicle garage	0.41
Food preparation area	1.06
Guestroom ^{c, d}	0.77
Laboratory	
In or as a classroom	1.20
Otherwise	1.45
Laundry/washing area	0.43
Loading dock, interior	0.58
Lobby	
For an elevator	0.68
In a facility for the visually impaired (and not used primarily by the staff) ^b	2.03
In a hotel	1.06
In a motion picture theater	0.45
In a performing arts theater	1.70
Otherwise	1.0
Locker room	0.48
Lounge/breakroom	
In a healthcare facility	0.78
Otherwise	0.62
Office	
Enclosed	0.93
Open plan	0.81
Parking area, interior	0.14
Pharmacy area	1.34
Restroom	
In a facility for the visually impaired (and not used primarily by the staff) ^b	0.96
Otherwise	0.85
Sales area	1.22
Seating area, general	0.42
Stairway (see Space containing stairway)	
Stairwell	0.58
Storage room	0.46

Vehicular maintenance area	0.56
Workshop	1.14
BUILDING TYPE SPECIFIC SPACE TYPES ^a	LPD (watts/sq.ft)
Automotive (see Vehicular maintenance area)	
Convention Center—exhibit space	0.88
Dormitory—living quarters ^{c, d}	0.54
Facility for the visually impaired ^b	
In a chapel (and not used primarily by the staff)	1.06
In a recreation room (and not used primarily by the staff)	1.80
Fire Station—sleeping quarters ^c	0.20
Gymnasium/fitness center	
In an exercise area	0.50
In a playing area	0.82
Healthcare facility	
In an exam/treatment room	1.68
In an imaging room	1.06
In a medical supply room	0.54
In a nursery	1.00
In a nurse's station	0.81
In an operating room	2.17
In a patient room ^c	0.62
In a physical therapy room	0.84
In a recovery room	1.03
Library	
In a reading area	0.82
In the stacks	1.20
Manufacturing facility	
In a detailed manufacturing area	0.93
In an equipment room	0.65
In an extra-high-bay area (greater than 50' floor-to-ceiling height)	1.05
In a high-bay area (25-50' floor-to-ceiling height)	0.75
In a low-bay area (less than 25' floor-to-ceiling height)	0.96
Museum	
In a general exhibition area	1.05
In a restoration room	0.85
Performing arts theater—dressing room	0.36
Post office—sorting area	0.68
Religious buildings	
In a fellowship hall	0.55
In a worship/pulpit/choir area	1.53

Retail facilities	
In a dressing/fitting room	0.50
In a mall concourse	0.90
Sports arena—playing area	
For a Class I facility ^e	2.47
For a Class II facility ^f	1.96
For a Class III facility ^g	1.70
For a Class IV facility ^h	1.13
Transportation facility	
In a baggage/carousel area	0.45
In an airport concourse	0.31
At a terminal ticket counter	0.62
Warehouse—storage area	
For medium to bulky, palletized items	0.35
For smaller, hand-carried items	0.69

- a. In cases where both a common space type and a building area specific space type are listed, the building area specific space type shall apply
- b. A 'Facility for the Visually Impaired' is a facility that is licensed or will be licensed by local or state authorities for senior long-term care, adult daycare, senior support or people with special visual needs.
- c. Where sleeping units are excluded from lighting power calculations by application of Section R405.1, neither the area of the sleeping units nor the wattage of lighting in the sleeping units is counted.
- d. Where dwelling units are excluded from lighting power calculations by application of Section R405.1, neither the area of the dwelling units nor the wattage of lighting in the dwelling units is counted.
- e. Class I facilities consist of professional facilities; and semiprofessional, collegiate, or club facilities with seating for 5,000 or more spectators.
- f. Class II facilities consist of collegiate and semiprofessional facilities with seating for fewer than 5,000 spectators; club facilities with seating for between 2,000 and 5,000 spectators; and amateur league and high-school facilities with seating for more than 2,000 spectators.
- g. Class III facilities consist of club, amateur league and high-school facilities with seating for 2,000 or fewer spectators.
- h. Class IV facilities consist of elementary school and recreational facilities; and amateur league and high-school facilities without provision for spectators.

Add new standard(s) as follows:

ASHRAE

ASHRAE
1791 Tullie Circle NE
Atlanta GA 30329

90.4-2016: Energy Standard for Data Centers

Reason: Data centers have long had difficulty meeting all prescriptive code requirements and are additionally discouraged from pursuing more efficient alternatives with useful waste heat. Instead of current prescriptive

code language (emphasizing component performance ratings and cooler-weather economization) this proposal seeks to require large sophisticated data center projects to meet a performance-based ASHRAE Standard allowing attractive system-wide tradeoffs for efficiency and explicit credit for useful heat recovery. While data centers pursuing this path may experience energy savings, this proposal seeks to instill a performance-based approach to encourage more efficient design overall using a methodology that better suits this unique building type.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. We do not anticipate any significant financial impacts to be incurred due to this change.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASHRAE 90.4-2016, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Analysis: A review of the standard proposed for inclusion in the code, ASHRAE 90.4-2016, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 4949

CE108-19

CE109-19

IECC: C403.2.2.1 (New)

Proponent: Joel Williams, TEXENERGY SOLUTIONS, representing TexEnergy Solutions

2018 International Energy Conservation Code

Add new text as follows:

C403.2.2.1 Multifamily ventilation addition. For unitary systems less than 65,000 KBTU/Yr serving a multifamily dwelling unit with a individual ventilation system having a fan either partially or completely dedicated to ventilation shall have a fan size no larger than ¼ horsepower.

Reason: We work mostly in multifamily commercial construction. The intent of this change is to move away from the primary strategy for ventilation (CZ1-3) being a duct with a damper attached to the return plenum. This brings in additional moisture due to the lack of control and design of the system.

Bibliography: Performance path energy models (REMRate/Ekotrope) for low-rise apartments do a good job of showing this impact. They take the fan power for the apartments and compare them against a baseline of 2.2 CFM/Watt (0.46 W/CFM) for the ventilation of the building and rate it on how many hours a day that it will run. It disincentivizes the air handler strategy in the performance code path and helps promote a more effective ventilation system.

Cost Impact: The code change proposal will increase the cost of construction. Since this is multifamily construction, most of the units are between 1.5T and 3.0T in sizing. Most projects use the air handler fan and put a duct with a damper to bring in the fresh air for their apartments. This would force a decision to buy more efficient equipment and not upsize the air handler to get a higher equipment efficiency at the detriment of the additional power used by the ventilation fan strategy.

Proposal # 5137

CE109-19

CE110-19

IECC: C202(New), C403.2, C403.2.3(New)

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Add new definition as follows:

FAULT DETECTION AND DIAGNOSTICS (FDD) SYSTEM. A software platform that utilizes building analytic algorithms to convert data provided by sensors and devices to automatically identify faults in building systems and provide a prioritized list of actionable resolutions to those faults based on cost or energy avoidance, comfort and maintenance impact.

Revise as follows:

C403.2 System design (Mandatory). Mechanical systems shall be designed to comply with Sections C403.2.1 and ~~C403.2.2 through C403.2.3~~. Where elements of a building's mechanical systems are addressed in Sections C403.3 through C403.12, such elements shall comply with the applicable provisions of those sections.

Add new text as follows:

C403.2.3 Fault Detection and Diagnostics (Mandatory). Buildings having 100,000 square feet (9,290 square meters) or more of *conditioned floor area* shall include a fault detection and diagnostics (FDD) system to monitor the building's HVAC system's performance and automatically identify faults. The FDD system shall:

1. Utilize permanently installed sensors and devices to monitor the HVAC system's central plant equipment, zone terminal equipment and associated mechanical components including but not limited to motors, actuators, valves and dampers;
2. Sample the permanently installed sensors and devices at least once per 15 minutes;
3. Automatically identify HVAC system faults using algorithmic-based analysis that performs rule-based or model-based diagnostics separately from the monitoring and alarming functionality of a building management system (BMS) or building automation system (BAS);
4. Automatically provide authorized personnel with prioritized recommendations for fault repair of identified faults based on estimated excess energy consumption or cost of non-repair; and
5. Be capable of transmitting the prioritized fault repair recommendations to remotely located authorized personnel.

Reason: The purpose of this code change proposal is to add a requirement for Fault Detection and Diagnostics (FDD) for HVAC systems in large commercial buildings. Energy efficiency of a new building's HVAC system will degrade over time if equipment is poorly maintained, failing, or improperly controlled. The proposed FDD requirement will reduce that degradation by detecting HVAC system faults and notifying building operators so that corrective actions may be taken to repair the faults and reduce the energy consumption of the building. In addition, FDD systems are commonly utilized to drive operational efficiency, make better use of maintenance personnel, and resolve comfort issues.

Bibliography: “Realizing ongoing energy and cost savings,” *available at* <https://ecobuilding.schneider-electric.com/documents/10807/217223/Lab+Project+Building+Analytics+Case+Study/a6d8b9b6-7fdd-4e87-a90b-c98ece595a25>

Cost Impact: The code change proposal will increase the cost of construction

This proposal will increase the cost of construction because it will require additional hardware, software and/or labor during installation of the mechanical system. However, based on field experience with FDD systems, we believe that these systems will rapidly pay for themselves. A recent study of a FDD system installed in a research lab in Massachusetts showed that the equipment would produce a return on investment of less than one year. See “Realizing ongoing energy and cost savings,” *available at* <https://ecobuilding.schneider-electric.com/documents/10807/217223/Lab+Project+Building+Analytics+Case+Study/a6d8b9b6-7fdd-4e87-a90bc98ece595a25>:

- Setup cost: \$23,190
- Annual maintenance cost: \$35,407
- Projected annual savings: \$286,000

Proposal # 4206

CE110-19

CE111-19

IECC: C202, (New), C403.2, C403.2.3(New)

Proponent: Marilyn Williams, representing National Electrical Manufacturers Association
(mar_williams@nema.org)

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Add new text as follows:

FAULT DETECTION AND DIAGNOSTICS (FDD) SYSTEM A software platform that utilizes building analytic algorithms to convert data provided by sensors and devices to automatically identify faults in building systems and provide a prioritized list of actionable resolutions to those faults based on cost or energy avoidance, comfort and maintenance impact.

Revise as follows:

C403.2 System design (Mandatory). Mechanical systems shall be designed to comply with Sections C403.2.1 and ~~C403.2.2 through C403.2.3~~. Where elements of a building's mechanical systems are addressed in Sections C403.3 through C403.12, such elements shall comply with the applicable provisions of those sections.

Add new text as follows:

C403.2.3 Fault Detection and Diagnostics (Mandatory) New buildings with a gross conditioned floor area of 100,000 square feet (9290 square meters) or larger shall include a fault detection and diagnostics (FDD) system to monitor the HVAC system's performance and automatically identify faults. The FDD system shall:

1. Include permanently installed sensors and devices to monitor the HVAC system's performance;
2. Sample the HVAC system's performance at least once per 15 minutes;
3. Automatically identify and report HVAC system faults;
4. Automatically notify authorized personnel of identified HVAC system faults;
5. Automatically provide prioritized recommendations for repair of identified faults based on analysis of data collected from the sampling of HVAC system performance; and
6. Be capable of transmitting the prioritized fault repair recommendations to remotely located authorized personnel.

Reason: Energy efficiency of a new building's HVAC system will degrade over time caused by poorly maintained, failing and improperly controlled equipment. The proposed FDD requirement will reduce that degradation by detecting HVAC system faults and notifying building operators so that actions may be taken to reduce energy consumption of the building. Additionally, FDD systems are being utilized to drive operational efficiency, make better use of maintenance personnel, and resolve comfort issues.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code change proposal "will" increase the cost of construction because it will require additional hardware, software and labor during installation. Providing specific cost would violate antitrust laws, however a published example of cost and savings is provided from the following link <https://ecobuilding.schneider-electric.com/documents/10807/217223/Lab+Project+Building+Analytics+Case+Study/a6d8b9b6-7fdd-4e87-a90b-c98ece595a25>: Setup/install cost - \$23,190, Annual maintenance cost - \$35,407, and Annual savings - \$286,000.

CE112-19

IECC: TABLE C403.3.2(5)

Proponent: Steven Rosenstock, Edison Electric Institute, representing Edison Electric Institute (srosenstock@eei.org)

2018 International Energy Conservation Code

Revise as follows:

**TABLE C403.3.2(5)
MINIMUM EFFICIENCY REQUIREMENTS: GAS- AND OIL-FIRED BOILERS**

Portions of table not shown remain unchanged.

EQUIPMENT TYPE ^a	SUBCATEGORY OR RATING CONDITION	SIZE CATEGORY (INPUT)	MINIMUM EFFICIENCY ^{d, e}	TEST PROCEDURE	
Boilers, steam	Gas-fired	< 300,000 Btu/h ^f	80% AFUE	10 CFR Part 430	
	Gas-fired- all, except natural draft	≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h ^b	79% E _t	10 CFR Part 431	
		> 2,500,000 Btu/h ^a	79% E _t		
	Gas-fired-natural draft	≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h ^b	77% E _t		
			<u>79% E_t as of March 2,2020</u>		
		> 2,500,000 Btu/h ^a	<u>79% E_t as of Mach 2.2020</u>		
	Oil-fired ^c	< 300,000 Btu/h	82% AFUE		10 CFR Part 430
		≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h ^b	81% E _t		10 CFR Part 431
		> 2,500,000 Btu/h ^a	81% E _t		

For SI: 1 British thermal unit per hour = 0.2931 W.

- These requirements apply to boilers with rated input of 8,000,000 Btu/h or less that are not packaged boilers and to all packaged boilers. Minimum efficiency requirements for boilers cover all capacities of packaged boilers.
- Maximum capacity – minimum and maximum ratings as provided for and allowed by the unit's controls.
- Includes oil-fired (residual).
- E_c = Combustion efficiency (100 percent less flue losses).
- E_t = Thermal efficiency. See referenced standard for detailed information.
- Boilers shall not be equipped with a constant-burning ignition pilot.
- A boiler not equipped with a tankless domestic water heating coil shall be equipped with an

automatic means for adjusting the temperature of the water such that an incremental change in inferred heat load produces a corresponding incremental change in the temperature of the water supplied.

Reason: This will align the IECC with the required minimum efficiency values shown in ASHRAE 90.1-2016 (and 2013, 2010, and 2007) Table 6.8.1-6, "Gas and Oil Fired *Boilers* - Minimum *Efficiency* Requirements". These values were agreed to on a consensus basis by the ASHRAE Mechanical SubCommittee, the ASHRAE 90.1 Full Committee, and then went out for public review before being published.

Cost Impact: The code change proposal will increase the cost of construction. There will be an increase in cost to install higher efficiency equipment.

Proposal # 4726

CE112-19

CE113-19

IECC: C403.3.2, TABLE C403.3.2(1), TABLE C403.3.2(2), TABLE C403.3.2(3), TABLE C403.3.2(4), TABLE C403.3.2(5), TABLE C403.3.2(6), TABLE C403.3.2(7), TABLE C403.3.2(8), TABLE C403.3.2(9), TABLE C403.3.2(10), C403.3.2.1, C403.3.2.2, C403.5.5, C403.9, C406.2, TABLE C407.5.1(1), C408.2.3.1

Proponent: Connor Barbaree, representing ASHRAE (cbarbaree@ashrae.org)

2018 International Energy Conservation Code

Revise as follows:

C403.3.2 HVAC equipment performance requirements (Mandatory). Equipment shall meet the minimum efficiency requirements of Tables ~~C403.3.2(1) through C403.3.2(9)~~ 6.8.1-1 through 6.8.1-19 of ASHRAE Standard 90.1 when tested and rated in accordance with the applicable test procedure. Plate-type liquid-to-liquid heat exchangers shall meet the minimum requirements of Table ~~C403.3.2(10)~~ 6.8.1-8 of ASHRAE Standard 90.1. The efficiency shall be verified through certification under an approved certification program or, where a certification program does not exist, the equipment efficiency ratings shall be supported by data furnished by the manufacturer. Where multiple rating conditions or performance requirements are provided, the equipment shall satisfy all stated requirements. Where components, such as indoor or outdoor coils, from different manufacturers are used, calculations and supporting data shall be furnished by the designer that demonstrates that the combined efficiency of the specified components meets the requirements herein. Table 6.8.1-1 Electrically Operated Unitary Air Conditioners and Condensing Units - Minimum Efficiency Requirements

Table 6.8.1-2 Electrically Operated Air Cooled Unitary and Heat Pumps - Minimum Efficiency Requirements

Table 6.8.1-3 Water Chilling Packages - Minimum Efficiency Requirements

Table 6.8.1-4 Electrically Operated Packaged Terminal Air Conditioners, Packaged Terminal Heat Pumps, Single-Package Vertical Air Conditioners, Single-Package Vertical Heat Pumps, Room Air Conditioners, and Room Air Conditioner Heat Pumps—Minimum Efficiency Requirements

Table 6.8.1-5 Warm-Air Furnaces and Combination Warm-Air Furnaces/Air-Conditioning Units, Warm-Air Duct Furnaces, and Unit Heaters—Minimum Efficiency Requirements

Table 6.8.1-6 Gas- and Oil-Fired Boilers—Minimum Efficiency Requirements

Table 6.8.1-7 Performance Requirements for Heat Rejection Equipment—Minimum Efficiency Requirements

Table 6.8.1-8 Heat Transfer Equipment—Minimum Efficiency Requirements

Table 6.8.1-9 Electrically Operated Variable-Refrigerant-Flow Air Conditioners—Minimum Efficiency Requirements

Table 6.8.1-10 Electrically Operated Variable-Refrigerant-Flow and Applied Heat Pumps— Minimum Efficiency Requirements[if supportFields]> FILENAME

Table 6.8.1-11 Floor Mounted Air Conditioners and Condensing Units Serving Computer Rooms—Minimum Efficiency Requirements

Table 6.8.1-13 Commercial Refrigerators, Freezers and Refrigeration—Minimum Efficiency Requirements

Table 6.8.1-14 Vapor Compression Based Indoor Pool Dehumidifiers—Minimum Efficiency Requirements

Table 6.8.1-15 Electrically Operated DX-DOAS Units, Single-Package and Remote Condenser, without Energy Recovery—Minimum Efficiency Requirements

Table 6.8.1-16 Electrically Operated DX-DOAS Units, Single-Package and Remote Condenser, with Energy Recovery—Minimum Efficiency Requirements

Table 6.8.1-17 Electrically Operated Water Source Heat Pumps—Minimum Efficiency Requirements

Table 6.8.1-18 Heat Pump and Heat Reclaim Chiller Packages – Minimum Efficiency Requirements

Table 6.8.1-19 Ceiling Mounted Computer Room Air Conditioners—Minimum Efficiency Requirements

Delete without substitution:

TABLE C403.3.2(1)

MINIMUM EFFICIENCY REQUIREMENTS: ELECTRICALLY OPERATED UNITARY AIR CONDITIONERS AND CONDENSING UNITS

EQUIPMENT TYPE	SIZE CATEGORY	HEATING SECTION TYPE	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY	TEST PROCEDURE^a
Air conditioners, air cooled	< 65,000 Btu/h ^b	All	Split System	13.0 SEER	AHRI 210/240
			Single Package	14.0 SEER	
Through-the-wall (air cooled)	≤ 30,000 Btu/h ^b	All	Split system	12.0 SEER	
			Single Package	12.0 SEER	
Small-duct high-velocity (air cooled)	< 65,000 Btu/h ^b	All	Split System	11.0 SEER	
Air conditioners, air cooled	≥ 65,000 Btu/h and < 135,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	11.2 EER 12.8 IEER	
		All other	Split System and Single Package	11.0 EER 12.6 IEER	
	≥ 135,000 Btu/h and < 240,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	11.0 EER 12.4 IEER	
		All other	Split System and Single Package	10.8 EER 12.2 IEER	
	≥ 240,000 Btu/h and < 760,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	10.0 EER 11.6 IEER	
		All other	Split System and Single Package	9.8 EER 11.4 IEER	

	$\geq 760,000$ Btu/h	Electric Resistance (or None)	Split System and Single Package	9.7 EER11.2 IEER			
		All other	Split System and Single Package	9.5 EER11.0 IEER			
Air conditioners, water cooled	$< 65,000$ Btu/h ^b	All	Split System and Single Package	12.1 EER12.3 IEER	AHRI 210/240		
	$\geq 65,000$ Btu/h and $< 135,000$ Btu/h	Electric Resistance (or None)	Split System and Single Package	12.1 EER13.9 IEER	AHRI 340/360		
		All other	Split System and Single Package	11.9 EER13.7 IEER			
	$\geq 135,000$ Btu/h and $< 240,000$ Btu/h	Electric Resistance (or None)	Split System and Single Package	12.5 EER13.9 IEER			
		All other	Split System and Single Package	12.3 EER13.7 IEER			
	$\geq 240,000$ Btu/h and $< 760,000$ Btu/h	Electric Resistance (or None)	Split System and Single Package	12.4 EER13.6 IEER			
		All other	Split System and Single Package	12.2 EER13.4 IEER			
	$\geq 760,000$ Btu/h	Electric Resistance (or None)	Split System and Single Package	12.2 EER13.5 IEER			
		All other	Split System and Single Package	12.0 EER13.3 IEER			
	Air conditioners, evaporatively cooled	$< 65,000$ Btu/h ^b	All	Split System and Single Package		12.1 EER12.3 IEER	AHRI 210/240
		$\geq 65,000$ Btu/h and $< 135,000$ Btu/h	Electric Resistance (or None)	Split System and Single Package		12.1 EER12.3 IEER	AHRI 340/360
			All other	Split System and Single Package		11.9 EER12.1 IEER	
$\geq 135,000$ Btu/h and $< 240,000$ Btu/h		Electric Resistance (or None)	Split System and Single Package	12.0 EER12.2 IEER			
		All other	Split System and Single Package	11.8 EER12.0 IEER			

	$\geq 240,000$ Btu/h and $< 760,000$ Btu/h	Electric Resistance (or None)	Split System and Single Package	11.9 EER12.1 IEER	
		All other	Split System and Single Package	11.7 EER11.9 IEER	
	$\geq 760,000$ Btu/h	Electric Resistance (or None)	Split System and Single Package	11.7 EER11.9 IEER	
		All other	Split System and Single Package	11.5 EER11.7 IEER	
Condensing units, air cooled	$\geq 135,000$ Btu/h	—	—	10.5 EER11.8 IEER	AHRI 365
Condensing units, water cooled	$\geq 135,000$ Btu/h	—	—	13.5 EER14.0 IEER	
Condensing units, evaporatively cooled	$\geq 135,000$ Btu/h	—	—	13.5 EER14.0 IEER	

For SI: 1 British thermal unit per hour = 0.2931 W.

- a. Chapter 6 contains a complete specification of the referenced test procedure, including the reference year version of the test procedure.
- b. Single phase, air cooled air conditioners less than 65,000 Btu/h are regulated by NAECA. SEER values are those set by NAECA.

TABLE C403.3.2(2)
MINIMUM EFFICIENCY REQUIREMENTS: ELECTRICALLY OPERATED UNITARY AND APPLIED HEAT PUMPS

EQUIPMENT TYPE	SIZE CATEGORY	HEATING SECTION TYPE	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY	TEST PROCEDURE ^a
Air cooled (cooling mode)	$< 65,000$ Btu/h ^b	All	Split System	14.0 SEER	AHRI 210/240
			Single Package	14.0 SEER	
Through the wall, air cooled	$\leq 30,000$ Btu/h ^b	All	Split System	12.0 SEER	
			Single Package	12.0 SEER	
Single duct high-velocity air cooled	$< 65,000$ Btu/h ^b	All	Split System	11.0 SEER	
	$\geq 65,000$ Btu/h and $< 135,000$ Btu/h	Electric Resistance (or None)	Split System and Single Package	11.0 EER 12.0 IEER	
		All other	Split System and Single Package	10.8 EER 11.8 IEER	

Air-cooled (cooling mode)	$\geq 135,000$ Btu/h and $< 240,000$ Btu/h	Electric Resistance (or None)	Split System and Single Package	10.6 EER 11.6 IEER	AHRI 340/360
		All other	Split System and Single Package	10.4 EER 11.4 IEER	
	$\geq 240,000$ Btu/h	Electric Resistance (or None)	Split System and Single Package	9.5 EER 10.6 IEER	
		All other	Split System and Single Package	9.3 EER-9.4 IEER	
Water to Air: Water Loop (cooling mode)	$< 17,000$ Btu/h	All	86°F entering water	12.2 EER	ISO 13256-1
	$\geq 17,000$ Btu/h and $< 65,000$ Btu/h	All	86°F entering water	13.0 EER	
	$\geq 65,000$ Btu/h and $< 135,000$ Btu/h	All	86°F entering water	13.0 EER	
Water to Air: Ground Water (cooling mode)	$< 135,000$ Btu/h	All	59°F entering water	18.0 EER	ISO 13256-1
Brine to Air: Ground Loop (cooling mode)	$< 135,000$ Btu/h	All	77°F entering water	14.1 EER	ISO 13256-1
Water to Water: Water Loop (cooling mode)	$< 135,000$ Btu/h	All	86°F entering water	10.6 EER	ISO 13256-2
Water to Water: Ground Water (cooling mode)	$< 135,000$ Btu/h	All	59°F entering water	16.3 EER	
Brine to Water: Ground Loop (cooling mode)	$< 135,000$ Btu/h	All	77°F entering fluid	12.1 EER	
Air cooled (heating mode)	$< 65,000$ Btu/h ^b	—	Split System	8.2 HSPF	
Through the wall, (air cooled, heating mode)	$\leq 30,000$ Btu/h ^b (cooling capacity)	—	Single Package	8.0 HSPF	
		—	Split System	7.4 HSPF	
Small duct high velocity (air cooled, heating mode)	$< 65,000$ Btu/h ^b	—	Split System	7.4 HSPF	
		—	Single Package	7.4 HSPF	
Air cooled (heating mode)	$\geq 65,000$ Btu/h and $< 135,000$ Btu/h (cooling capacity)	—	47°F db/43°F wb outdoor air	3.3 GOP	AHRI 340/360
			17°F db/15°F wb outdoor air	2.25 GOP	
	$\geq 135,000$ Btu/h (cooling capacity)	—	47°F db/43°F wb outdoor air	3.2 GOP	
			17°F db/15°F wb outdoor air	2.05 GOP	
Water to Air: Water Loop (heating mode)	$< 135,000$ Btu/h (cooling capacity)	—	68°F entering water	4.3 GOP	

Water to Air: Ground Water (heating mode)	< 135,000 Btu/h (cooling capacity)	—	50°F entering water	3.7 GOP	ISO 13256-1
Brine to Air: Ground Loop (heating mode)	< 135,000 Btu/h (cooling capacity)	—	32°F entering fluid	3.2 GOP	
Water to Water: Water Loop (heating mode)	< 135,000 Btu/h (cooling capacity)	—	68°F entering water	3.7 GOP	ISO 13256-2
Water to Water: Ground Water (heating mode)	< 135,000 Btu/h (cooling capacity)	—	50°F entering water	3.1 GOP	
Brine to Water: Ground Loop (heating mode)	< 135,000 Btu/h (cooling capacity)	—	32°F entering fluid	2.5 GOP	

For SI: 1 British thermal unit per hour = 0.2931 W, °C = [(°F) - 32]/1.8.

- a. Chapter 6 contains a complete specification of the referenced test procedure, including the reference year version of the test procedure.
- b. Single-phase, air-cooled heat pumps less than 65,000 Btu/h are regulated by NAECA. SEER and HSPF values are those set by NAECA.

TABLE C403.3.2(3)

MINIMUM EFFICIENCY REQUIREMENTS: ELECTRICALLY OPERATED PACKAGED TERMINAL AIR CONDITIONERS, PACKAGED TERMINAL HEAT PUMPS, SINGLE-PACKAGE VERTICAL AIR CONDITIONERS, SINGLE VERTICAL HEAT PUMPS, ROOM AIR CONDITIONERS AND ROOM AIR-CONDITIONER HEAT PUMPS

EQUIPMENT TYPE	SIZE CATEGORY (INPUT)	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY	TEST PROCEDURE ^a
PTAC (cooling mode) new construction	All Capacities	95°F db outdoor air	14.0 - (0.300 × Cap/1000) EER	AHRI 310/380
PTAC (cooling mode) replacements ^b	All Capacities	95°F db outdoor air	10.9 - (0.213 × Cap/1000) EER	
PTHP (cooling mode) new construction	All Capacities	95°F db outdoor air	14.0 - (0.300 × Cap/1000) EER	
PTHP (cooling mode) replacements ^b	All Capacities	95°F db outdoor air	10.8 - (0.213 × Cap/1000) EER	
PTHP (heating mode) new construction	All Capacities	—	3.2 - (0.026 × Cap/1000) COP	
PTHP (heating mode) replacements ^b	All Capacities	—	2.9 - (0.026 × Cap/1000) COP	
SPVAC (cooling mode)	< 65,000 Btu/h	95°F db/ 75°F wb outdoor air	9.0 EER	AHRI 300
	≥ 65,000 Btu/h and < 135,000 Btu/h	95°F db/ 75°F wb outdoor air	8.9 EER	
	≥ 135,000 Btu/h and < 240,000 Btu/h	95°F db/ 75°F wb outdoor air	8.6 EER	

SPVHP (cooling mode)	< 65,000 Btu/h	95°F db/ 75°F wb outdoor air	9.0 EER	
	≥ 65,000 Btu/h and < 135,000 Btu/h	95°F db/ 75°F wb outdoor air	8.9 EER	
	≥ 135,000 Btu/h and < 240,000 Btu/h	95°F db/ 75°F wb outdoor air	8.6 EER	
SPVHP (heating mode)	< 65,000 Btu/h	47°F db/ 43°F wb outdoor air	3.0 COP	AHRI-390
	≥ 65,000 Btu/h and < 135,000 Btu/h	47°F db/ 43°F wb outdoor air	3.0 COP	
	≥ 135,000 Btu/h and < 240,000 Btu/h	47°F db/ 75°F wb outdoor air	2.9 COP	
Room air conditioners, with louvered sides	< 6,000 Btu/h	—	11.0 CEER	
	≥ 6,000 Btu/h and < 8,000 Btu/h	—	11.0 CEER	
	≥ 8,000 Btu/h and < 14,000 Btu/h	—	10.9 CEER	
	≥ 14,000 Btu/h and < 20,000 Btu/h	—	10.7 CEER	
	≥ 20,000 Btu/h and ≤ 25,000 Btu/h	—	9.4 CEER	
	> 25,000 Btu/h	—	9.0 CEER	
Room air conditioners, without louvered sides	< 6,000 Btu/h	—	10.0 CEER	ANSI/AHAM RAG-1
	≥ 6,000 Btu/h and < 8,000 Btu/h	—	10.0 CEER	
	≥ 8,000 Btu/h and < 11,000 Btu/h	—	9.6 CEER	
	≥ 11,000 Btu/h and < 14,000 Btu/h	—	9.5 CEER	
	≥ 14,000 Btu/h and < 20,000 Btu/h	—	9.3 CEER	
	≥ 20,000 Btu/h	—	9.4 CEER	
Room air-conditioner heat pumps with louvered sides	< 20,000 Btu/h	—	9.8 CEER	
	≥ 20,000 Btu/h	—	9.3 CEER	
Room air-conditioner heat pumps without louvered sides	< 14,000 Btu/h	—	9.3 CEER	
	≥ 14,000 Btu/h	—	8.7 CEER	
Room air conditioner easement only	All capacities	—	9.5 CEER	ANSI/AHAM RAG-1
Room air conditioner easement slider	All capacities	—	10.4 CEER	

For SI: 1 British thermal unit per hour = 0.2931 W, °C = [(°F) - 32]/1.8, wb = wet bulb, db = dry bulb.

“Cap” = The rated cooling capacity of the project in Btu/h. Where the unit’s capacity is less than 7000 Btu/h, use 7000 Btu/h in the calculation. Where the unit’s capacity is greater than 15,000 Btu/h, use 15,000 Btu/h in the

calculations:

- a. Chapter 6 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.
- b. Replacement unit shall be factory labeled as follows: “MANUFACTURED FOR REPLACEMENT APPLICATIONS ONLY: NOT TO BE INSTALLED IN NEW CONSTRUCTION PROJECTS.” Replacement efficiencies apply only to units with existing sleeves less than 16 inches (406 mm) in height and less than 42 inches (1067 mm) in width.

TABLE C403.3.2(4)

WARM-AIR FURNACES AND COMBINATION WARM-AIR FURNACES/AIR-CONDITIONING UNITS, WARM-AIR DUCT FURNACES AND UNIT HEATERS, MINIMUM EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	SIZE CATEGORY (INPUT)	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY ^{d, e}	TEST PROCEDURE ^a
Warm-air furnaces, gas fired	< 225,000 Btu/h	—	80% AFUE or 80% E_t^e	DOE 10 GFR Part 430 or ANSI Z21.47
	≥ 225,000 Btu/h	Maximum capacity ^e	80% E_t^f	ANSI Z21.47
Warm-air furnaces, oil fired	< 225,000 Btu/h	—	83% AFUE or 80% E_t^e	DOE 10 GFR Part 430 or UL 727
	≥ 225,000 Btu/h	Maximum capacity ^b	81% E_t^g	UL 727
Warm-air duct furnaces, gas fired	All capacities	Maximum capacity ^b	80% E_e	ANSI Z83.8
Warm-air unit heaters, gas fired	All capacities	Maximum capacity ^b	80% E_e	ANSI Z83.8
Warm-air unit heaters, oil fired	All capacities	Maximum capacity ^b	80% E_e	UL 731

For SI: 1 British thermal unit per hour = 0.2931 W.

- a. Chapter 6 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.
- b. Minimum and maximum ratings as provided for and allowed by the unit's controls.
- e. Combination units not covered by the National Appliance Energy Conservation Act of 1987 (NAECA) (3-phase power or cooling capacity greater than or equal to 65,000 Btu/h [19 kW]) shall comply with either rating.
- d. E_t = Thermal efficiency. See test procedure for detailed discussion.
- e. E_e = Combustion efficiency (100% less flue losses). See test procedure for detailed discussion.
- f. E_c = Combustion efficiency. Units shall also include an IID, have jackets not exceeding 0.75 percent of the input rating, and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned space.
- g. E_t = Thermal efficiency. Units shall also include an IID, have jacket losses not exceeding 0.75 percent of the input rating, and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned space.

TABLE C403.3.2(5)
MINIMUM EFFICIENCY REQUIREMENTS: GAS AND OIL-FIRED BOILERS

EQUIPMENT TYPE ^a	SUBCATEGORY OR RATING CONDITION	SIZE CATEGORY (INPUT)	MINIMUM EFFICIENCY ^{d, e}	TEST PROCEDURE
Boilers, hot water	Gas-fired	< 300,000 Btu/h ^{f, g}	82% AFUE	10 CFR Part 430
		≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h ^b	80% E_t	10 CFR Part 431
		> 2,500,000 Btu/h ^a	82% E_e	
	Oil-fired ^e	< 300,000 Btu/h ^g	84% AFUE	10 CFR Part 430
		≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h ^b	82% E_t	10 CFR Part 431
		> 2,500,000 Btu/h ^a	84% E_e	
Boilers, steam	Gas-fired	< 300,000 Btu/h ^f	80% AFUE	10 CFR Part 430
	Gas-fired— all, except natural draft	≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h ^b	79% E_t	10 CFR Part 431
		> 2,500,000 Btu/h ^a	79% E_t	
	Gas-fired— natural draft	≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h ^b	77% E_t	
		> 2,500,000 Btu/h ^a	77% E_t	
	Oil-fired ^e	< 300,000 Btu/h	82% AFUE	10 CFR Part 430
		≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h ^b	81% E_t	10 CFR Part 431
		> 2,500,000 Btu/h ^a	81% E_t	

For SI: 1 British thermal unit per hour = 0.2931 W.

- a. These requirements apply to boilers with rated input of 8,000,000 Btu/h or less that are not packaged boilers and to all packaged boilers. Minimum efficiency requirements for boilers cover all capacities of packaged boilers.
- b. Maximum capacity — minimum and maximum ratings as provided for and allowed by the unit's controls.
- e. Includes oil-fired (residual).
- d. E_e = Combustion efficiency (100 percent less flue losses).
- e. E_t = Thermal efficiency. See referenced standard for detailed information.
- f. Boilers shall not be equipped with a constant burning ignition pilot.
- g. A boiler not equipped with a tankless domestic water heating coil shall be equipped with an automatic means for adjusting the temperature of the water such that an incremental change in inferred heat load produces a corresponding incremental change in the temperature of the water supplied.

TABLE C403.3.2(6)
MINIMUM EFFICIENCY REQUIREMENTS: CONDENSING UNITS, ELECTRICALLY OPERATED

EQUIPMENT TYPE	SIZE CATEGORY	MINIMUM EFFICIENCY ^b	TEST PROCEDURE ^a
Condensing units, air cooled	≥ 135,000 Btu/h	10.1 EER/11.2 IPLV	AHRI 365
Condensing units, water or evaporatively cooled	≥ 135,000 Btu/h	13.1 EER/13.1 IPLV	

For SI: 1 British thermal unit per hour = 0.2931 W.

- a. Chapter 6 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.
- b. IPLVs are only applicable to equipment with capacity modulation.

TABLE C403.3.2(7)
WATER CHILLING PACKAGES — EFFICIENCY REQUIREMENTS^{a, b, d}

EQUIPMENT TYPE	SIZE CATEGORY	UNITS	BEFORE 1/1/2015		AS OF 1/1/2015		TEST PROCEDURE ^c	
			Path-A	Path-B	Path-A	Path-B		
Air cooled chillers	< 150 Tons	EER (Btu/W)	≥ 9.562 FL	NA ^e	≥ 10.100 FL	≥ 9.700 FL		
			≥ 12.500 IPLV		≥ 13.700 IPLV	≥ 15.800 IPLV		
	≥ 150 Tons		≥ 9.562 FL	NA ^e	≥ 10.100 FL	≥ 9.700 FL		
			≥ 12.500 IPLV		≥ 14.000 IPLV	≥ 16.100 IPLV		
Air cooled without condenser, electrically operated	All capacities	EER(Btu/W)	Air cooled chillers without condenser shall be rated with matching condensers and complying with air cooled chiller efficiency requirements.					
Water cooled, electrically operated positive displacement	< 75 Tons	kW/ton	≤ 0.780 FL	≤ 0.800 FL	≤ 0.750 FL	≤ 0.780 FL		AHRI 550/590
			≤ 0.630 IPLV	≤ 0.600 IPLV	≤ 0.600 IPLV	≤ 0.500 IPLV		
	≥ 75 tons and < 150 tons		≤ 0.775 FL	≤ 0.790 FL	≤ 0.720 FL	≤ 0.750 FL		
			≤ 0.615 IPLV	≤ 0.586 IPLV	≤ 0.560 IPLV	≤ 0.490 IPLV		
	≥ 150 tons and < 300 tons		≥ 0.680 FL	≥ 0.718 FL	≥ 0.660 FL	≥ 0.680 FL		
			≥ 0.580 IPLV	≥ 0.540 IPLV	≥ 0.540 IPLV	≥ 0.440 IPLV		
	≥ 300 tons and < 600 tons		≤ 0.620 FL	≤ 0.639 FL	≤ 0.610 FL	≤ 0.625 FL		
			≤ 0.540 IPLV	≤ 0.490 IPLV	≤ 0.520 IPLV	≤ 0.410 IPLV		
> 600 tons	≤ 0.620 FL	≤ 0.639 FL	≤ 0.560 FL	≤ 0.585 FL				

	≥ 600 tons		≤ 0.540 IPLV	≤ 0.490 IPLV	≤ 0.500 IPLV	≤ 0.380 IPLV	
Water cooled, electrically operated centrifugal	< 150 Tons	kW/ton	≤ 0.634 FL	≤ 0.639 FL	≤ 0.610 FL	≤ 0.695 FL	
			≤ 0.596 IPLV	≤ 0.450 IPLV	≤ 0.550 IPLV	≤ 0.440 IPLV	
	≥ 150 tons and < 300 tons		≤ 0.634 FL	≤ 0.639 FL	≤ 0.610 FL	≤ 0.635 FL	
	≤ 0.596 IPLV		≤ 0.450 IPLV	≤ 0.550 IPLV	≤ 0.400 IPLV		
	≥ 300 tons and < 400 tons		≤ 0.576 FL	≤ 0.600 FL	≤ 0.560 FL	≤ 0.595 FL	
	≤ 0.549 IPLV		≤ 0.400 IPLV	≤ 0.520 IPLV	≤ 0.390 IPLV		
	≥ 400 tons and < 600 tons		≤ 0.576 FL	≤ 0.600 FL	≤ 0.560 FL	≤ 0.585 FL	
	≤ 0.549 IPLV		≤ 0.400 IPLV	≤ 0.500 IPLV	≤ 0.380 IPLV		
≥ 600 Tons	≤ 0.570 FL	≤ 0.590 FL	≤ 0.560 FL	≤ 0.585 FL			
			≤ 0.539 IPLV	≤ 0.400 IPLV	≤ 0.500 IPLV	≤ 0.380 IPLV	
Air cooled, absorption, single effect	All capacities	GOP	≥ 0.600 FL	NA ^e	≥ 0.600 FL	NA ^e	AHRI-560
Water cooled absorption, single effect	All capacities	GOP	≥ 0.700 FL	NA ^e	≥ 0.700 FL	NA ^e	
Absorption, double effect, indirect fired	All capacities	GOP	≥ 1.000 FL	NA ^e	≥ 1.000 FL	NA ^e	
			≥ 1.050 IPLV		≥ 1.050 IPLV		
Absorption double effect direct fired	All capacities	GOP	≥ 1.000 FL	NA ^e	≥ 1.000 FL	NA ^e	
			≥ 1.000 IPLV		≥ 1.050 IPLV		

- a. The requirements for centrifugal chiller shall be adjusted for nonstandard rating conditions in accordance with Section G403.3.2.1 and are only applicable for the range of conditions listed in Section G403.3.2.1. The requirements for air-cooled, water-cooled positive displacement and absorption chillers are at standard rating conditions defined in the reference test procedure.
- b. Both the full-load and IPLV requirements shall be met or exceeded to comply with this standard. Where there is a Path B, compliance can be with either Path A or Path B for any application.
- c. NA means the requirements are not applicable for Path B and only Path A can be used for compliance.
- d. FL represents the full-load performance requirements and IPLV the part-load performance requirements.

**TABLE C403.3.2(8)
MINIMUM EFFICIENCY REQUIREMENTS: HEAT REJECTION EQUIPMENT**

EQUIPMENT TYPE^a	TOTAL SYSTEM HEAT REJECTION CAPACITY AT RATED CONDITIONS	SUBCATEGORY OR RATING CONDITIONⁱ	PERFORMANCE REQUIRED^{b, c, d, g, h}	TEST PROCEDURE^{e, f}
Propeller or axial fan open-circuit cooling towers	All	95°F entering water 85°F leaving water 75°F entering wb	≥ 40.2 gpm/hp	GTI ATC-105 and GTI STD-201 RS
Gentrifugal fan open-circuit cooling towers	All	95°F entering water 85°F leaving water 75°F entering wb	≥ 20.0 gpm/hp	GTI ATC-105 and GTI STD-201 RS
Propeller or axial fan closed-circuit cooling towers	All	102°F entering water 90°F leaving water 75°F entering wb	≥ 16.1 gpm/hp	GTI ATC-105S and GTI STD-201 RS
Gentrifugal fan closed-circuit cooling towers	All	102°F entering water 90°F leaving water 75°F entering wb	≥ 7.0 gpm/hp	GTI ATC-105S and GTI STD-201 RS
Propeller or axial fan evaporative condensers	All	Ammonia Test Fluid 140°F entering gas temperature 96.3°F condensing temperature 75°F entering wb	≥ 134,000 Btu/h × hp	GTI ATC-106
Gentrifugal fan evaporative condensers	All	Ammonia Test Fluid 140°F entering gas temperature 96.3°F condensing temperature 75°F entering wb	≥ 110,000 Btu/h × hp	GTI ATC-106
Propeller or axial fan evaporative condensers	All	R-507A Test Fluid 165°F entering gas temperature 105°F condensing temperature 75°F entering wb	≥ 157,000 Btu/h × hp	GTI ATC-106
Gentrifugal fan evaporative condensers	All	R-507A Test Fluid 165°F entering gas temperature 105°F condensing temperature 75°F entering wb	≥ 135,000 Btu/h × hp	GTI ATC-106
Air-cooled condensers	All	125°F Condensing Temperature 190°F Entering Gas Temperature 15°F subcooling 95°F entering db	≥ 176,000 Btu/h × hp	AHRI 460

For SI: °C = [(°F) - 32]/1.8, L/s × kW = (gpm/hp)/(11.83), COP = (Btu/h × hp)/(2550.7),

db = dry bulb temperature, °F, wb = wet bulb temperature, °F.

a. The efficiencies and test procedures for both open and closed-circuit cooling towers are not applicable to hybrid cooling towers that contain a combination of wet and dry heat exchange

sections-

- b. ~~For purposes of this table, open circuit cooling tower performance is defined as the water flow rating of the tower at the thermal rating condition, divided by the fan nameplate-rated motor power.~~
- e. ~~For purposes of this table, closed circuit cooling tower performance is defined as the water flow rating of the tower at the thermal rating condition, divided by the sum of the fan nameplate-rated motor power and the spray pump nameplate-rated motor power.~~
- d. ~~For purposes of this table, air-cooled condenser performance is defined as the heat rejected from the refrigerant divided by the fan nameplate-rated motor power.~~
- e. ~~Chapter 6 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure. The certification requirements do not apply to field-erected cooling towers.~~
- f. ~~Where a certification program exists for a covered product and it includes provisions for verification and challenge of equipment efficiency ratings, then the product shall be listed in the certification program; or, where a certification program exists for a covered product, and it includes provisions for verification and challenge of equipment efficiency ratings, but the product is not listed in the existing certification program, the ratings shall be verified by an independent laboratory test report.~~
- g. ~~Cooling towers shall comply with the minimum efficiency listed in the table for that specific type of tower with the capacity effect of any project-specific accessories or options included in the capacity of the cooling tower~~
- h. ~~For purposes of this table, evaporative condenser performance is defined as the heat rejected at the specified rating condition in the table divided by the sum of the fan motor nameplate power and the integral spray pump nameplate power~~
- i. ~~Requirements for evaporative condensers are listed with ammonia (R-717) and R-507A as test fluids in the table. Evaporative condensers intended for use with halocarbon refrigerants other than R-507A shall meet the minimum efficiency requirements listed in this table with R-507A as the test fluid.~~

TABLE C403.3.2(9)

MINIMUM EFFICIENCY AIR CONDITIONERS AND CONDENSING UNITS SERVING COMPUTER ROOMS

EQUIPMENT TYPE	NET SENSIBLE COOLING CAPACITY^a	MINIMUM SCOP-127^b EFFICIENCY DOWNFLOW UNITS / UPFLOW UNITS	TEST PROCEDURE
Air conditioners, air cooled	< 65,000 Btu/h	2.20 / 2.09	ANSI/ASHRAE
	≥ 65,000 Btu/h and < 240,000 Btu/h	2.10 / 1.99	
	≥ 240,000 Btu/h	1.90 / 1.79	
Air conditioners, water cooled	< 65,000 Btu/h	2.60 / 2.49	
	≥ 65,000 Btu/h and < 240,000 Btu/h	2.50 / 2.39	
	≥ 240,000 Btu/h	2.40 / 2.29	
Air conditioners, water cooled with fluid	< 65,000 Btu/h	2.55 / 2.44	
	≥ 65,000 Btu/h and < 240,000 Btu/h	2.45 / 2.34	

economizer			127
	$\geq 240,000$ Btu/h	2.35 / 2.24	
Air conditioners, glycol-cooled (rated at 40% propylene glycol)	$< 65,000$ Btu/h	2.50 / 2.39	
	$\geq 65,000$ Btu/h and $< 240,000$ Btu/h	2.15 / 2.04	
	$\geq 240,000$ Btu/h	2.10 / 1.99	
Air conditioners, glycol-cooled (rated at 40% propylene glycol) with fluid economizer	$< 65,000$ Btu/h	2.45 / 2.34	
	$\geq 65,000$ Btu/h and $< 240,000$ Btu/h	2.10 / 1.99	
	$\geq 240,000$ Btu/h	2.05 / 1.94	

For SI: 1 British thermal unit per hour = 0.2931 W.

- a. Net sensible cooling capacity: the total gross cooling capacity less the latent cooling less the energy to the air movement system. (Total Gross — latent — Fan Power).
- b. Sensible coefficient of performance (SCOP-127): a ratio calculated by dividing the net sensible cooling capacity in watts by the total power input in watts (excluding reheaters and humidifiers) at conditions defined in ASHRAE Standard 127. The net sensible cooling capacity is the gross sensible capacity minus the energy dissipated into the cooled space by the fan system.

TABLE C403.3.2(10)
HEAT TRANSFER EQUIPMENT

EQUIPMENT TYPE	SUBCATEGORY	MINIMUM EFFICIENCY	TEST PROCEDURE ^a
Liquid-to-liquid heat exchangers	Plate type	NR	AHRI 400

NR = No Requirement.

- a. Chapter 6 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.

C403.3.2.1 Water-cooled centrifugal chilling packages (Mandatory). Equipment not designed for operation at AHRI Standard 550/590 test conditions of 44°F (7°C) leaving chilled-water temperature and 2.4 gpm/ton evaporator fluid flow and 85°F (29°C) entering condenser water temperature with 3 gpm/ton (0.054 l/s • kW) condenser water flow shall have maximum full-load kW/ton (FL) and part-load ratings requirements adjusted using Equations 4-6 and 4-7.

$$FL_{adj} = FL/K_{adj}$$

(Equation 4-6)

$$PLV_{adj} = IPLV/K_{adj}$$

(Equation 4-7)

where:

$$K_{adj} = A \times B$$

FL = Full-load kW/ton value as specified
in ~~Table C403.3.2(7)~~ the tables in Section C403.3.2.

FL_{adj} = Maximum full-load kW/ton rating, adjusted for nonstandard conditions.

$IPLV$ = Value as specified in ~~Table C403.3.2(7)~~ the tables in Section C403.3.2.

PLV_{adj} = Maximum $NPLV$ rating, adjusted for nonstandard conditions.

$$A = 0.00000014592 \times (LIFT)^4 - 0.0000346496 \times (LIFT)^3 + 0.00314196 \times (LIFT)^2 - 0.147199 \times (LIFT) + 3.9302$$

$$B = 0.0015 \times L_{vg}E_{vap} + 0.934$$

$$LIFT = L_{vg}Cond - L_{vg}E_{vap}$$

$L_{vg}Cond$ = Full-load condenser leaving fluid temperature ($^{\circ}F$).

$L_{vg}Evap$ = Full-load evaporator leaving temperature ($^{\circ}F$).

The FL_{adj} and PLV_{adj} values are only applicable for centrifugal chillers meeting all of the following full-load design ranges:

1. Minimum evaporator leaving temperature: $36^{\circ}F$.
2. Maximum condenser leaving temperature: $115^{\circ}F$.
3. $20^{\circ}F \leq LIFT \leq 80^{\circ}F$.

C403.3.2.2 Positive displacement (air- and water-cooled) chilling packages. Equipment with a leaving fluid temperature higher than $32^{\circ}F$ ($0^{\circ}C$) and water-cooled positive displacement chilling packages with a condenser leaving fluid temperature below $115^{\circ}F$ ($46^{\circ}C$) shall meet the requirements of ~~Table C403.3.2(7)~~ the tables in Section C403.3.2. when tested or certified with water at standard rating conditions, in accordance with the referenced test procedure.

C403.5.5 Economizer fault detection and diagnostics (Mandatory). Air-cooled unitary direct-expansion units listed in ~~Tables C403.3.2(1) through C403.3.2(3)~~ the tables in Section C403.3.2. and variable refrigerant flow (VRF) units that are equipped with an economizer in accordance with Sections C403.5 through C403.5.4 shall include a fault detection and diagnostics system complying with the following:

1. The following temperature sensors shall be permanently installed to monitor system operation:
 - 1.1. Outside air.
 - 1.2. Supply air.
 - 1.3. Return air.
2. Temperature sensors shall have an accuracy of $\pm 2^{\circ}F$ ($1.1^{\circ}C$) over the range of $40^{\circ}F$ to $80^{\circ}F$ ($4^{\circ}C$ to $26.7^{\circ}C$).
3. Refrigerant pressure sensors, where used, shall have an accuracy of ± 3 percent of full scale.
4. The unit controller shall be configured to provide system status by indicating the following:
 - 4.1. Free cooling available.
 - 4.2. Economizer enabled.
 - 4.3. Compressor enabled.
 - 4.4. Heating enabled.
 - 4.5. Mixed air low limit cycle active.
 - 4.6. The current value of each sensor.
5. The unit controller shall be capable of manually initiating each operating mode so that the operation of compressors, economizers, fans and the heating system can be independently

- tested and verified.
6. The unit shall be configured to report faults to a fault management application available for access by day-to-day operating or service personnel, or annunciated locally on zone thermostats.
 7. The fault detection and diagnostics system shall be configured to detect the following faults:
 - 7.1. Air temperature sensor failure/fault.
 - 7.2. Not economizing when the unit should be economizing.
 - 7.3. Economizing when the unit should not be economizing.
 - 7.4. Damper not modulating.
 - 7.5. Excess outdoor air.

C403.9 Heat rejection equipment. Heat rejection equipment, including air-cooled condensers, dry coolers, open-circuit cooling towers, closed-circuit cooling towers and evaporative condensers, shall comply with this section.

Exception: Heat rejection devices where energy usage is included in the equipment efficiency ratings listed in ~~Tables C403.3.2(6) and C403.3.2(7)~~ the tables in Section C403.3.2.

C406.2 More efficient HVAC equipment performance. Equipment shall exceed the minimum efficiency requirements listed in ~~Tables C403.3.2(1) through C403.3.2(7)~~ the tables in Section C403.3.2 by 10 percent, in addition to the requirements of Section C403. Where multiple performance requirements are provided, the equipment shall exceed all requirements by 10 percent. *Variable refrigerant flow systems* shall exceed the energy efficiency provisions of ANSI/ASHRAE/IESNA 90.1 by 10 percent. Equipment not listed in Tables C403.3.2(1) through C403.3.2(7) shall be limited to 10 percent of the total building system capacity.

TABLE C407.5.1(1)
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

BUILDING COMPONENT CHARACTERISTICS	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Space use classification	Same as proposed	The space use classification shall be chosen in accordance with Table C405.5.2 for all areas of the building covered by this permit. Where the space use classification for a building is not known, the building shall be categorized as an office building.
Roofs	Type: Insulation entirely above deck	As proposed
	Gross area: same as proposed	As proposed
	U-factor: as specified in Table C402.1.4	As proposed
	Solar absorptance: 0.75	As proposed
	Emittance: 0.90	As proposed
Walls, above-grade	Type: Mass wall where proposed wall is mass; otherwise steel-framed wall	As proposed
	Gross area: same as proposed	As proposed
	U-factor: as specified in Table C402.1.4	As proposed

	Solar absorptance: 0.75	As proposed
	Emittance: 0.90	As proposed
Walls, below-grade	Type: Mass wall	As proposed
	Gross area: same as proposed	As proposed
	U-Factor: as specified in Table C402.1.4 with insulation layer on interiorside of walls	As proposed
Floors, above-grade	Type: joist/framed floor	As proposed
	Gross area: same as proposed	As proposed
	U-factor: as specified in Table C402.1.4	As proposed
Floors, slab-on-grade	Type: Unheated	As proposed
	F-factor: as specified in Table C402.1.4	As proposed
Opaque doors	Type: Swinging	As proposed
	Area: Same as proposed	As proposed
	U-factor: as specified in Table C402.1.4	As proposed
Vertical fenestration other than opaque doors	Area 1.The proposed vertical fenestration area; where the proposed vertical fenestration area is less than 40 percent of above-grade wall area. 2.40 percent of above-grade wall area; where the proposed vertical fenestration area is 40 percent or more of the above-grade wall area.	As proposed
	U-factor: as specified in Table C402.4	As proposed
	SHGC: as specified in Table C402.4 except that for climates with no requirement (NR) SHGC = 0.40 shall be used	As proposed
	External shading and PF: None	As proposed

Skylights	Area 1.The proposed skylight area; where the proposed skylight area is less than that permitted by Section C402.1. 2.The area permitted by Section C402.1; where the proposed skylight area exceeds that permitted by Section C402.1	As proposed
	U-factor: as specified in Table C402.4	As proposed
	SHGC: as specified in Table C402.4 except that for climates with no requirement (NR) SHGC = 0.40 shall be used.	As proposed
Lighting, interior	The interior lighting power shall be determined in accordance with Section C405.3.2. Where the occupancy of the building is not known, the lighting power density shall be 1.0 Watt per square foot (10.7 W/m ²) based on the categorization of buildings with unknown space classification as offices.	As proposed
Lighting, exterior	The lighting power shall be determined in accordance with Table C405.4.2(2) and C405.4.2(3). Areas and dimensions of surfaces shall be the same as proposed.	As proposed
Internal gains	Same as proposed	Receptacle, motor and process loads shall be modeled and estimated based on the space use classification. End-use load components within and associated with the building shall be modeled to include, but not be limited to, the following: exhaust fans, parking garage ventilation fans, exterior building lighting, swimming pool heaters and pumps, elevators, escalators, refrigeration equipment and cooking equipment.

Schedules	Same as proposed Exception: Thermostat settings and schedules for HVAC systems that utilize radiant heating, radiant cooling and elevated air speed, provided that equivalent levels of occupant thermal comfort are demonstrated by means of equal Standard Effective Temperature as calculated in Normative Appendix B of ASHRAE Standard 55.	Operating schedules shall include hourly profiles for daily operation and shall account for variations between weekdays, weekends, holidays and any seasonal operation. Schedules shall model the time-dependent variations in occupancy, illumination, receptacle loads, thermostat settings, mechanical ventilation, HVAC equipment availability, service hot water usage and any process loads. The schedules shall be typical of the proposed building type as determined by the designer and approved by the jurisdiction.
Mechanical ventilation	Same as proposed	As proposed, in accordance with Section C403.2.2.
Heating systems	Fuel type: same as proposed design	As proposed
	Equipment type ^a : as specified in Tables C407.5.1(2) and C407.5.1(3)	As proposed
	Efficiency: as specified in Tables C403.3.2(4) and C403.3.2(5) the tables in Section C403.3.2.	As proposed
	Capacity ^b : sized proportionally to the capacities in the proposed design based on sizing runs, and shall be established such that no smaller number of unmet heating load hours and no larger heating capacity safety factors are provided than in the proposed design.	As proposed
Cooling systems	Fuel type: same as proposed design	As proposed
	Equipment type ^c : as specified in Tables C407.5.1(2) and C407.5.1(3)	As proposed
	Efficiency: as specified in Tables C403.3.2(1), C403.3.2(2) and C403.3.2(3) the tables in Section C403.3.2	As proposed

	Capacity ^b : sized proportionally to the capacities in the proposed design based on sizing runs, and shall be established such that no smaller number of unmet cooling load hours and no larger cooling capacity safety factors are provided than in the proposed design.	As proposed
	Economizer ^d : same as proposed, in accordance with Section C403.5.	As proposed
Service water heating ^e	Fuel type: same as proposed	As proposed
	Efficiency: as specified in Table C404.2	For <i>Group R</i> , as proposed multiplied by SWHF. For other than <i>Group R</i> , as proposed multiplied by efficiency as provided by the manufacturer of the DWHR unit.
	Capacity: same as proposed	As proposed
	Where no service water hot water system exists or is specified in the proposed design, no service hot water heating shall be modeled.	

SWHF = Service water heat recovery factor, DWHR = Drain water heat recovery.

- a. Where no heating system exists or has been specified, the heating system shall be modeled as fossil fuel. The system characteristics shall be identical in both the standard reference design and proposed design.
- b. The ratio between the capacities used in the annual simulations and the capacities determined by sizing runs shall be the same for both the standard reference design and proposed design.
- c. Where no cooling system exists or no cooling system has been specified, the cooling system shall be modeled as an air-cooled single-zone system, one unit per thermal zone. The system characteristics shall be identical in both the standard reference design and proposed design.
- d. If an economizer is required in accordance with Table C403.5(1) and where no economizer exists or is specified in the proposed design, then a supply-air economizer shall be provided in the standard reference design in accordance with Section C403.5.
- e. The SWHF shall be applied as follows:
 1. Where potable water from the DWHR unit supplies not less than one shower and not greater than two showers, of which the drain water from the same showers flows through the DWHR unit then $SWHF = [1 - (DWHR \text{ unit efficiency} \cdot 0.36)]$.
 2. Where potable water from the DWHR unit supplies not less than three showers and not greater than four showers, of which the drain water from the same showers flows through the DWHR unit then $SWHF = [1 - (DWHR \text{ unit efficiency} \cdot 0.33)]$.
 3. Where potable water from the DWHR unit supplies not less than five showers and not greater than six showers, of which the drain water from the same showers flows through the DWHR unit, then $SWHF = [1 - (DWHR \text{ unit efficiency} \cdot 0.26)]$.
 4. Where Items 1 through 3 are not met, $SWHF = 1.0$.

C408.2.3.1 Equipment. Equipment functional performance testing shall demonstrate the installation and

operation of components, systems, and system-to-system interfacing relationships in accordance with approved plans and specifications such that operation, function, and maintenance serviceability for each of the commissioned systems is confirmed. Testing shall include all modes and *sequence of operation*, including under full-load, part-load and the following emergency conditions:

1. All modes as described in the *sequence of operation*.
2. Redundant or *automatic* back-up mode.
3. Performance of alarms.
4. Mode of operation upon a loss of power and restoration of power.

Exception: Unitary or packaged HVAC equipment listed in ~~Tables C403.3.2(1) through C403.3.2(3)~~ the tables in Section C403.3.2 that do not require supply air economizers.

Reason: *These tables have historically come from ASHRAE Standard 90.1. They all represent industry consensus, and are rarely, if ever, intended to be different than 90.1.*

During the last few code cycles, we have noticed that due to the processes, the tables tend to diverge. The reason for this is that public comments to the IECC are due before the final tables are developed and generated for 90.1. Typically, we find errata in the 90.1 tables when we are developing the print version of the standard. Due to timing, those corrections in 90.1 never make it into the IECC. By referencing these tables in 90.1, we ensure that the requirements are aligned. ASHRAE also recognizes that code officials want to have the tables in the book. If this proposal is accepted, ASHRAE has contacted ICC staff about the possibility of reprinting the necessary tables in the IECC as printed in 90.1.

This proposal intends to modify the code by extracting and reprinting the following Tables from ASHRAE Standard 90.1-2019:

Table 6.8.1-1 Electrically Operated Unitary Air Conditioners and Condensing Units—Minimum Efficiency Requirements

Table 6.8.1-2 Electrically Operated Air Cooled Unitary and Heat Pumps—Minimum Efficiency Requirements

Table 6.8.1-3 Water-Chilling Packages—Minimum Efficiency Requirements

Table 6.8.1-4 Electrically Operated Packaged Terminal Air Conditioners, Packaged Terminal Heat Pumps, Single-Package Vertical Air Conditioners, Single-Package Vertical Heat Pumps, Room Air Conditioners, and Room Air Conditioner Heat Pumps—Minimum Efficiency Requirements

Table 6.8.1-5 Warm-Air Furnaces and Combination Warm-

Air Furnaces/Air-Conditioning Units, Warm-Air Duct Furnaces, and Unit Heaters—Minimum *Efficiency* Requirements

Table 6.8.1-6 Gas- and Oil-Fired *Boilers*—Minimum *Efficiency* Requirements

Table 6.8.1-7 Performance Requirements for Heat Rejection Equipment—Minimum *Efficiency* Requirements

Table 6.8.1-8 Heat Transfer *Equipment*—Minimum *Efficiency* Requirements

Table 6.8.1-9 Electrically Operated Variable-Refrigerant-Flow Air Conditioners—Minimum *Efficiency* Requirements

Table 6.8.1-10 Electrically Operated Variable-Refrigerant-Flow and Applied Heat Pumps—Minimum *Efficiency* Requirements

Table 6.8.1-11 Floor Mounted Air Conditioners and *Condensing Units* Serving *Computer Rooms*—Minimum *Efficiency* Requirements

Table 6.8.1-13 Commercial Refrigerators, Freezers and Refrigeration—Minimum *Efficiency* Requirements

Table 6.8.1-14 Vapor Compression Based *Indoor Pool Dehumidifiers*—Minimum *Efficiency* Requirements

Table 6.8.1-15 Electrically Operated *DX-DOAS Units*, Single-Package and Remote Condenser, without *Energy Recovery*—Minimum *Efficiency* Requirements

Table 6.8.1-16 Electrically Operated *DX-DOAS Units*, Single-Package and Remote Condenser, with *Energy Recovery*—Minimum *Efficiency* Requirements

Table 6.8.1-17 Electrically Operated Water Source Heat

Pumps—Minimum *Efficiency* Requirements

Table 6.8.1-18 Heat Pump and Heat Reclaim Chiller Packages – Minimum Efficiency Requirements

Table 6.8.1-19 Ceiling Mounted Computer Room Air Conditioners—Minimum *Efficiency* Requirements

This proposal does add new tables for DOAS units, electrically operated water source heat pumps, heat pump and heat reclaim chiller packages, ceiling mounted computer room air conditioners, and commercial refrigerators and freezers that were previously not covered in the IECC.

The proposal includes six sections and a table which contain specific references to one or more individual tables in Section C403.3.2. In each of these the specific references are replaced by a generic reference to the tables in Section C403.3.2. It is our intent that any other sections which have a specific reference, that it will also be replaced by the generic reference.

Please note that replacement of the IECC tables will result in the following standards no longer being directly referenced in the IECC: AHRI 210/240, AHRI 340/360, AHRI 365, AHRI 390, AHRI 400, AHRI 460, AHRI 560, ANSI/AHAM RAC-1, ANSI Z21.47, ANSI Z83.8, ASHRAE 127, CTI ATC-105, CTI ATC 105S, CTI STD-201 RS, CTI ATC-106, CTI STD 201, ISO 13256-1, ISO 13256-2, UL727, UL731 and NAECA.

Bibliography: ANSI/ASHRAE/IES Standard 90.1

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Some efficiencies in 90.1 for various types of equipment have been changed, and there are some new efficiencies for products that were previously uncovered. In some of those instances, the cost of construction may increase.

Proposal # 4858

CE113-19

CE114-19

IECC: C403.3.3, C403.3.4

Proponent: David Collins, SEHPCAC, representing SEHPCAC (SEHPCAC@iccsafe.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Energy Conservation Code

Revise as follows:

C403.3.3 Hot gas bypass limitation (Mandatory). Cooling systems shall not use hot gas bypass or other evaporator pressure control systems unless the system is designed with multiple steps of unloading or continuous capacity modulation. The capacity of the hot gas bypass shall be limited as indicated in Table C403.3.3, as limited by Section C403.5.1.

C403.3.4 Boiler turndown (Mandatory). Boiler systems with design input of greater than 1,000,000 Btu/h (293 kW) shall comply with the turndown ratio specified in Table C403.3.4.

The system turndown requirement shall be met through the use of multiple single-input boilers, one or more modulating boilers or a combination of single-input and modulating boilers.

Reason:

While hot gas bypass limitations and boiler turn down are not technically impossible to model, it is generally considered infeasible to do so. Even if it were to be modeled verifying the assumptions used for the model would be virtually impossible. It is only theoretically tradable, and is not typically – if ever - traded by users of the performance path.

As essentially non-tradeable, C403.3.3 and C403.3.4 should be labeled as mandatory.

Note that SEHPCAC has a proposal to eliminate the use of the labels "prescriptive" and "mandatory" in favor of a tabular method of identifying non-tradeable requirements. If that proposal is successful ICC staff have stated that sections being individually approved to be labeled as 'mandatory' will instead have their respective section numbers added to the new C407.2 table of requirements that are non-tradeable in the performance path.

This proposal is submitted by the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at:

<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>

(<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>)

Cost Impact: The code change proposal will increase the cost of construction

As commonly interpreted, these items are already considered mandatory and would have no impact on cost. However, it may increase the cost of construction for a subset of buildings designed to comply with Section C407 that do not include the specified hot gas bypass limitations or boiler turndown provisions included in Section C403.3.3 and C403.3.4.

CE115-19 Part I

PART I — IECC: Part I: C403.4.1.1 (New)

IECC: Part II: R403.1.2(N1103.1.2) (New)

PART II — IECC: R403.1.2 (IRC N1103.1.2)

Proponent: Steven Rosenstock, Edison Electric Institute, representing Edison Electric Institute
(srosenstock@eei.org)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE.
PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER
FOR THESE COMMITTEES.

2018 International Energy Conservation Code

Add new text as follows:

C403.4.1.1 Heat pump supplemental heat (Mandatory). Heat pumps having supplemental electric resistance heat shall have controls that prevent supplemental heat operation where the heat pump vapor compression cycle can provide the necessary heating to satisfy the thermostat control.

Exceptions:

1. Defrost operation.
2. Vapor compression cycle malfunction.
3. Thermostat malfunction.

Proposal # 4115

CE115-19 Part I

CE115-19 Part II

IECC: R403.1.2 (IRC N1103.1.2)

Proponent: Steven Rosenstock, Edison Electric Institute, representing Edison Electric Institute
(srosenstock@eei.org)

2018 International Energy Conservation Code

Revise as follows:

R403.1.2 (IRC N1103.1.2) Heat pump supplementary supplemental heat (Mandatory). Heat pumps having supplementary supplemental electric-resistance heat shall have controls that, except during defrost, prevent supplemental heat operation when the heat pump compressor can meet the heating load. Vapor compression cycle can provide the necessary heating to satisfy the thermostat control.

Exceptions:

1. Defrost operation.
2. Vapor compression cycle heating malfunction.
3. Thermostat malfunction.

Reason: This proposal updates this requirement to account for real world operation of heat pumps. There are times when supplemental heat will be needed to be used apart from defrost operation. The reasons for the additional exceptions are as follows:

Vapor compression cycle heating malfunction. If the compressor or reversing valve or metering device (such as a capillary tube or thermal expansion valve) is not working properly, the current requirements do not allow supplemental heat to be used. As a result, the space will not be conditioned, and in extreme cases where the compressor is not fixed, the temperatures could fall to levels where unsafe situations (such as pipes freezing) could develop.

Thermostat malfunction. If the thermostat is not working properly, the current requirements do not allow supplemental heat to be used. As a result, the space may not be conditioned, and when the thermostat is repaired, supplemental heat may be needed in conjunction with the compressor and fan motor to get the space back to its programmed temperature in a short period of time.

It should also be noted that the national energy efficiency standards for residential heat pumps have increased significantly over the past 25 years, and will increase again in January, 2023. Also, with more heat pumps having "smart" technology, the system owner can be notified immediately on a smart phone or computer if such a malfunction is occurring, which will limit such operation.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This will not increase (or decrease) the cost of construction, as the exceptions shown are already aspects of current heat pump control strategies and will not increase the cost to purchase, install, or operate a heat pump.

Proposal # 4104

CE115-19 Part II

CE116-19 Part I

PART I — IECC: C403.4.1.1

PART II — IECC: R403.1.2 (IRC N1103.1.2)

Proponent: Charles Foster, representing self (cfoster20187@yahoo.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

Revise as follows:

C403.4.1.1 Heat pump supplementary heat (Mandatory). Heat pumps having supplementary electric resistance heat shall have controls that ~~-, except during defrost, prevent supplementary heat operation where the heat pump can provide the heating load-~~ limit supplemental heat operation to only those times when:

1. The vapor compression cycle cannot provide the necessary heating energy to satisfy the thermostat setting.
2. The heat pump is operating in defrost mode.
3. The vapor compression cycle malfunctions, or
4. The thermostat malfunctions.

Proposal # 4971

CE116-19 Part I

CE116-19 Part II

IECC: R403.1.2 (IRC N1103.1.2)

Proponent: Charles Foster, representing self (cfoster20187@yahoo.com)

2018 International Energy Conservation Code

Revise as follows:

R403.1.2 (IRC N1103.1.2) Heat pump supplementary heat (Mandatory). Heat pumps having supplementary electric-resistance heat shall have controls that ~~, except during defrost, prevent~~ limit supplemental heat operation to only those times when :

1. The vapor compression cycle cannot provide the necessary heating energy to satisfy the heat pump compressor can meet the heating load. thermostat setting.
2. The heat pump is operating in defrost mode.
3. The vapor compression cycle malfunctions. or
4. The thermostat malfunctions.

Reason: This proposal updates this requirement to account for real world operation of heat pumps. There are times when supplemental heat will be needed to be used apart from defrost operation. The reasons for the additional exceptions are as follows:

Vapor Compression cycle malfunction. If the compressor or reversing valve or metering device (such as a capillary tube or thermal expansion valve) is not working properly, the current requirements do not allow supplemental heat to be used. As a result, the space will not be conditioned, and in extreme cases where the compressor is not fixed, the temperatures could fall to levels where unsafe situations (such as pipes freezing) could develop.

Thermostat malfunction. If the thermostat is not working properly, the current requirements do not allow supplemental heat to be used. As a result, the space may not be conditioned, and when the thermostat is repaired, supplemental heat may be needed in conjunction with the compressor and fan motor to get the space back to its programmed temperature in a short period of time.

It should also be noted that the national energy efficiency standards for residential heat pumps have increased significantly over the past 25 years, and will increase again in January, 2023. Also, with more heat pumps having "smart" technology, the system owner can be notified immediately on a smart phone or computer if such a malfunction is occurring, which will limit such operation.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This will not increase (or decrease) the cost of construction, as the exceptions shown are already aspects of current heat pump control strategies and will not increase the cost to purchase, install, or operate a heat pump.

Proposal # 4979

CE116-19 Part II

CE117-19

IECC: C403.4.1.4

Proponent: donald sivigny, State of MN, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Energy Conservation Code

Revise as follows:

C403.4.1.4 Heated or cooled vestibules (Mandatory). The heating ~~system~~ for heated vestibules and air curtains with integral heating shall be provided with controls ~~configured~~ to shut off the source of heating when the outdoor air temperature is greater than 45°F (7°C) 60°F (16°C). Vestibule heating and cooling systems shall be controlled by a thermostat located in the vestibule configured to limit heating to a temperature not greater than 60°F (16°C) 68°F (20°C) and cooling to a temperature not less than 85°F (29°C).

Exception: Control of heating or cooling provided by site-recovered energy or transfer air that would otherwise be exhausted.

Reason: Why is the proposed code change needed?

Heated vestibules are important in Cold weather climates to provide the thermal separation between the indoors and outdoors. Shutting off the heat source at 45°F will mean that the vestibule temperature will drop to 45°F, which will cause problems with cold air entering the building when the vestibule doors are opened. These problems include causing cold conditions at reception areas of commercial office buildings.

Increasing the allowable controlled temperature within the vestibule provides a better thermal buffer when the doors are opened. With cold outdoor air conditions, the vestibules cool off very quickly when the doors are opened, especially if there is a wind blowing into the vestibule. Problems associated with vestibule in the winter are too low of temperatures and the proposed limitations will only make the problems greater.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code already requires the controls to operate the heating and cooling systems for vestibules so there are no additional materials or installation labor necessary. This is simply a change in thermostat set points to maintain reception areas and entrance areas to office buildings at a warmer temperature for those individuals working at or near building entrances. There will be a energy savings in colder climates because keeping this area at a warmer more comfortable temperature, negates the need for the individuals to place a small electric inefficient heater under the desk to stay warm. Less use of portable space heaters in a building will also reduce fire hazards.

Proposal # 5123

CE117-19

CE118-19

IECC: C403.4.1.4

Proponent: Ellen Eggerton, City of Alexandria, representing self (ellen.eggerton@alexandriava.gov)

2018 International Energy Conservation Code

Revise as follows:

C403.4.1.4 Heated or cooled vestibules (Mandatory). The heating system for heated vestibules and air curtains with integral heating shall be provided with controls configured to shut off the source of heating when the outdoor air temperature is greater than ~~45°F~~ 40°F (7°C). Vestibule heating ~~and cooling systems~~ shall be controlled by a thermostat located in the vestibule configured to limit heating to a temperature not greater than ~~60°F~~ 50°F (16°C 10°C) ~~and cooling to a temperature not less than 85°F (29°C)~~. Mechanical cooling of vestibules is prohibited.

Exception: Control of heating or cooling provided by site-recovered energy or transfer air that would otherwise be exhausted.

Reason: Vestibules are a transition from conditioned to unconditioned space. Vestibules only require freeze protection for sprinklers and maintaining door operations during cold weather. Cooling vestibules wastes cooling energy each time the outside outside doors open.

Better designed vestibules minimize the movement of air into the building by a design where the outside door starts to close as the inside door is opening other than during high traffic times or has a change in direction to reduce the flow of air infiltration of unconditioned air.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This change will not increase construction cost as thermostatic controls are already required. This change will reduce operating energy consumption.

Proposal # 5422

CE118-19

CE119-19

IECC: C403.4.2.1

Proponent: donald sivigny, State of MN, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Energy Conservation Code

Revise as follows:

C403.4.2.1 Thermostatic setback (Mandatory). Thermostatic setback controls shall be configured to set back or temporarily operate the system to maintain zone temperatures down to 55°F (13°C) or up to 85°F (29°C). Heating systems shall be configured with controls to automatically restart and temporarily operate the systems to maintain setback zone temperatures above the heating setpoint adjustable down to 55°F (13°C). Cooling systems shall be configured with controls to automatically restart and temporarily operate the system to maintain setback zone temperatures below a cooling setpoint adjustable up to 85°F (29°C) or to prevent excessive space humidity levels.

Exceptions:

1. Radiant floor and radiant ceiling heating systems.
2. Spaces where constant temperature conditions must be maintained.

Reason: Why is the proposed code change needed?

It clarifies the heating conditions and cooling conditions. It is important to control the humidity level in the summer. Radiant heating systems should not be reset because their thermal mass causes them to change conditions very slowly, which can be problematic towards maintaining comfort conditions in the occupied spaces

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code already requires the set back thermostat controls. so there are no additional materials or installation labor necessary. This code change simply clarifies heating and cooling conditions and control humidity levels in buildings. Latent Loads on a building will cause the systems to operate poorly resulting in more energy to reduce moist loads that make the building more comfortable for its occupants.

Proposal # 5067

CE119-19

CE120-19

IECC: C403.4.2.3

Proponent: Nicholas O'Neil, NW Energy Codes Group, representing NW Energy Codes Group
(noneil@energy350.com)

2018 International Energy Conservation Code

Revise as follows:

C403.4.2.3 Automatic start and stop (Mandatory). Automatic start and stop controls shall be provided for each HVAC system. The automatic start controls shall be configured to automatically adjust the daily start time of the HVAC system in order to bring each space to the desired occupied temperature immediately prior to scheduled occupancy. The automatic stop controls shall be configured to reduce the HVAC system's heating temperature setpoint and increase the cooling temperature setpoint by at least 2°F before scheduled unoccupied periods based upon the thermal lag and acceptable drift in space temperature that is within comfort limits.

Reason: The IECC currently requires Automatic Start but neglects to include Automatic Stop controls which can further reduce energy use with minimal cost. This feature has been commonplace on DDC and BMS control systems for many years and is now becoming commonplace with standalone building thermostats as well, making this feature a market-ready solution to further reduce energy costs. The primary economic impact is a reduction in energy consumption through the use of existing building controls. There is a direct benefit to the building owner, tenants, and businesses via a reduction in energy costs related to reduced cooling and heating loads.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Systems that include Automatic Start are capable of implementing Automatic Stop as well. The financial impact on construction is effectively zero as the additional labor to program the Automatic Stop control algorithm into a BMS or DDC system that is already required to have Automatic Start is minimal.

Proposal # 4929

CE120-19

CE121-19

IECC: C403.4.3.3.2

Proponent: Donald Sivigny, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Energy Conservation Code

C403.1.1 Calculation of heating and cooling loads. Design loads associated with heating, ventilating and air conditioning of the building shall be determined in accordance with ANSI/ASHRAE/ACCA Standard 183 or by an *approved* equivalent computational procedure using the design parameters specified in Chapter 3. Heating and cooling loads shall be adjusted to account for load reductions that are achieved where energy recovery systems are utilized in the HVAC system in accordance with the ASHRAE *HVAC Systems and Equipment Handbook* by an approved equivalent computational procedure.

Revise as follows:

C403.4.3.3.2 Heat rejection. The following shall apply to hydronic water loop heat pump systems in Climate Zones 3 through 8:

1. Where a closed-circuit cooling tower is used directly in the heat pump loop, either an automatic valve shall be installed to bypass the flow of water around the closed-circuit cooling tower, except for any flow necessary for freeze protection, or low-leakage positive-closure dampers shall be provided.
2. Where an open-circuit cooling tower is used directly in the heat pump loop, an automatic valve shall be installed to bypass all heat pump water flow around the open-circuit cooling tower.
3. Where an open-circuit or closed-circuit cooling tower is used in conjunction with a separate heat exchanger to isolate the open-circuit cooling tower from the heat pump loop, heat loss shall be controlled by shutting down the circulation pump on the cooling tower loop.

Exception: Where it can be demonstrated that a heat pump system will be required to reject heat throughout the year.

Reason: There may be installations where a closed-circuit cooling tower is used for the described purposes. The circulation pumps for the closed-circuit cooling tower should be treated the same as for the open-circuit cooling tower

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal may increase costs when closed circuit towers are used in conjunction with a separate heat exchanger, which is happening currently every day. We believe the intent of the original language was to include requirements for both open and closed-circuit towers but adding closed circuit was mistakenly left out of the code language. It makes sense to have the language for both open and closed in this specific case or use.

Proposal # 5122

CE121-19

CE122-19

IECC: C403.4.3.3.3

Proponent: donald sivigny, State of MN, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Energy Conservation Code

Revise as follows:

C403.4.3.3.3 Two-position valve. Each hydronic heat pump on the hydronic system having a total pump system power exceeding 10 hp (7.5 kW) shall have a two-position automatic valve interlocked to shut off the water flow when the compressor is off

Reason: 1. **Reason** Why is the proposed code change needed?

The two position valve needs to be an automatic valve to shut off when the heat pump compressor is off. It is also important to interlock with the compressor so that the compressor does not run unless the valve is open. This wording makes this section essentially the same as Section C403.4.3.3.3.

2. Why is the proposed code change a reasonable solution?

Because it is the correct method to install automatic valves in heat pump systems.

If the interlock is not installed correctly, there will be problems with heat pumps tripping out.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The two position valve is already required by the code. Typically, these valves are automatic so in most cases, no additional materials or installation labor are necessary. This proposal simply clarifies that they should be automatic to provide for the intended operation. These valves save on operational costs of the system by not running heat pumps when the pumps not needed. Proper interlocking reduces excess wear and tear on the pumps which adds longevity to the system.

Proposal # 5066

CE122-19

CE123-19

IECC: C403.5

Proponent: Joseph Hill, NYSDOS, representing NYSDOS (Joseph.Hill@dos.ny.gov); John Addario, New York State Department of State, representing New York State Department of State (john.addario@dos.ny.gov); Gina Bocra, representing New York City Department of Buildings (gbocra@buildings.nyc.gov)

2018 International Energy Conservation Code

Revise as follows:

C403.5 Economizers (Prescriptive). Economizers shall comply with Sections C403.5.1 through C403.5.5.

An air or water economizer shall be provided for the following cooling systems:

1. Chilled water systems with a total cooling capacity, less cooling capacity provided with air economizers, as specified in Table C403.5(1).
2. Individual fan systems with cooling capacity greater than or equal to 54,000 Btu/h (15.8 kW) ~~in buildings having~~ serving other than a ~~Group R occupancy~~ occupancies.
The total supply capacity of all fan cooling units not provided with economizers shall not exceed 20 percent of the total supply capacity of all fan cooling units in the building or 300,000 Btu/h (88 kW), whichever is greater.
3. Individual fan systems with cooling capacity greater than or equal to 270,000 Btu/h (79.1 kW) ~~in buildings having a~~ serving ~~Group R occupancy~~ occupancies. The total supply capacity of all fan cooling units not provided with economizers shall not exceed 20 percent of the total supply capacity of all fan cooling units in the building or 1,500,000 Btu/h (440 kW), whichever is greater.

Exceptions: Economizers are not required for the following systems.

1. Individual fan systems not served by chilled water for buildings located in *Climate Zones* 1A and 1B.
2. Where more than 25 percent of the air designed to be supplied by the system is to spaces that are designed to be humidified above 35°F (1.7°C) dew-point temperature to satisfy process needs.
3. Systems expected to operate less than 20 hours per week.
4. Systems serving supermarket areas with open refrigerated casework.
5. Where the cooling efficiency is greater than or equal to the efficiency requirements in Table C403.5(2).
6. Systems that include a heat recovery system in accordance with Section C403.9.5.

Reason: This change more correctly represents the intent of the code, which is specifically, the occupancy served by economizers.

Bibliography: 2018 IECC

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is a clarification only and will not effect the requirements of the energy code.

Proposal # 4872

CE123-19

CE124-19

IECC: C403.5

Proponent: Julius Ballanco, JB Engineering and Code Consulting, P.C., representing Daikin US (JBEngineer@aol.com)

2018 International Energy Conservation Code

Revise as follows:

C403.5 Economizers (Prescriptive). Economizers shall comply with Sections C403.5.1 through C403.5.5. An air or water economizer shall be provided for the following cooling systems:

1. Chilled water systems with a total cooling capacity, less cooling capacity provided with air economizers, as specified in Table C403.5(1).
2. Individual fan systems with cooling capacity greater than or equal to 54,000 Btu/h (15.8 kW) in buildings having other than a *Group R* occupancy. The total supply capacity of all fan cooling units not provided with economizers shall not exceed 20 percent of the total supply capacity of all fan cooling units in the building or 300,000 Btu/h (88 kW), whichever is greater.
3. Individual fan systems with cooling capacity greater than or equal to 270,000 Btu/h (79.1 kW) in buildings having a *Group R* occupancy. The total supply capacity of all fan cooling units not provided with economizers shall not exceed 20 percent of the total supply capacity of all fan cooling units in the building or 1,500,000 Btu/h (440 kW), whichever is greater.

Exceptions: Economizers are not required for the following systems.

1. Individual fan systems not served by chilled water for buildings located in *Climate Zones* 1A and 1B.
2. Where more than 25 percent of the air designed to be supplied by the system is to spaces that are designed to be humidified above 35°F (1.7°C) dew-point temperature to satisfy process needs.
3. Systems expected to operate less than 20 hours per week.
4. Systems serving supermarket areas with open refrigerated casework.
5. Where the cooling efficiency is greater than or equal to the efficiency requirements in Table C403.5(2).
6. Systems that include a heat recovery system in accordance with Section C403.9.5.
7. VRF systems installed with a dedicated outdoor air system.

Reason: VRF (variable refrigerant flow) systems are unique in that they rely on the heating and cooling of the air within a room of space. There is no massive installation of ducts to move air through a central air handling system. Outside air is provided by a dedicated outside air (DOA) system. This type of heating and cooling system does not lend itself to having an economizer. The DOA system would have to be completely oversized in order to accomplish cooling with outside air. That defeats the purpose of this highly efficient heating and cooling system.

An analysis was done comparing a VRF system with a DOA system to a typical roof top air handling unit having an economizer cycle. The two areas of the country analyzed were Chicago and Houston. The cooling energy use was compared since economizers provide cooling with outside air. The VRF with DOA used 45.5% less energy to cool a building in Chicago. For the same building in Houston, the VRF with DOA used 32.9% less energy than a rooftop unit.

This proves that a VRF system with a DOA system is more efficient than a standard rooftop unit with an

economizer cycle. The code should be modified to recognize this energy savings.

Cost Impact: The code change proposal will decrease the cost of construction

An economizer for a VRF system is very expensive since there would have to be oversizing of DOA ducts and a larger air handler for the DOA system.

Proposal # 5102

CE124-19

CE125-19

IECC: C403.6.5, C405.6.5.1(New)

Proponent: Connor Barbaree, representing ASHRAE (cbarbaree@ashrae.org)

2018 International Energy Conservation Code

Revise as follows:

C403.6.5 Supply-air temperature reset controls. Multiple-zone HVAC systems shall include controls that are capable of and configured to automatically reset the supply-air temperature in response to representative building loads, or to outdoor air temperature. The controls shall be configured to reset the supply air temperature not less than 25 percent of the difference between the design supply-air temperature and the design room air temperature. Controls that adjust the reset based on zone humidity are allowed in Climate Zones 0B, 1B, 2B, 3B, 3C and 4 through 8. HVAC zones that are expected to experience relatively constant loads, shall have maximum airflow designed to accommodate the fully reset supply air temperature.

Exceptions:

1. Systems that prevent reheating, recooling or mixing of heated and cooled supply air.
2. Seventy-five percent of the energy for reheating is from site-recovered or site-solar energy sources.
3. Systems in Climate Zones with peak supply air quantities of 300 cfm (142 L/s) or less: 0A, 1A, and 3A with less than 3000 cfm (1500 L/s) of design outside air.
4. Systems in Climate Zone 2A with less than 10,000 cfm (5000 L/s) of design outside air.
5. Systems in Climate Zones 0A, 1A, 2A, and 3A with not less than 80 percent outside air and employing exhaust air energy recovery complying with Section C403.7.4.

Add new text as follows:

C403.6.5.1 Dehumidification Control Interaction. In Climate Zones 0A, 1A, 2A, and 3A, the system design shall allow supply air temperature reset while dehumidification is provided. When dehumidification control is active, air economizers shall be locked out.

Reason: HVAC systems with simultaneous heating and cooling require supply air temperature (SAT) reset. However, in climate zones 0A through 3A the SAT reset is likely to be overridden during dehumidification conditions. In these climate zones, several system types can successfully dehumidify the outside air while still providing SAT reset and reducing reheat energy use. By providing specific requirements related to dehumidification control interaction, the requirement for concurrent SAT reset is clarified. Supply temperature reset saves significant heating energy in VAV reheat systems in high outside air systems, and that savings is higher in climate zone 3A than 2A, 1A and 0A. Separately dehumidifying the outside air reduces the total volume of air that must be cooled, significantly reducing cooling energy use in all the warm and humid climate zones.

An investigation using EnergyPlus of a system with a separate outside air coil for dehumidification for buildings with both 50% and 10% outside air using dual-max controlled VAV reheat boxes was conducted. It found that this approach was cost effective at or above 3000 cfm of outside air in climate zones 0A, 1A, and 3A. In climate zone 2A, cost effectiveness was found for systems with 10,000 cfm or more of outside air. In all but climate zone 2A both the low and high outside air cases were cost effective at or above 3000 cfm of outside air. In climate zone 2A, the low cfm case had a longer payback and did not meet the cost effective threshold at 3000 cfm, so the airflow threshold was increased for climate zone 2A to 10,000 cfm. The exception for zones with

less than 300 cfm (142 L/s) was removed, as costs relate to the main system outside airflow, not the zone airflow.

While the system with a separate outside air cooling coil proved cost effective, there are other allowed systems that may have lower costs that produce similar savings. These include: bypassing return air around the cooling coil, a dedicated outside air system, and series heat recovery. The revisions proposed improve coordination with ASHRAE Standard 90.1.

Bibliography: Addendum *ap* to ASHRAE standard 90.1-2016.

Cost Impact: The code change proposal will increase the cost of construction. The code change proposal may increase the cost of construction where a bypass or separate outside air cooling coil is added. An analysis found that the proposed changes in addendum *ap* to ASHRAE standard 90.1-2016—clearly requiring SAT reset in more climate zones—would be cost effective in line with the exceptions provided.

Proposal # 4916

CE125-19

CE126-19

IECC: C403.6.9

Proponent: donald sivigny, State of MN, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Energy Conservation Code

Revise as follows:

C403.6.9 Static pressure sensor location. Static pressure sensors used to control VAV fans shall be located such that the controller setpoint is not greater than 1.2 inches w.c. (299 Pa)–, except for systems with zone reset control complying with Section C403.6.8, Setpoints for direct digital control. Sensors shall be located in a position so the controller setpoint is optimized to maintain the minimum static pressure required for system operation throughout its range. Where this results in one or more sensors being located downstream of major duct splits, not less than one sensor shall be located on each major branch to ensure that static pressure can be maintained in each branch.

Reason: Determining where the system pressure does not exceed 1.2 inches could be difficult. When Section C403.6.9 is used, the setpoint is continually optimized, meaning that determining where the 1.2 inches is not exceeded becomes unnecessary,

Cost Impact: The code change proposal will decrease the cost of construction Where the system designer chooses a direct digital control system for control of VAVs, sensors are already an integral part of the system. Therefore , no additional materials or installation labor are necessary . The proposal simply clarifies the location for those sensors. The continual optimization of static pressure on the system reduces the energy usage of the building.

Proposal # 5115

CE126-19

CE127-19

IECC: C403.7.1

Proponent: Nicholas O'Neil, NW Energy Codes Group, representing NW Energy Codes Group
(noneil@energy350.com)

2018 International Energy Conservation Code

Revise as follows:

C403.7.1 Demand control ventilation (Mandatory). Demand control ventilation (DCV) shall be provided for all single-zone systems required to comply with Sections C403.5 through 403.5.3 and spaces larger than 500 square feet (46.5 m²) and with an average occupant load of 25 people or greater per 1,000 square feet (93 m²) of floor area, as established in Table 403.3.1.1 of the International Mechanical Code, and served by systems with one or more of the following:

1. An air-side economizer.
2. Automatic modulating control of the outdoor air damper.
3. A design outdoor airflow greater than 3,000 cfm (1416 L/s).

Exceptions:

1. Systems with energy recovery complying with Section C403.7.4.
2. Multiple-zone systems without direct digital control of individual zones communicating with a central control panel.
3. ~~Systems~~ Multiple-zone systems with a design outdoor airflow less than 1,200 cfm (566 L/s).
4. Spaces where the supply airflow rate minus any makeup or outgoing transfer air requirement is less than 1,200 cfm (566 L/s).
5. Ventilation provided only for process loads.

Reason: Many spaces are over-ventilated due to design professionals establishing ventilation rates based on peak design conditions that rarely exist on a daily basis. Substantial energy savings can be obtained even in low-occupancy areas through the implementation of DCV. CO₂ sensor costs have fallen in recent years making DCV on smaller sized units that already require economizers, (and therefore already have modulating dampers) more cost-effective than they have been in the past.

Cost Impact: The code change proposal will increase the cost of construction

A single CO₂ sensor in the return air duct of a single zone system is expected to cost less than \$300 and provides assurance that indoor air quality in smaller spaces will be maintained to safe CO₂ levels. Note that the requirement for installing DCV is only on units that are already required to have an economizer installed, which drastically reduces the cost of implementing DCV.

Proposal # 4935

CE127-19

CE128-19

IECC: C403.7.1

Proponent: Connor Barbaree, representing ASHRAE (cbarbaree@ashrae.org)

2018 International Energy Conservation Code

Revise as follows:

C403.7.1 Demand control ventilation (Mandatory). Demand control ventilation (DCV) shall be provided for spaces larger than 500 square feet (46.5 m²) and with an average occupant load of 25 people or greater per 1,000 square feet (93 m²) of floor area, as established in Table 403.3.1.1 of the International Mechanical Code, and served by systems with one or more of the following:

1. An air-side economizer.
2. Automatic modulating control of the outdoor air damper.
3. A design outdoor airflow greater than 3,000 cfm (1416 L/s).

Exceptions:

1. Systems with energy recovery complying with Section C403.7.4.
2. Multiple-zone systems without direct digital control of individual zones communicating with a central control panel.
3. Systems with a design outdoor airflow less than 1,200 cfm (566 L/s).
4. Spaces where more than 75 percent of the supply airflow rate minus any makeup or outgoing transfer air requirement is less than 1,200 cfm (566 L/s): space design outdoor airflow is required for makeup air that is exhausted from the space or transfer air that is required for makeup air that is exhausted from other spaces.
5. Spaces with one of the following occupancy classifications as defined in Table 403.3.1.1 of the *International Mechanical Code* : correctional cells, education laboratories, barber, beauty and nail salons, and bowling alley seating areas.
5. ~~Ventilation provided only for process loads.~~

Reason: The revisions to the DCV exceptions improve coordination with ASHRAE Standard 90.1-2013 and later. Based on improved availability of DCV controls at lower costs, the outdoor airflow exception was reduced from 1,200 cfm (566 L/s) to 750 cfm (375 L/s). The transfer air exception was changed from a fixed outside airflow amount to a percentage of outdoor air, to allow exceptions where the DCV control implementation would be difficult due to the large percentage of transfer or makeup air. The exception for ventilation for process loads would be covered by the percentage makeup air exception, so it was removed as redundant. In conjunction with the reduction of excepted spaces, certain spaces were identified where DCV would simply not work—bowling alley seating areas—or would not be appropriate to maintain adequate indoor air quality.

Bibliography: Addendum as to ASHRAE standard 90.1-2010. Available at:

<https://www.ashrae.org/File%20Library/Technical%20Resources/Standards%20and%20Guidelines/Standards%20/>

Cost Impact: The code change proposal will increase the cost of construction

The code change proposal will increase the cost of construction in cases where systems would have been exempt under the old exceptions; however, this is in the context of reduced cost of DCV controls as a result of more widespread use. In certain cases with a high percentage of makeup air or transfer air, the cost of construction will be reduced. An analysis found that the proposed changes in addendum as to ASHRAE standard 90.1-2010—requiring DCV in more spaces—would be cost effective in all climate zones.

CE129-19

IECC: C403.7.2

Proponent: Nicholas O'Neil, Energy 350, representing Energy 350 (noneil@energy350.com)

2018 International Energy Conservation Code

Revise as follows:

C403.7.2 Enclosed parking garage ventilation controls (Mandatory). Enclosed parking garages used for storing or handling automobiles operating under their own power shall employ ~~contamination-sensing devices~~ carbon monoxide detectors applied in conjunction with nitrogen dioxide detectors and automatic controls configured to stage fans or modulate fan average airflow rates to 50 percent or less of design capacity, or intermittently operate fans less than 20 percent of the occupied time or as required to maintain acceptable contaminant levels in accordance with International Mechanical Code provisions. Failure of contamination-sensing devices shall cause the exhaust fans to operate continuously at design airflow.

Exceptions:

1. Garages with a total exhaust capacity less than ~~22 8,500 000~~ 10 620 3 775 cfm (40 620 3 775 L/s) with ventilation systems that do not utilize heating or mechanical cooling and use occupant sensors to activate the full required ventilation rate.
2. Garages that have a garage area to ventilation system motor nameplate power ratio that exceeds 1125 cfm/hp (710 L/s/kW) and do not utilize heating or mechanical cooling.

Reason: The current threshold for exempting parking ventilation controls ignores a substantial percentage of the parking garage market that could benefit from reduced fan ventilation during times of low (or no) occupancy. The cost of fan system controls and sensors has fallen in recent years making ventilation controls on smaller sized garages more cost-effective than they have been in the past.

Cost Impact: The code change proposal will increase the cost of construction. The primary components required are sensors, controllers and fan variable frequency drives (VFDs). The cost for implementing this code requirement is estimated at \$400 per 1,000 square feet of parking garage, or \$0.40 per square foot. Additionally, the payback for this code proposal is less than 5 years and will be faster for larger garage sizes.

Proposal # 4932

CE129-19

CE130-19

IECC: C403.7.2.1(New), C403.7.2.2(New), C403.7.2.3(New)

Proponent: donald sivigny, State of MN, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Energy Conservation Code

SECTION C403 BUILDING MECHANICAL SYSTEMS

C403.7.2 Enclosed parking garage ventilation controls (Mandatory). Enclosed parking garages used for storing or handling automobiles operating under their own power shall employ contamination-sensing devices and automatic controls configured to stage fans or modulate fan average airflow rates to 50 percent or less of design capacity, or intermittently operate fans less than 20 percent of the occupied time or as required to maintain acceptable contaminant levels in accordance with International Mechanical Code provisions. Failure of contamination-sensing devices shall cause the exhaust fans to operate continuously at design airflow.

Exceptions:

1. Garages with a total exhaust capacity less than 22,500 cfm (10 620 L/s) with ventilation systems that do not utilize heating or mechanical cooling.
2. Garages that have a garage area to ventilation system motor nameplate power ratio that exceeds 1125 cfm/hp (710 L/s/kW) and do not utilize heating or mechanical cooling.

Add new text as follows:

403.7.2.1 Enclosed parking garages. Mechanical ventilation systems for enclosed parking garages shall automatically operate upon detection of certain gases. Parking garages must be equipped with carbon monoxide (CO) detection sensors that will activate the mechanical ventilation system upon detection of a CO level of 25 part per million (ppm) or greater. Parking garages must also be equipped with nitrogen dioxide (NO₂) detection sensors that will activate the mechanical ventilation system upon detection of a NO₂ level of 3 ppm or greater. Such detectors shall be listed in accordance with UL 2075 and installed in accordance with their listing and the manufacturers' instructions.

403.7.2.2 Minimum exhaust.

The mechanical ventilation system shall provide a minimum exhaust rate of 0.75 cfm per square foot [0.0038 m³/s-m²] of the floor area served.

403.7.2.3 Occupied spaces accessory to public garages. Connecting offices, elevator lobbies, waiting rooms, ticket booths and similar uses that are accessory to a public garage shall be maintained at a positive pressure and shall be provided with ventilation in accordance with Section 403.3.1.

Reason: Why is the proposed code change needed?

Experience has shown that it is unnecessary to continuously ventilate parking garages to maintain safe air quality conditions within, especially during periods of minimal or no vehicular activity, such as nights or weekends. Requiring continuous ventilation will create temperature conditions in the garage that are the same as the outdoors, which is not always desirable, especially during very cold outdoor conditions. Requiring CO and NO₂ sensors and control maintains safe conditions within the enclosed parking garages even with vehicular activity.

The proposed revisions are essentially the same as the current Minnesota requirements, which have been in

place for a long time and have worked well. Some language is clarified, and the UL standards for the CO and NO₂ sensors was added. It is important to identify the concentrations of these gases where the ventilation system is activated because the sensors have different settings.

Our existing code identifies the CO sensor requirements for parking garages containing gas fueled vehicles and NO₂ sensor requirements for garages containing diesel fueled vehicles. This proposed change requires both types of sensors to be required in all enclosed parking garages because there is no reasonable method of separating out garage service, and diesel vehicles are more common.

Why is the proposed code change a reasonable solution?

It brings forward and updates the existing requirements for enclosed parking garages.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code already requires the detection sensors therefore, no additional materials or installation labor are necessary. The proposal simply clarifies the necessary details about the sensor contaminate types and activation thresholds.

Proposal # 5117

CE130-19

CE131-19

IECC: C403.7.4

Proponent: Aaron Gary, representing Self (aaron.gary@texenergy.org)

2018 International Energy Conservation Code

Revise as follows:

C403.7.4 Energy recovery ventilation systems (Mandatory). Where the supply airflow rate of a fan system exceeds the values specified in Tables C403.7.4(1) and C403.7.4(2), the system shall include an energy recovery system. The energy recovery system shall be configured to provide a change in the enthalpy of the outdoor air supply of not less than 50 percent of the difference between the outdoor air and return air enthalpies, at design conditions. Where an air economizer is required, the energy recovery system shall include a bypass or controls that permit operation of the economizer as required by Section C403.5.

Exception: An energy recovery ventilation system shall not be required in any of the following conditions:

1. Where energy recovery systems are prohibited by the International Mechanical Code .
2. Laboratory fume hood systems that include not fewer than one of the following features:
 - 2.1. Variable-air-volume hood exhaust and room supply systems configured to reduce exhaust and makeup air volume to 50 percent or less of design values.
 - 2.2. Direct makeup (auxiliary) air supply equal to or greater than 75 percent of the exhaust rate, heated not warmer than 2°F (1.1°C) above room setpoint, cooled to not cooler than 3°F (1.7°C) below room setpoint, with no humidification added, and no simultaneous heating and cooling used for dehumidification control.
3. Systems serving spaces that are heated to less than 60°F (15.5°C) and that are not cooled.
4. Where more than 60 percent of the outdoor heating energy is provided from site-recovered or site-solar energy.
5. Heating energy recovery in *Climate Zones* 1 and 2.
6. Cooling energy recovery in *Climate Zones* 3C, 4C, 5B, 5C, 6B, 7 and 8.
7. Systems requiring dehumidification that employ energy recovery in series with the cooling coil.
8. Where the largest source of air exhausted at a single location at the building exterior is less than 75 percent of the design *outdoor air* flow rate.
9. Systems expected to operate less than 20 hours per week at the *outdoor air* percentage covered by Table C403.7.4(1).
10. Systems exhausting toxic, flammable, paint or corrosive fumes or dust.
11. Commercial kitchen hoods used for collecting and removing grease vapors and smoke.
12. Individual ventilation systems that serve an individual dwelling unit or sleeping unit.

Reason: This code change proposal increases the ease of use of the Code without changing the de facto requirements of this Mandatory provision. Individual ventilation systems that serve individual dwelling units are already not required to use Energy recovery ventilation systems based on the tables below. The math and logic to arrive at that answer can be difficult and confusing however. This exception then just pre-states when it already a reality is such a way to save the user of the Code time and effort in understanding and implementing to Code.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This code change proposal simplifies the understanding and implementation of Code without changing the underlying requirement.

CE132-19

IECC: C202 (New), C403.7.4, C403.7.4.1(New), C403.7.4.2(New)

Proponent: Mike Moore, Newport Ventures, representing Broan-NuTone (mmoore@newportventures.net)

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Add new definition as follows:

ENTHALPY RECOVERY RATIO. Change in the enthalpy of the outdoor air supply divided by the difference between the outdoor air and entering exhaust air enthalpy, expressed as a percentage.

Revise as follows:

~~C403.7.4 Energy recovery ventilation systems (Mandatory) systems.~~ ~~Where the supply airflow rate of a fan system exceeds the values specified in Tables C403.7.4(1) and C403.7.4(2), the system shall include an energy recovery system. The energy recovery system shall be configured to provide a change in the enthalpy of the outdoor air supply of not less than 50 percent of the difference between the outdoor air and return air enthalpies, at design conditions. Where an air economizer is required, the energy recovery system shall include a bypass or controls that permit operation of the economizer as required by Section C403.5. Energy recovery ventilation systems shall comply with Sections C403.7.4.1 and Section C403.7.4.2.~~

~~Exception: An energy recovery ventilation system shall not be required in any of the following conditions:~~

- ~~• 1. Where energy recovery systems are prohibited by the International Mechanical Code :~~
- ~~• 2. Laboratory fume hood systems that include not fewer than one of the following features:
 - ~~1. 2.1. Variable air volume hood exhaust and room supply systems configured to reduce exhaust and makeup air volume to 50 percent or less of design values.~~
 - ~~2. 2.2. Direct makeup (auxiliary) air supply equal to or greater than 75 percent of the exhaust rate, heated not warmer than 2°F (1.1°C) above room setpoint, cooled to not cooler than 3°F (1.7°C) below room setpoint, with no humidification added, and no simultaneous heating and cooling used for dehumidification control.~~~~
- ~~• 3. Systems serving spaces that are heated to less than 60°F (15.5°C) and that are not cooled.~~
- ~~• 4. Where more than 60 percent of the outdoor heating energy is provided from site-recovered or site-solar energy.~~
- ~~• 5. Heating energy recovery in *Climate Zones* 1 and 2.~~
- ~~• 6. Cooling energy recovery in *Climate Zones* 3C, 4C, 5B, 5C, 6B, 7 and 8.~~
- ~~• 7. Systems requiring dehumidification that employ energy recovery in series with the cooling coil.~~
- ~~• 8. Where the largest source of air exhausted at a single location at the building exterior is less than 75 percent of the design *outdoor air* flow rate.~~
- ~~• 9. Systems expected to operate less than 20 hours per week at the *outdoor air* percentage covered by Table C403.7.4(1).~~
- ~~• 10. Systems exhausting toxic, flammable, paint or corrosive fumes or dust.~~
- ~~• 11. Commercial kitchen hoods used for collecting and removing grease vapors and smoke.~~

Add new text as follows:

C403.7.4.1 Nontransient dwelling units (Prescriptive). Nontransient dwelling units shall be provided with outdoor air energy recovery ventilation systems with an enthalpy recovery ratio of not less than 50% at cooling design condition and not less than 60% at heating design condition.

Exceptions:

1. Nontransient dwelling units in Climate Zone 3C.

2. Nontransient dwelling units with no more than 500 ft² of conditioned floor area in Climate Zones 0, 1, 2, 3, 4C, and 5C.

3. Enthalpy recovery ratio requirements at heating design condition in Climate Zones 0, 1, and 2.

4. Enthalpy recovery ratio requirements at cooling design condition in Climate Zones 4, 5, 6, 7, and 8.

C403.7.3.2 Spaces other than nontransient dwelling units (Mandatory). Where the supply airflow rate of a fan system serving a space other than a nontransient dwelling unit exceeds the values specified in Tables C403.7.4(1) and C403.7.4(2), the system shall include an energy recovery system. The energy recovery system shall provide an enthalpy recovery ratio of not less than 50 percent at design conditions. Where an air economizer is required, the energy recovery system shall include a bypass or controls that permit operation of the economizer as required by Section C403.5.

Exception: An energy recovery ventilation system shall not be required in any of the following conditions:

1. Where energy recovery systems are prohibited by the International Mechanical Code .
2. Laboratory fume hood systems that include not fewer than one of the following features:
 - 2.1. Variable-air-volume hood exhaust and room supply systems configured to reduce exhaust and makeup air volume to 50 percent or less of design values.
 - 2.2. Direct makeup (auxiliary) air supply equal to or greater than 75 percent of the exhaust rate, heated not warmer than 2°F (1.1°C) above room setpoint, cooled to not cooler than 3°F (1.7°C) below room setpoint, with no humidification added, and no simultaneous heating and cooling used for dehumidification control.
3. Systems serving spaces that are heated to less than 60°F (15.5°C) and that are not cooled.
4. Where more than 60 percent of the outdoor heating energy is provided from site-recovered or site-solar energy.
5. Enthalpy recovery ratio requirements in Climate Zones 1 and 2.
6. Enthalpy recovery ratio requirements in Climate Zones 3C, 4C, 5B, 5C, 6B, 7 and 8.
7. Systems requiring dehumidification that employ energy recovery in series with the cooling coil.
8. Where the largest source of air exhausted at a single location at the building exterior is less than 75 percent of the design outdoor air flow rate.
9. Systems expected to operate less than 20 hours per week at the outdoor air percentage covered by Table C403.7.4(1).
10. Systems exhausting toxic, flammable, paint or corrosive fumes or dust.
11. Commercial kitchen hoods used for collecting and removing grease vapors and smoke.

Reason: This proposal aligns ASHRAE 90.1 and the IECC requirements for energy recovery ventilation systems by:

1) Changing the specification of heat and energy recovery ventilation systems (H/ERVs) for nontransient* dwelling units from Mandatory to Prescriptive, and

2) Adding minimum prescriptive path requirements for nontransient* dwelling unit H/ERVs in the prescriptive path, where cost effective.

*Based on the IBC definition of “transient”, “nontransient” dwelling units are those that are occupied for more than 30 days; this term carries the same meaning as used in Section 310 of the 2018 IBC.

Prior to the publication of addendum ay to ASHRAE 90.1-2017, both 90.1 and IECC Section C403.7.4 contained energy recovery ventilation requirements that were developed without consideration given for dwelling units within the scope of 90.1 and the IECC. In an effort to develop rational energy recovery ventilation requirements for nontransient dwelling units, 90.1 considered building energy simulations that were conducted on a nominal 1000 ft², 2-bedroom apartment in compliance with the prescriptive path of 90.1 across all climate zones. Four ventilation systems were evaluated for outdoor air: exhaust-only, dedicated supply, central fan integrated supply, and balanced with energy recovery. Ventilation rates were set in accordance with the minimum permitted by ASHRAE 62.2 (comparable to 2018 IMC minimum requirements for mechanical ventilation of high-rise dwelling units). Simulations were run in EnergyPlus. A list of detailed inputs and outputs is also provided in a separate Excel file, with a narrative available in a PowerPoint document. The simulations and accompanying economic analysis resulted in a very favorable scalar ratio (ASHRAE 90.1’s metric for cost effectiveness**) for dwelling unit energy recovery ventilation systems in all climate zones except for 3C for typical dwelling units and except for climate zones 0B, 1, 2, 3, 4C, and 5C for small dwelling units (i.e., no more than 500 ft²). Additionally, the proposal exempts all dwelling units in climate zones 0, 1, 2, and 3C from heating energy recovery requirements and climate zones 3C, 4, 5, 6, 7, and 8 from cooling energy recovery requirements based on insignificant energy savings. This proposal to the IECC mirrors what was vetted and developed over several months by ASHRAE Technical Committee TC5.5 prior to submitting to the 90.1 Mechanical Subcommittee and ultimately approved as addendum ay by the full 90.1 committee.

**A “favorable scalar” is 12.5 or less for heat exchangers with an expected life of 15 years. The economic analysis behind 90.1 addendum ay and this proposal showed an average scalar of 2.9 for the 1008 ft² apartment across all climate zones, and an average of 9.3 for the 500 ft² apartment across all climate zones but the exempted climate zones 0, 1, 2, 3, 4C, and 5C.

For an overview of ASHRAE 90.1’s economic model and the scalar method, a presentation summarizing the building energy simulations supporting ASHRAE 90.1 addendum ay and this proposal, and an Excel workbook with the building energy simulation inputs, results, and economic analysis, see this link:
<https://www.dropbox.com/sh/tbjpbqyz2tccqlk/AADJUnPOlwumQVcJJeVGjsNoa?dl=0>.

Bibliography: For an overview of ASHRAE 90.1’s economic model and the scalar method, a presentation summarizing the building energy simulations supporting ASHRAE 90.1 addendum ay and this proposal, and an Excel workbook with the building energy simulation inputs, results, and economic analysis, see this link:
<https://www.dropbox.com/sh/tbjpbqyz2tccqlk/AADJUnPOlwumQVcJJeVGjsNoa?dl=0>.

Cost Impact: The code change proposal will increase the cost of construction. By moving the requirement for nontransient dwelling unit H/ERVs from the Mandatory path to the Prescriptive path, first costs may be reduced for some projects where H/ERVs are currently mandated. For other projects that are not currently required to have H/ERVs in the prescriptive path, would not normally install H/ERVs, and for which this proposal introduces new prescriptive path requirements, the first could increase. As explained in the rationale, however, where new requirements are introduced by this proposal, they have been vetted by ASHRAE 90.1 and shown to be cost effective based on energy savings over the useful life of the equipment. A detailed explanation of costs and benefits associated with this proposal can be found with this link:
<https://www.dropbox.com/sh/tbjpbqyz2tccqlk/AADJUnPOlwumQVcJJeVGjsNoa?dl=0>.

CE133-19

IECC: SECTION C202 (New), C403.7.4, C403.7.4.1(New), C403.7.4.2(New)

Proponent: Connor Barbaree, representing ASHRAE (cbarbaree@ashrae.org)

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Add new definition as follows:

ENTHALPY RECOVERY RATIO. Change in the enthalpy of the outdoor air supply divided by the difference between the outdoor air and entering exhaust air enthalpy, expressed as a percentage.

Add new text as follows:

C403.7.4 Energy Recovery Systems. Energy recovery ventilation systems shall be provided as specified in either Section 403.7.1 or 403.7.2, as applicable.

C403.7.4.1 Nontransient dwelling units (Prescriptive). Nontransient dwelling units shall be provided with outdoor air energy recovery ventilation systems with an enthalpy recovery ratio of not less than 50 percent at cooling design condition and not less than 60 percent at heating design condition.

Exceptions:

1. Nontransient dwelling units in Climate Zone 3C.
2. Nontransient dwelling units with no more than 500 square feet (46 m²) of conditioned floor area in Climate Zones 0, 1, 2, 3, 4C, and 5C.
3. Enthalpy recovery ratio requirements at heating design condition in Climate Zones 0, 1, and 2.
4. Enthalpy recovery ratio requirements at cooling design condition in Climate Zones 4, 5, 6, 7, and 8.

Revise as follows:

~~**C403.7.4 C403.7.4.2 Energy recovery ventilation systems Spaces other than nontransient dwelling units (Mandatory).**~~ Where the supply airflow rate of a fan system serving a space other than a nontransient dwelling unit exceeds the values specified in Tables C403.7.4(1) and C403.7.4(2), the system shall include an energy recovery system. The energy recovery system shall be configured to provide a change in the enthalpy of the outdoor air supply provide an enthalpy recovery ratio of not less than 50 percent of the difference between the outdoor air and return air enthalpies, at design conditions. Where an air economizer is required, the energy recovery system shall include a bypass or controls that permit operation of the economizer as required by Section C403.5.

Exception: An energy recovery ventilation system shall not be required in any of the following conditions:

1. Where energy recovery systems are prohibited by the International Mechanical Code .
2. Laboratory fume hood systems that include not fewer than one of the following features:
 - 2.1. Variable-air-volume hood exhaust and room supply systems configured to reduce exhaust and makeup air volume to 50 percent or less of design values.

- 2.2. Direct makeup (auxiliary) air supply equal to or greater than 75 percent of the exhaust rate, heated not warmer than 2°F (1.1°C) above room setpoint, cooled to not cooler than 3°F (1.7°C) below room setpoint, with no humidification added, and no simultaneous heating and cooling used for dehumidification control.
3. Systems serving spaces that are heated to less than 60°F (15.5°C) and that are not cooled.
4. Where more than 60 percent of the outdoor heating energy is provided from site-recovered or site-solar energy.
5. ~~Heating energy-Enthalpy recovery ratio requirements~~ in Climate Zones 0, 1 and 2.
6. ~~Cooling energy-Enthalpy recovery ratio requirements~~ in Climate Zones 3C, 4C, 5B, 5C, 6B, 7 and 8.
7. Systems requiring dehumidification that employ energy recovery in series with the cooling coil.
8. Where the largest source of air exhausted at a single location at the building exterior is less than 75 percent of the design outdoor air flow rate.
9. Systems expected to operate less than 20 hours per week at the outdoor air percentage covered by Table C403.7.4(1).
10. Systems exhausting toxic, flammable, paint or corrosive fumes or dust.
11. Commercial kitchen hoods used for collecting and removing grease vapors and smoke.

Reason: This proposal aligns ASHRAE 90.1 and the IECC requirements for energy recovery ventilation systems by:

- 1) Changing the specification of energy recovery ventilation systems from Mandatory to Prescriptive, and
- 2) Adding minimum prescriptive path requirements for nontransient* dwelling unit H/ERVs in the prescriptive path, where cost effective.

*Based on the IBC definition of “transient”, “nontransient” dwelling units are those that are occupied for more than 30 days; this term carries the same meaning as used in Section 310 of the 2018 IBC.

Prior to the publication of addendum ay to ASHRAE 90.1-2017, both 90.1 and IECC Section C403.7.4 contained energy recovery ventilation requirements that were developed without consideration given for dwelling units within the scope of 90.1 and the IECC. In an effort to develop rational energy recovery ventilation requirements for nontransient dwelling units, 90.1 considered building energy simulations that were conducted on a nominal 1000 ft², 2-bedroom apartment in compliance with the prescriptive path of 90.1 across all climate zones. Four ventilation systems were evaluated for outdoor air: exhaust-only, dedicated supply, central fan integrated supply, and balanced with energy recovery. Ventilation rates were set in accordance with the minimum permitted by ASHRAE 62.2 (comparable to 2018 IMC minimum requirements for mechanical ventilation of high-rise dwelling units). Simulations were run in EnergyPlus. A list of detailed inputs and outputs is also provided in a separate Excel file, with a narrative available in a PowerPoint document. The simulations and accompanying economic analysis resulted in a very favorable scalar ratio (ASHRAE 90.1’s metric for cost effectiveness**) for dwelling unit energy recovery ventilation systems in all climate zones except for 3C for typical dwelling units and except for climate zones 0B, 1, 2, 3, 4C, and 5C for small dwelling units (i.e., no more than 500 ft²). Additionally, the proposal exempts all dwelling units in climate zones 0, 1, 2, and 3C from heating energy recovery requirements and climate zones 3C, 4, 5, 6, 7, and 8 from cooling energy recovery requirements based on insignificant savings. This proposal to the IECC mirrors what was vetted and developed over several months by ASHRAE Technical Committee TC5.5 prior to submitting to the 90.1 Mechanical Subcommittee and ultimately approved as addendum ay by the full 90.1 committee.

**A “favorable scalar” is 12.5 or less for heat exchangers with an expected life of 15 years. The economic analysis behind 90.1 addendum ay and this proposal showed an average scalar of 2.9 for the 1008 ft² apartment across all climate zones, and an average of 9.3 for the 500 ft² apartment across all climate zones but

the exempted climate zones 0, 1, 2, 3, 4C, and 5C.

For an overview of ASHRAE 90.1's economic model and the scalar method, a presentation summarizing the building energy simulations supporting ASHRAE 90.1 addendum ay and this proposal, and an Excel workbook with the building energy simulation inputs, results, and economic analysis, see this link:
<https://www.dropbox.com/sh/tbjpbqyz2tccqIk/AADJUnPOlwumQVcJJeVGjsNoa?dl=0>.

Bibliography: Addendum AY to 90.1-2016.

Cost Impact: The code change proposal will increase the cost of construction. By moving the requirement for H/ERVs from the Mandatory path to the Prescriptive path, first costs may be reduced for some projects. For other projects that are not currently required to have H/ERVs in the prescriptive path, would not normally install H/ERVs, and for which this proposal introduces new prescriptive path requirements, the first cost will increase. As explained in the rationale, however, where new requirements are introduced by this proposal, they have been vetted by ASHRAE 90.1 and shown to be cost effective based on energy savings over the useful life of the equipment and a favorable scalar ratio. A detailed explanation of costs and benefits associated with this proposal can be found with this link:
<https://www.dropbox.com/sh/tbjpbqyz2tccqIk/AADJUnPOlwumQVcJJeVGjsNoa?dl=0>.

Proposal # 4865

CE133-19

CE134-19

IECC: C403.7.5 (New), TABLE C403.7.5 (New)

Proponent: Guy McMann, Jefferson County, Colorado, representing Colorado Association of Plumbing and Mechanical Officials (CAPMO) (gmcmann@jeffco.us)

2018 International Energy Conservation Code

Delete without substitution:

~~**C403.7.5 Kitchen exhaust systems (Mandatory).** Replacement air introduced directly into the exhaust hood cavity shall not be greater than 10 percent of the hood exhaust airflow rate. Conditioned supply air delivered to any space shall not exceed the greater of the following:~~

- ~~1. The ventilation rate required to meet the space heating or cooling load.~~
- ~~2. The hood exhaust flow minus the available transfer air from adjacent space where available transfer air is considered to be that portion of outdoor ventilation air not required to satisfy other exhaust needs, such as restrooms, and not required to maintain pressurization of adjacent spaces.~~

~~Where total kitchen hood exhaust airflow rate is greater than 5,000 cfm (2360 L/s), each hood shall be a factory-built commercial exhaust hood listed by a nationally recognized testing laboratory in compliance with UL 710. Each hood shall have a maximum exhaust rate as specified in Table C403.7.5 and shall comply with one of the following:~~

- ~~1. Not less than 50 percent of all replacement air shall be transfer air that would otherwise be exhausted.~~
- ~~2. Demand ventilation systems on not less than 75 percent of the exhaust air that are configured to provide not less than a 50 percent reduction in exhaust and replacement air system airflow rates, including controls necessary to modulate airflow in response to appliance operation and to maintain full capture and containment of smoke, effluent and combustion products during cooking and idle.~~
- ~~3. Listed energy recovery devices with a sensible heat recovery effectiveness of not less than 40 percent on not less than 50 percent of the total exhaust airflow.~~

~~Where a single hood, or hood section, is installed over appliances with different duty ratings, the maximum allowable flow rate for the hood or hood section shall be based on the requirements for the highest appliance duty rating under the hood or hood section.~~

Exception: ~~Where not less than 75 percent of all the replacement air is transfer air that would otherwise be exhausted.~~

**TABLE C403.7.5
MAXIMUM NET EXHAUST FLOW RATE, CFM PER LINEAR FOOT OF HOOD LENGTH**

TYPE OF HOOD	LIGHT-DUTY EQUIPMENT	MEDIUM-DUTY EQUIPMENT	HEAVY-DUTY EQUIPMENT	EXTRA-HEAVY-DUTY EQUIPMENT
Wall-mounted canopy	140	210	280	385
Single-island	280	350	420	490

Double island (per side)	175	210	280	385
Eyebrow	175	175	NA	NA
Backshelf/Pass- over	210	210	280	NA

For SI: 1 cfm = 0.4719 L/s; 1 foot = 305 mm.

NA = Not Allowed.

Reason: These sections are inconsistent with the IMC and was never coordinated for the last two cycles. This requirement is also a job killer in that non-710 hoods over 5000 cfm can no longer be constructed where the IMC still permits it. This does nothing to help the economy whatsoever. This has created a tremendous conflict between the two codes. The unintended consequence is that it results in the inability to re-locate a non-710 hood over 5000 cfm to a new location even though it was lawfully installed at the time. Whats the logic in tossing a perfectly good system and having to spend thousands of dollars to replace it. The table is already in the IMC where it belongs and not in the IECC. Yes a 710 hood moves less air than a non-listed hood but the savings will never be realized if a new system has to be employed. This will eliminate the ability to build a custom hood if a designer so chose to do so. The cost of this code section presents an unfair burden on the owners. This subject matter belongs in the IMC, not the IECC.

Cost Impact: The code change proposal will decrease the cost of construction
Not having to toss a perfectly good system will decrease cost.

Proposal # 4119

CE134-19

CE135-19

IECC: SECTION C202, C403.7.6.1, C403.7.6.2

Proponent: Connor Barbaree, representing ASHRAE (cbarbaree@ashrae.org)

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Revise as follows:

NETWORKED GUESTROOM CONTROL SYSTEM. A control system, accessible from the front desk or other central location associated with a *Group R-1* building, that is capable of identifying the ~~occupancy~~ rented and unrented status of each guestroom according to a timed schedule, and is capable of controlling HVAC in each hotel and motel guestroom separately.

C403.7.6 Automatic control of HVAC systems serving guestrooms (Mandatory). In *Group R-1* buildings containing more than 50 guestrooms, each guestroom shall be provided with controls complying with the provisions of Sections C403.7.6.1 and C403.7.6.2. Card key controls comply with these requirements.

C403.7.6.1 Temperature setpoint controls. Controls shall be provided on each HVAC system that are capable of and configured with three modes of temperature control.

1. When the guest room is rented but unoccupied, the controls shall ~~to~~ automatically raise the cooling setpoint and lower the heating setpoint by not less than 4°F (2°C) from the occupant setpoint within 30 minutes after the occupants have left the guestroom.
2. When the guest room is unrented and unoccupied, the controls shall ~~The controls shall be capable of and configured to~~ automatically raise the cooling setpoint to not lower than 80°F (27°C) and lower the heating setpoint to not higher than 60°F (16°C) ~~when the guestroom is unrented or has not been continuously occupied for more than 16 hours or~~ . Unrented and unoccupied guest room mode shall be initiated within 16 hours of the guest room being continuously occupied or where a networked guestroom control system indicates that the guestroom is unrented and the guestroom is unoccupied for more than 30 20 minutes. A networked guestroom control system that is capable of returning the thermostat setpoints to default occupied setpoints 60 minutes prior to the time a guestroom is scheduled to be occupied is not precluded by this section. Cooling that is capable of limiting relative humidity with a setpoint not lower than 65-percent relative humidity during unoccupied periods is not precluded by this section.
3. When the guest room is occupied, HVAC set points shall return to their occupied set points once occupancy is sensed.

C403.7.6.2 Ventilation controls. Controls shall be provided on each HVAC system that are capable of and configured to automatically turn off the ventilation and exhaust fans within ~~30 20~~ minutes of the occupants leaving the guestroom, or *isolation devices* shall be provided to each guestroom that are capable of automatically shutting off the supply of outdoor air to and exhaust air from the guestroom.

Exception: Guestroom ventilation systems are not precluded from having an automatic daily pre-occupancy purge cycle that provides daily outdoor air ventilation during unrented periods at the design ventilation rate for 60 minutes, or at a rate and duration equivalent to one air change.

Reason: This addendum contains minor changes to language for clarification. Original language could be interpreted to allow room lighting and HVAC to resume after 30 minutes of unoccupied and unrented condition. Changes include:

1. The guest room temperature controls subsection is reorganized to clarify that there are three distinct modes of operation.
2. The definition of networked guest room control system is modified to be consistent with the requirements.
3. The time-out period for unoccupied indication is changed from 30 minutes to 20 minutes for consistency between HVAC and the lighting control in Section C405.2.1.1.

Bibliography: Addendum *k* to ASHRAE standard 90.1-2016

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code change proposal will not increase the cost of construction. The language changes are intended to be clarifications only.

Proposal # 4898

CE135-19

CE136-19

IECC: SECTION C202 (New), C403.8.2

Proponent: Connor Barbaree, representing ASHRAE (cbarbaree@ashrae.org)

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Add new definition as follows:

FAN NAMEPLATE ELECTRICAL INPUT POWER. The nominal electrical input power rating stamped on a fan assembly nameplate.

Revise as follows:

C403.8.2 Motor nameplate horsepower (Mandatory). For each fan, the fan brake horsepower shall be indicated on the construction documents and the selected motor shall be not larger than the first available motor size greater than the following:

1. For fans less than 6 bhp (~~4413~~ 4476 W), 1.5 times the fan brake horsepower.
2. For fans 6 bhp (~~4413~~ 4476 W) and larger, 1.3 times the fan brake horsepower.

Exception Exceptions:

1. Fans equipped with electronic speed control devices to vary the fan airflow as a function of load
2. Fans with a fan nameplate electrical input power of less than .89 kW.
3. Systems complying with Section C403.8.1 fan system motor nameplate hp (Option 1).
4. Fans with motor nameplate horsepower less than 1 hp (746 W) ~~are exempt from this section.~~

Reason: 1. This proposal corrects an IP / SI conversion error related to shaft power: 6 bhp equals 4476 W mechanical power.

2. It proposes moving the clause about *fan system motor nameplate* into the exceptions section for better clarity.

3. This proposal increases the design options for load-matching variable-speed fan motors, accommodates new motor and drive technologies, and it simplifies the motor selection criteria for fans.

Only motors that are government regulated in terms of test procedure and labeling have verifiable output power rating on the nameplates. None-covered motor types that are common for fans are air-over rated motors and electronically commutated permanent magnet motors. All other advanced motor topologies also prevent straight-forward motor output power ratings.

Related ASHRAE 90.1 interpretations are 90.1-2013-11 and 90.1-2016-3 of January 29, 2017, 90.1-2013-13 of June 25, 2017.

Even the nameplate output power rating of government regulated motors is irrelevant when the fan design duty

requires variable frequency drive operation below 60 Hz. Then the motor horsepower must be oversized to deliver the required torque.

AC induction motors operated with variable frequency drives maintain high efficiency at part load. Permanent magnet fan motors maintain even higher efficiency. For all so-called power drive applications exists a self-regulating effect because of the higher marginal cost of oversized combinations of drives and motors as opposed to oversized induction motors for across-the-line operation. The existing restriction of motor selections provides no benefits in the case of fans with electronic variable-speed controls.

Small fans especially are often supplied strictly with electrical input power ratings rather than motor output power ratings. A lower limit expressed in electrical input power is therefore needed. The original 1 hp motor nameplate output power limit equates to 0.89 kW electrical motor input power according to the reference motor in ANSI/AMCA 208.

Bibliography:

- ANSI/AMCA 208 Calculation of the Fan Energy Index
https://www.techstreet.com/standards/amca-208-18?product_id=2004773
Courtesy copy available for the IECC committee through AMCA.
- The term “power drive system” is established in IEC 61800 and in ANSI/ASHRAE standard 222.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. It removes restrictions for fan selections with electronic power drive systems such as variable frequency drives and electronically committed motors.

Proposal # 4869

CE136-19

CE137-19

IECC: (New), C403.8.3, AMCA Chapter 06 (New)

Proponent: Amanda Hickman, The Hickman Group, representing AMCA International
(amanda@thehickmangroup.com)

2018 International Energy Conservation Code

Add new definition as follows:

FAN, EMBEDDED. A fan that is part of a manufactured assembly where the assembly includes functions other than air movement.

FAN ARRAY. Multiple fans in parallel between two plenum sections in an air distribution system.

FAN ENERGY INDEX (FEI) The ratio of the electric input power of a reference fan to the electric input power of the actual fan as calculated in accordance with AMCA 208.

FAN NAMEPLATE ELECTRICAL INPUT POWER The nominal electrical input power rating stamped on a fan assembly nameplate.

FAN SYSTEM ELECTRICAL INPUT POWER. The sum of the fan electrical power of all fans that are required to operate at fan system design conditions to supply air from the heating or cooling source to the conditioned spaces and/or return it to the source or exhaust it to the outdoors.

Delete and substitute as follows:

~~**C403.8.3 Fan efficiency (Mandatory).** Fans shall have a fan efficiency grade (FEG) of not less than 67, as determined in accordance with AMCA 205 by an *approved*, independent testing laboratory and labeled by the manufacturer. The total efficiency of the fan at the design point of operation shall be within 15 percentage points of the maximum total efficiency of the fan.~~

~~**Exception:** The following fans are not required to have a fan efficiency grade:~~

- ~~1. Fans of 5 hp (3.7 kW) or less as follows:
 - ~~1.1. Individual fans with a motor nameplate horsepower of 5 hp (3.7 kW) or less, unless Exception 1.2 applies.~~
 - ~~1.2. Multiple fans in series or parallel that have a combined motor nameplate horsepower of 5 hp (3.7 kW) or less and are operated as the functional equivalent of a single fan.~~~~
- ~~2. Fans that are part of equipment covered in Section C403.3.2.~~
- ~~3. Fans included in an equipment package certified by an *approved agency* for air or energy performance.~~
- ~~4. Powered wall/roof ventilators.~~
- ~~5. Fans outside the scope of AMCA 205.~~
- ~~6. Fans that are intended to operate only during emergency conditions.~~

C403.8.3 Fan efficiency (Mandatory). Each fan and fan array shall have a fan energy index (FEI) of not less than 1.00 at the design point of operation, as determined in accordance with AMCA 208 by an *approved*, independent testing laboratory and labeled by the manufacturer. Each fan and fan array used for a variable-air-volume system shall have an FEI of not less than 0.95 at the design point of operation as determined in

accordance with AMCA 208 by an approved, independent testing laboratory and labeled by the manufacturer. The FEI for fan arrays shall be calculated in accordance with Annex C of AMCA 208.

Exceptions: The following fans are not required to have a fan energy index:

1. Fans that are not embedded fans with motor nameplate horsepower of less than 1.0 hp (0.75 kW) or less with a fan nameplate electrical input power of less than 0.89 kW.
2. Embedded fans that have a motor nameplate horsepower of 5 hp (3kW) or less or with a fan system electrical input power of 4.1 kW or less.
3. Multiple fans operated in series or parallel as the functional equivalent of a single fan that have a combined motor nameplate horsepower of 5 hp (3.7 kW) or less or with a fan system electrical input power of 4.1 kW or less.
4. Fans that are part of equipment covered in Section C403.3.2.
5. Fans included in an equipment package certified by an approved agency for air or energy performance.
6. Ceiling fans, i.e., non portable devices suspended from a ceiling or overhead structure for circulating air via the rotation of fan blades.
7. Fans used for moving gases at temperatures above 482°F (250°C)
8. Fans used for operation in explosive atmospheres.
9. Reversible fans used for tunnel ventilation.
10. Fans that are intended to operate only during emergency conditions.
11. Fans outside the scope of AMCA 208.

Add new standard(s) as follows:

AMCA

Air Movement and Control
Association International
30 West University Drive
Arlington Heights IL 60004-1806

208-18: Calculation of the Fan Energy Index

Reason: This proposal updates the current fan efficiency metric from a Fan Efficiency Grade (FEG) to a more current and improved metric known as Fan Energy Index (FEI). It also updates terms in the definitions chapter. This proposal also updates the definitions and associated standards for this new metric.

In the course of a U.S. Department of Energy (DOE) rulemaking for commercial fans and blowers, a wire-to-air metric was deemed to be more effective at saving energy because it would consider the impacts of motors and drives on fan energy performance. Although DOE has since stalled the fan rulemaking, the State of California has initiated an efficiency regulation for commercial and industrial fans under its Title 20 appliance/equipment efficiency standard.

Stemming from a public negotiation of fan-industry stakeholders (manufacturers, efficiency advocates,

consulting engineers, and a DOE representative), the Fan Energy Index (FEI), was developed by AMCA International and member companies, working collaboratively with efficiency advocates and DOE. FEI is defined in the calculation standard, ANSI/AMCA 208-2018.

Energy savings will primarily result from better fan selections out of existing product portfolios rather than marginal improvements from costly fan redesigns. FEI incentivizes a good match of the fan with its mechanical drive and the electric motor even at part load. The fan velocity pressure is credited in the FEI metric for fans with ducted outlets. Velocity pressure is not included for fans with unducted outlets.\

The lower scope limit is expressed in nameplate motor output power and in nameplate fan electrical input power because only the former is available for some fans and for others only the latter. The conversion from motor output power to fan input power uses the reference motor efficiency curve fit from AMCA 208.

FEI will be easier to enforce over FEG because language requiring that fans be selected “15-percentage points from peak total efficiency” is no longer needed. Also, FEI applies to all types of fans, so the exclusions for PRVs and panel fans go away, bringing a fan-efficiency requirement to more fans than previously covered.

Bibliography: Title: New Federal Regulations for Ceiling Fans
Authors: New Federal Regulations for Ceiling Fans

Published: ASHRAE Journal, January 2018

File: 42-46_Taber-Ivanovich_Fans, for Web.pdf

Keywords: large diameter, ceiling fans, efficiency, performance, U.S. Department of Energy, DOE, AMCA Standard 230, AMCA Standard 208, fan energy index, FEI

Abstract: In January 2017, the U.S. Department of Energy (DOE) finalized its first efficiency performance standards for ceiling fans, which include minimum efficiency requirements for large-diameter ceiling fans. Ratings using the DOE test procedure allow comparisons of products based on electric input power and airflow. Because the DOE performance metric is not based on a specific airflow point, some additional effort on the part of the designer may be required to evaluate fan performance equitably at a specific airflow point. Here are four things to know about the DOE’s regulation of ceiling fans that will help to ensure a successful and efficient ceiling-fan selection.

Revolutionary Method of Saving Energy for Commercial and Industrial Fan Systems, Michael Ivanovich, Mark Bublitz, and Tim Mathson. Presented at the 2017 ACEEE Summer Study for Industrial Energy Efficiency, Denver, Colorado. August 15-18, 2017:

Paper: ACEEE-2017-Paper.pdf

PowerPoint: Bublitz FEI ACEEE Industrial EE 2017 presentation.pdf

New Efficiency Metric for Fans Enables New Approaches for Efficiency Regulations and Incentives. Michael Ivanovich, Mike Wolf, Tom Catania. Presented at the 9th International Conference on Energy Efficiency In Domestic Appliances And Lighting (EEDAL), Irvine, California, September 13-15, 2017.

Paper: EEDAL-2017-Paper.pdf

Presentation: AMCA FEI EEDAL 2017 presentation.pdf

AMCA Introduction to Fan Energy Index (FEI) for Stand-Alone Fans. A self-directed 1.5-hour interactive training course. Includes AMCA Standard 208, Calculating Fan Energy Index.

Course link: <https://courses-pes.talentlms.com/catalog/info/id:141>

Cost Impact: The code change proposal will increase the cost of construction

This proposal could, in some cases increase the cost of construction. However, these potential increases are cost effective. Moreover, this proposal will result in better fan selections out of existing product portfolios rather than marginal improvements from costly fan redesigns.

Staff Analysis: A review of the standard proposed for inclusion in the code, AMCA 208-18, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 4114

CE137-19

CE138-19

IECC: C403.8.3

Proponent: Amanda Hickman, The Hickman Group, representing AMCA International
(amanda@thehickmangroup.com)

2018 International Energy Conservation Code

Delete without substitution:

C403.8.3 Fan efficiency (Mandatory). Fans shall have a fan efficiency grade (FEG) of not less than 67, as determined in accordance with AMCA 205 by an *approved*, independent testing laboratory and labeled by the manufacturer. The total efficiency of the fan at the design point of operation shall be within 15 percentage points of the maximum total efficiency of the fan.

Exception: The following fans are not required to have a fan efficiency grade:

1. Fans of 5 hp (3.7 kW) or less as follows:
 - 1.1. Individual fans with a motor nameplate horsepower of 5 hp (3.7 kW) or less, unless Exception 1.2 applies.
 - 1.2. Multiple fans in series or parallel that have a combined motor nameplate horsepower of 5 hp (3.7 kW) or less and are operated as the functional equivalent of a single fan.
2. Fans that are part of equipment covered in Section C403.3.2.
3. Fans included in an equipment package certified by an *approved agency* for air or energy performance.
4. Powered wall/roof ventilators.
5. Fans outside the scope of AMCA 205.
6. Fans that are intended to operate only during emergency conditions.

Reason: AMCA International and a consensus of its member companies worked through the US DOE and ASHRAE to develop an improved metric for inclusion into the codes. For this reason, this proposal deletes the antiquated metric: Fan Efficiency Grade from this section.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This will eliminate an outdated requirement, which could decrease the cost of the fan selected for a given application.

Proposal # 4583

CE138-19

CE139-19

IECC: SECTION C202 (New), C403.8.3, Chapter 6CE (New)

Proponent: Connor Barbaree, representing ASHRAE (cbarbaree@ashrae.org)

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Add new definition as follows:

FAN, EMBEDDED. A fan that is part of a manufactured assembly where the assembly includes functions other than air movement.

FAN ARRAY. Multiple fans in parallel between two plenum sections in an air distribution system.

FAN NAMEPLATE ELECTRICAL INPUT POWER. The nominal electrical input power rating stamped on a fan assembly nameplate.

FAN ENERGY INDEX (FEI). The ratio of the electric input power of a reference fan to the electric input power of the actual fan as calculated in accordance with AMCA 208.

FAN SYSTEM ELECTRICAL INPUT POWER. The sum of the fan electrical power of all fans that are required to operate at fan system design conditions to supply air from the heating or cooling source to the conditioned spaces and/or return it to the source or exhaust it to the outdoors.

Revise as follows:

C403.8.3 Fan efficiency (Mandatory). Fans Each fan and fan array shall have a fan efficiency-grade energy index (FEG-FEI) of not less than 67.1.00 at the design point of operation, as determined in accordance with AMCA 205 208 by an approved, independent testing laboratory and labeled by the manufacturer. The total efficiency of the fan Each fan and fan array used for a variable-air-volume system shall have an FEI of not less than 0.95 at the design point of operation shall be within 15 percentage points of the maximum total efficiency of the fan, as determined in accordance with AMCA 208 by an approved, independent testing laboratory and labeled by the manufacturer. The FEI for fan arrays shall be calculated in accordance with AMCA 208 Annex C.

Exceptions Exception: The following fans are not required to have a fan efficiency-grade energy index:

1. Fans that are not embedded fans with motor nameplate horsepower of less than 1.0 hp (0.75 kW) or with a nameplate electrical input power of less than 0.89 kW.
2. Embedded fans that have 1. Fans of 5 hp (3.7 kW) or less as follows: 1.1. Individual fans with a motor nameplate horsepower of 5 hp (3.7 kW) or less, unless Exception 1.2 applies; or with a fan system electrical input power of 4.1 kW or less.
3. Multiple fans operated 1.2. Multiple fans in series or parallel as the functional equivalent of a single fan that have a combined motor nameplate horsepower of 5 hp (3.7 kW) or less and are operated as the functional equivalent of a single fan, or with a fan system electrical input power of 4.1 kW or less.
- 4.2. Fans that are part of equipment covered in Section C403.3.2.
- 5.3. Fans included in an equipment package certified by an approved agency for air or energy performance.

4. ~~Powered wall/roof ventilators.~~
5. ~~Fans outside the scope of AMCA 205.~~
6. Ceiling fans, i.e., nonportable devices suspended from a ceiling or overhead structure for circulating air via the rotation of the blades.
7. Fans used for moving gases at temperatures above 425°F (250 °C).
8. Fans used for operation in explosive atmospheres.
9. Reversible fans used for tunnel ventilation.
10. ~~6. Fans that are intended to operate only during emergency conditions.~~
11. Fans outside the scope of AMC208.

AMCA

Air Movement and Control
Association International
30 West University Drive
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208-18: Calculation of the Fan Energy Index

Reason: This proposal harmonizes the recent revisions in Addendum ao of ASHRAE 90.1, which will be in the 2019 edition of the standard. Replacing the Fan Efficiency Grade (FEG) metric with Fan Energy Index (FEI) will result in a more effective energy savings metric and updates the corresponding definitions and standard. FEI was developed in response to the U.S. Department of Energy (DOE) rulemaking for commercial fans and blowers, whereby a wire-to-air metric was deemed to be more effective at saving energy because it would consider the impacts of motors and drives on fan energy performance. Although DOE has since stalled the fan rulemaking, the State of California has initiated an efficiency regulation for commercial and industrial fans under its Title 20 appliance/equipment efficiency standard. FEI has been added to the DOE EnergyPlus software and to the DOE Fan System Assessment Tool. Unlike FEG, FEI can be used in calculations for energy savings, and it does not require a “sizing/selection window,” which makes enforcement easier.

Bibliography: 1. Title: New Federal Regulations for Ceiling Fans: What You Need to Know
Authors: Christian Taber; Michael Ivanovich

Published: ASHRAE Journal, January 2018

File: 42-46_Taber-Ivanovich_Fans, for Web.pdf

Link: www.amca.org/resources/documents/42-46_Taber-Ivanovich_Fans,%20for%20Web.pdf

Keywords: large diameter, ceiling fans, efficiency, performance, U.S. Department of Energy, DOE, AMCA Standard 230, AMCA Standard 208, fan energy index, FEI

Abstract: In January 2017, the U.S. Department of Energy (DOE) finalized its first efficiency performance standards for ceiling fans, which include minimum efficiency requirements for large-diameter ceiling fans. Ratings using the DOE test procedure allow comparisons of products based on electric input power and airflow. Because the DOE performance metric is not based on a specific airflow point, some additional effort on the part of the designer may be required to evaluate fan performance equitably at a specific airflow point. Here are four things to know about the DOE's regulation of ceiling fans that will help to ensure a successful and efficient ceiling-fan selection.

2. Title: Revolutionary Method of Saving Energy for Commercial and Industrial Fan Systems,

Authors: Michael Ivanovich, Mark Bublitz, and Tim Mathson. Presented at the 2017 ACEEE Summer Study for

Industrial Energy Efficiency, Denver, Colorado. August 15-18, 2017:

Paper: ACEEE-2017-Paper.pdf

Link: www.amca.org/resources/documents/ACEEE-2017-Paper.pdf

PowerPoint: Bublitz FEI ACEEE Industrial EE 2017 presentation.pdf

Link:

www.amca.org/resources/documents/Bublitz%20FEI%20ACEEE%20Industrial%20EE%202017%20presentation.pdf

3. Title: New Efficiency Metric for Fans Enables New Approaches for Efficiency Regulations and Incentives.

Authors: Michael Ivanovich, Mike Wolf, Tom Catania.

Presented at the 9th International Conference on Energy Efficiency In Domestic Appliances And Lighting (EEDAL), Irvine, California, September 13-15, 2017.

Paper: EEDAL-2017-Paper.pdf

Link: www.amca.org/resources/documents/EEDAL-2017-Paper.pdf

Presentation: AMCA FEI EEDAL 2017 presentation.pdf

Link: www.amca.org/resources/documents/AMCA%20FEI%20EEDAL%202017%20presentation.pdf

4. AMCA Introduction to Fan Energy Index (FEI) for Stand-Alone Fans. A self-directed 1.5-hour interactive training course. Includes AMCA Standard 208, Calculating Fan Energy Index.

Course link: <https://courses-pes.talentlms.com/catalog/info/id:141>

Cost Impact: The code change proposal will increase the cost of construction

This proposal may increase the cost of some construction. However, it is a cost-effective change resulting in more efficient fan selection with proven economic payback and positive return on investment.

Staff Analysis: A review of the standard proposed for inclusion in the code, AMCA 208-18, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Analysis: A review of the standard proposed for inclusion in the code, AMCA 208, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 4866

CE139-19

CE140-19

IECC: C403.8.5 (New), TABLE C403.8.5 (New)

Proponent: Eric Makela, representing New Buildings Institute (ericm@newbuildings.org); Mike Moore, Newport Ventures, representing Broan-NuTone (mmoore@newportventures.net)

2018 International Energy Conservation Code

Add new text as follows:

C403.8.5 Low-capacity ventilation fans. Mechanical ventilation system fans with motors less than 1/12 horsepower in capacity shall meet the efficacy requirements of Table C403.8.5.

Exceptions:

1. Where ventilation fans are a component of a listed heating or cooling appliance.
2. Dryer exhaust duct power ventilators, domestic range hoods, and domestic range booster fans that operate intermittently.

TABLE C403.8.5
LOW-CAPACITY VENTILATION FAN EFFICACY

<u>FAN LOCATION</u>	<u>AIR FLOW RATE MINIMUM</u>	<u>MINIMUM EFFICACY</u>	<u>AIR FLOW RATE MAXIMUM</u>
	<u>(CFM)</u>	<u>(CFM/WATT)</u>	<u>(CFM)</u>
<u>HRV or ERV</u>	<u>Any</u>	<u>1.2 cfm/watt</u>	<u>Any</u>
<u>In-line fan</u>	<u>Any</u>	<u>3.8 cfm/watt</u>	<u>Any</u>
<u>Bathroom, utility room</u>	<u>10</u>	<u>2.8 cfm/watt</u>	<u>< 90</u>
<u>Bathroom, utility room</u>	<u>90</u>	<u>3.5 cfm/watt</u>	<u>Any</u>

a. When tested in accordance with HVI Standard 916. Fan efficacy for HRV, ERV, balanced, and in-line fans shall be taken at a static pressure ≥ 0.2 in. w.c. Fan efficacy for range hoods, bathroom, and utility room fans shall be taken at a static pressure ≥ 0.1 in. w.c.

Reason: Exhaust fan efficacies were introduced in the code in 2012 IECC for whole-house ventilation in low-rise residential buildings, but have never been included in the commercial provisions of the IECC. Mid-rise residential occupancies and small commercial buildings often utilize the same small ventilation fans leaving a loophole for a common energy load. These fans are used for point-of-source contaminant exhaust and are frequently utilized as part of a ventilation strategy in multifamily buildings. These fans are also smaller than the threshold for fan size (1/12 HP) that is attached to the other commercial fan requirements. This makes them a common load, and a potentially significant load in multifamily buildings, that is completely unregulated in commercial buildings.

This proposal adopts the table approach already utilized for these fans in the residential section of the code. However, it updates the efficiency requirements. The current residential IECC fan efficacies are from an older version of Energy Star (Version 2.0), so these have been updated to align the latest Energy Star requirement Version 4.0. These fan efficacy values are very conservative based on what is currently on the market.

It sets the efficiency requirement at a level that can reasonably be met by a large number of products available on the market. According to the HVI database of fans, the average efficiency of bath fans is around 7 CFM/W, and the average efficiency of in-line fans is 3.1. This proposal, therefore, places the requirement far below the

market average efficiency for bath fans and close to the market average for in-line fans, making this a reasonable requirement.

Another proposal has been submitted to the residential section of the code to update those fan efficacy requirements to the same levels.

Cost Impact: The code change proposal will increase the cost of construction. The proposal could increase the cost of construction. Cost for the kinds of fans covered by this requirement are not driven solely by efficacy. Cost is also a function of flow rate, finishes, design and noise and whether they include other features like lights, sensors, or heaters. In some cases, fans that meet this requirement can be obtained for less other fans that do not. Nevertheless, a comparison of the low-cost exhaust fans shows that this proposal can result in no incremental first costs or short simple paybacks where incremental costs are incurred.

For example, no-frills bath fans from major manufacturers moving a minimum of 50 to ~100 cfm at 0.25" w.c. have an immediate payback (i.e., no cost premium) or a simple payback estimated at ≤6 years where there is a cost premium (see Tables 1 and 2). The 2021 IRC requires exhaust fans to be rated at a static pressure of 0.25" w.c., which is widely recognized as a typical installed static pressure found in bath fan exhaust ducts.

Table 1. Lowest cost exhaust fans for major manufacturers having a flow rate ≥ 50 cfm and < 90 cfm at 0.25" w.c.:

Fan	Efficacy at 0.1" w.c.	Flow at 0.25" w.c.	Price Premium by Manufacturer	Simple Payback (years)
AirKing BFQ75 (compliant with proposal)	3.0	70	--	N/A
AirKing AS70 (entry-level at 0.25" w.c.)	1.4	62	\$11.02	6
Broan AE80B (compliant with proposal)	3.0	60	--	N/A
Broan A70L (entry-level at 0.25" w.c.)	1.7	60	\$1.61	1
DeltaBreeze SLM70 (entry-level at 0.25" w.c. is compliant with proposal)	4.7	54	--	immediate

*Simple payback assumes \$0.1178/kWh (DOE EIA national average for residential and commercial), 1-hour of operation per day. Pricing sourced from homedepot.com on 1/9/2019. For Delta, the lowest price fan having at flow rate ≥ 50 cfm and < 90 cfm at 0.25" w.c. also had a fan efficacy meeting the proposed value, so there is no price premium associated with the manufacturer's lowest cost product, and payback is "immediate".

Table 2. Lowest cost exhaust fans for major manufacturers having a flow rate ≥ 90 cfm at 0.25" w.c.:

Fan	Efficacy at 0.1" w.c.	Flow at 0.25" w.c.	Price Premium by Manufacturer	Simple Payback (years)
AirKing BFQ140 (entry-level at 0.25" w.c.)	1.6	109	--	N/A
AirKing AK110LS (compliant with proposal)	3.9	90	\$48.32	6
Broan AN110 (entry-level at 0.25" w.c.)	2.3	102	--	N/A
Broan AEN110 (compliant with proposal)	4.7	92	\$41.09	6
DeltaBreeze VFB25AEH (entry-level at 0.25" w.c.)	5.9	105	--	immediate

is compliant with proposal) Panasonic FV-08-11VFS (entry-level at 0.25” w.c. is compliant with proposal)	4.2	104	--	immediate
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*Simple payback assumes \$0.1178/kWh (DOE EIA national average for residential and commercial), 4-hours of operation per day (higher run time associated with assumption that higher flow rate bath fans are more likely to be installed in commercial bathrooms which are more likely to run continuously or at longer run times than a typical 1-hour residential assumption). Pricing sourced from homedepot.com on 1/9/2019. For some manufacturers, such as Delta and Panasonic, the lowest price fan having at flow rate ≥ 50 cfm and < 90 cfm at 0.25” w.c. also had a fan efficacy meeting the proposed value, so there is no price premium associated with the manufacturer’s lowest cost product, and payback is “immediate”.

Proposal # 5038

CE140-19

CE141-19

IECC: (New), C403.9 (New), AMCA Chapter 06 (New)

Proponent: Amanda Hickman, The Hickman Group, representing AMCA International and MacroAir (amanda@thehickmangroup.com)

2018 International Energy Conservation Code

Add new definition as follows:

LARGE-DIAMETER CEILING FAN. A ceiling fan that is greater than 7 feet (2134 mm) in diameter. These fans are sometimes referred to as High-Volume, Low-Speed (HVLS) fans.

Add new text as follows:

C403.9 Large-diameter ceiling fans. Where provided, large diameter ceiling fans shall be tested and labeled in accordance with AMCA 230.

Add new standard(s) as follows:

AMCA

Air Movement and Control
Association International
30 West University Drive
Arlington Heights IL 60004-1806

ANSI/AMCA 230-15: Laboratory Methods of Testing Air Circulating Fans for Rating and Certification

Reason: This proposal brings in the definition for large diameter ceiling fans (LDCF) that is consistent with the DOE fan regulations and also the International Mechanical Code. Additionally, this proposal includes language and reference for the appropriate testing standard for these fans **when** they are installed. The addition of this language will be beneficial to the countries and states that adopt the IECC and not the IMC. This section and standard is also needed because language for giving credit for these fans in the performance path was approved into the 2018 IECC last cycle.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal is not requiring anything new, as the IMC already requires these fans to comply with this standard.

Staff Analysis: A review of the standard proposed for inclusion in the code, AMCA 230-15, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 4116

CE141-19

CE142-19

IECC: C403.9.4

Proponent: donald sivigny, State of MN, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Energy Conservation Code

Revise as follows:

C403.9.4 Tower flow turndown. Open-circuit cooling towers used on water-cooled chiller systems that are configured with multiple- or variable-speed condenser water pumps shall be designed so that all open- circuit cooling tower cells can be run in parallel with the larger of the flow that is produced by the smallest pump at its minimum expected flow rate or at 50 percent of the design flow for the cell.

Exception: Cooling towers used during wintertime heat rejection conditions where reducing water flow could cause freezing problems.

Reason: There isn't any need to design a system to operate in a manner under which it can never be operated because of the concern for system damage. Correct system design for an application doesn't result in additional materials or installation labor over that required for an incorrectly designed system that has to be immediately re-worked in the field. In the long run, this proposal will also save money from having to replace parts of the system that are damaged or ruined when the flow becomes so little that the system freezes up and is damaged.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This change will save money from having to replace parts of the system that are damaged or ruined if the flow is so little it freezes up and damages the system.

Proposal # 5116

CE142-19

CE143-19

IECC: C403.9.6 (New)

Proponent: Connor Barbaree, representing ASHRAE (cbarbaree@ashrae.org)

2018 International Energy Conservation Code

Add new text as follows:

C403.9.6 Heat recovery for space conditioning in healthcare facilities Where heating water is used for space heating, a condenser heat recovery system shall be installed provided all of the following are true:

1. The building is a Group I-2 Condition 2 occupancy
2. The total design chilled water capacity for the Group I-2 Condition 2 occupancy, either air cooled or water cooled, required at cooling design conditions exceeds 3,600,000 Btu/h (1,100 kW) of cooling.
3. Simultaneous heating and cooling occurs above 60°F (16°C) outdoor air temperature.

The required heat recovery system shall have a cooling capacity that is not less than 7 percent of the total design chilled water capacity of the Group I-2 Condition 2 occupancy at peak design conditions.

Exceptions:

1. Buildings that provide 60 percent or more of their reheat energy from on-site renewable energy or site-recovered energy.
2. Buildings in Climate Zones 5C, 6B, 7 and 8.

Reason: Most I-2 Condition 2 occupancies use reheat HVAC systems with simultaneous heating and cooling. Even with required air or water economizers, there are many hours with simultaneous heating and cooling use. It is generally lower cost to generate heating water with a heat recovery chiller or heat pump when the chilled water generated is useful than it is to use a boiler that complies with 90.1.

Evaluation of a typical hospital in multiple climate zones shows a potential for reasonable recovery with a heat recovery chiller or heat pump that is sized between 7% and 12% of the cooling plant, depending on climate zone. For simplification and conservative, the minimum is set at 7% of total cooling load across the board.

An economic analysis was made using the 90.1 scalar method based on installed heat recovery chiller costs of \$1,800 per ton. The resulting paybacks were all under 10 years for required climate zones vs. a scalar limit of 13 years. The trend of higher savings in warmer climate zones was used to include climate zones 1 and 0 without specific analysis. The payback in Climate Zone 2B was under 5 years.

Bibliography: Addendum V to 90.1- 2016

Cost Impact: The code change proposal will increase the cost of construction

The code change proposal will increase the cost of construction due to equipment and infrastructure costs. The payback for such installations is less than 10

years in all required climate zones.

Proposal # 4895

CE143-19

CE144-19

IECC: C402.1, C403.10

Proponent: Ben Edwards, representing Mathis Consulting Co. (ben@mathisconsulting.com)

2018 International Energy Conservation Code

Revise as follows:

C402.1 General (Prescriptive). Building thermal envelope assemblies for buildings that are intended to comply with the code on a prescriptive basis in accordance with the compliance path described in Item 2 of Section C401.2, shall comply with the following:

1. The opaque portions of the building thermal envelope shall comply with the specific insulation requirements of Section C402.2 and the thermal requirements of either the *R*-value-based method of Section C402.1.3; the *U*-, *C*- and *F*-factor-based method of Section C402.1.4; or the component performance alternative of Section C402.1.5.
2. Roof solar reflectance and thermal emittance shall comply with Section C402.3.
3. Fenestration in building envelope assemblies shall comply with Section C402.4.
4. Air leakage of building envelope assemblies shall comply with Section C402.5.

Alternatively, where buildings have a vertical fenestration area or skylight area exceeding that allowed in Section C402.4, the building and building thermal envelope shall comply with Section C401.2, Item 1 or Section C401.2, Item 3.

Walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with Section ~~C403.10.1~~ or ~~C403.10.2~~ C403.10.

C403.10 Refrigeration equipment performance. Refrigeration equipment shall have an energy use in kWh/day not greater than the values of Tables C403.10.1(1) and C403.10.1(2) when tested and rated in accordance with AHRI Standard 1200. The energy use shall be verified through certification under an approved certification program or, where a certification program does not exist, the energy use shall be supported by data furnished by the equipment manufacturer.

Exception: Walk-in coolers and walk-in freezers regulated under federal law in accordance with Subpart R of 10 CFR 431.

Reason:

- This change will make enforcement easier for code officials by making explicit that they do not have to address the attributes of walk-in systems preempted by federal requirements.
- The IECC already references 10 CFR for furnaces, boilers, industrial equipment, electric motors, etc., all in similar scenarios (see: Table C403.3.2(5), C403.8.4, Table C404.2, C405.6, etc.).
- No changes to efficiency or definitions have been proposed.
- The references to C403.10.1 and C403.10.2 in C402.1 have been collapsed to reference the relevant parent section, C403.10.
- By providing a reference to the CFR, the guidance of the prescriptive list remains for international users.

The federal standard being referenced is Department of Energy in 10 CFR 431, Subpart R - Walk-in Coolers and Walk-in Freezers - it can be reviewed at this link: <https://www.law.cornell.edu/cfr/text/10/part-431/subpart-R>

Bibliography: General: 10 CFR Part 431, Subpart R - Walk-in Coolers and Walk-in Freezers.
Definitions: 10 CFR 431.302 - Definitions concerning walk-in coolers and walk-in freezers.

Requirements: 10 CFR 431.306 - Energy conservation standards and their effective dates.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. There is no cost impact, because no requirements have been changed; the equipment already is preempted. Potentially, costs could be reduced by avoiding enforcement conflicts.

Proposal # 4770

CE144-19

CE145-19

IECC: C402.1, C403.10.1, C403.10.2, C403.10.2.1, TABLE C403.10.2.1(1), TABLE C403.10.2.1(2), TABLE C403.10.2.1(3), C403.10.4, C405.1

Proponent: Ben Edwards, representing Mathis Consulting Co. (ben@mathisconsulting.com)

2018 International Energy Conservation Code

Revise as follows:

C402.1 General (Prescriptive). Building thermal envelope assemblies for buildings that are intended to comply with the code on a prescriptive basis in accordance with the compliance path described in Item 2 of Section C401.2, shall comply with the following:

1. The opaque portions of the building thermal envelope shall comply with the specific insulation requirements of Section C402.2 and the thermal requirements of either the R-value-based method of Section C402.1.3; the U-, C- and F-factor-based method of Section C402.1.4; or the component performance alternative of Section C402.1.5.
2. Roof solar reflectance and thermal emittance shall comply with Section C402.3.
3. Fenestration in building envelope assemblies shall comply with Section C402.4.
4. Air leakage of building envelope assemblies shall comply with Section C402.5.

Alternatively, where buildings have a vertical fenestration area or skylight area exceeding that allowed in Section C402.4, the building and building thermal envelope shall comply with Section C401.2, Item 1 or Section C401.2, Item 3.

~~Walk-in coolers, walk-in freezers, refrigerated~~ Refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with Section ~~C403.10.1 or C403.10.2.~~ C403.10.1.

Delete without substitution:

~~C403.10.1 Walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers (Mandatory).~~ ~~Refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with this section. Walk-in coolers and walk-in freezers that are neither site assembled nor site constructed shall comply with the following:~~

- ~~1. Be equipped with automatic door closers that firmly close walk-in doors that have been closed to within 1 inch (25 mm) of full closure.~~

~~Exception:~~ ~~Automatic closers are not required for doors more than 45 inches (1143 mm) in width or more than 7 feet (2134 mm) in height.~~

- ~~2. Doorways shall have strip doors, curtains, spring-hinged doors or other method of minimizing infiltration when doors are open.~~
- ~~3. Walk-in coolers and refrigerated warehouse coolers shall contain wall, ceiling, and door insulation of not less than R-25 and walk-in freezers and refrigerated warehouse freezers shall contain wall, ceiling and door insulation of not less than R-32.~~

~~Exception:~~ ~~Glazed portions of doors or structural members need not be insulated.~~

- ~~4. Walk-in freezers shall contain floor insulation of not less than R-28.~~
- ~~5. Transparent reach-in doors for walk-in freezers and windows in walk-in freezer doors shall be of triple-pane glass, either filled with inert gas or with heat-reflective treated glass.~~

6. ~~Windows and transparent reach-in doors for *walk-in coolers* shall be of double-pane or triple-pane, inert gas-filled, heat-reflective treated glass.~~
7. ~~Evaporator fan motors that are less than 1 hp (0.746 kW) and less than 460 volts shall use electronically commutated motors, brushless direct-current motors, or 3-phase motors.~~
8. ~~Condenser fan motors that are less than 1 hp (0.746 kW) shall use electronically commutated motors, permanent split capacitor-type motors or 3-phase motors.~~
9. ~~Where antisweat heaters without antisweat heater controls are provided, they shall have a total door rail, glass and frame heater power draw of not more than 7.1 W/ft² (76 W/m²) of door opening for *walk-in freezers* and 3.0 W/ft² (32 W/m²) of door opening for *walk-in coolers*.~~
10. ~~Where antisweat heater controls are provided, they shall reduce the energy use of the antisweat heater as a function of the relative humidity in the air outside the door or to the condensation on the inner glass pane.~~
11. ~~Lights in *walk-in coolers*, *walk-in freezers*, *refrigerated warehouse coolers* and *refrigerated warehouse freezers* shall either use light sources with an efficacy of not less than 40 lumens per watt, including ballast losses, or shall use light sources with an efficacy of not less than 40 lumens per watt, including ballast losses, in conjunction with a device that turns off the lights within 15 minutes when the space is not occupied.~~

Revise as follows:

C403.10.2 C403.10.1 Walk-in coolers and walk-in Refrigerated warehouse coolers, refrigerated warehouse freezers (Mandatory). ~~Site-assembled or site-constructed walk-in *Refrigerated warehouse coolers* and walk-in *refrigerated warehouse freezers*~~ shall comply with the following:

1. Automatic door closers shall be provided that fully close walk-in doors that have been closed to within 1 inch (25 mm) of full closure.
Exception: Closers are not required for doors more than 45 inches (1143 mm) in width or more than 7 feet (2134 mm) in height.
2. Doorways shall be provided with strip doors, curtains, spring-hinged doors or other method of minimizing infiltration when the doors are open.
3. ~~Walls shall be provided with insulation having a thermal resistance~~ Refrigerated warehouse cooler wall, ceiling, and door insulation shall have an R-value of not less than R-25, ceilings shall be provided with insulation having a thermal resistance of not less than R-25 and doors of walk-in coolers and walk-in freezers shall be provided with insulation having a thermal resistance 25. Refrigerated warehouse freezer wall, ceiling, and door insulation shall have an R-value of not less than R-32. 32.
Exception: Insulation is not required for glazed portions of doors or at structural members associated with the walls, ceiling or door frame.
4. The floor of ~~walk-in *refrigerated warehouse freezers*~~ shall be provided with insulation having a thermal resistance of not less than R-28.
5. ~~Transparent *Refrigerated warehouse freezer* transparent reach-in doors for,~~ and windows in opaque ~~walk-in freezer~~ doors shall be provided with triple-pane glass having the interstitial spaces filled with inert gas or provided with heat-reflective treated glass.
6. ~~Transparent *Refrigerated warehouse cooler* transparent reach-in doors for,~~ and windows in opaque ~~walk-in cooler~~ doors shall be double-pane heat-reflective treated glass having the interstitial space gas filled.
7. Evaporator fan motors that are less than 1 hp (0.746 kW) and less than 460 volts shall be electronically commutated motors, brushless direct-current motors, or 3-phase motors.
8. Condenser fan motors that are less than 1 hp (0.746 kW) in capacity shall be of the electronically commutated or permanent split capacitor-type or shall be 3-phase motors.

Exception: Fan motors in ~~walk-in *refrigerated warehouse coolers* and walk-in *refrigerated*~~

warehouse freezers combined in a single enclosure greater than 3,000 square feet (279 m²) in floor area are exempt.

9. ~~Antisweat heaters that are not provided with~~ Where antisweat heaters without anti-sweat heater controls are provided, they shall have a total door rail, glass, and frame heater power draw not greater more than 7.1 W/ft² (76 W/m²) of door opening for walk-in-refrigerated warehouse freezers, and not greater more than 3.0 W/ft² (32 W/m²) of door opening for walk-in-refrigerated warehouse coolers.
10. ~~Antisweat~~ Where antisweat heater controls are provided, they shall be configured to reduce the energy use of the antisweat heater as a function of the relative humidity in the air outside the door or to the condensation on the inner glass pane.
11. Light sources shall have an efficacy of not less than 40 lumens per Watt, including any ballast losses, or shall be provided with a device that automatically turns off the lights within 15 minutes of when the *walk-in cooler* or *walk-in freezer* was last occupied.

Delete without substitution:

~~**G403.10.2.1 Performance standards (Mandatory).** Effective January 1, 2020, *walk-in coolers* and *walk-in freezers* shall meet the requirements of Tables G403.10.2.1(1), G403.10.2.1(2) and G403.10.2.1(3).~~

**TABLE G403.10.2.1(1)
WALK-IN COOLER AND FREEZER DISPLAY DOOR EFFICIENCY REQUIREMENTS^a**

CLASS DESCRIPTOR	CLASS	MAXIMUM ENERGY CONSUMPTION (kWh/day) ^a
Display door, medium temperature	DD, M	$0.04 \times A_{dd} + 0.41$
Display door, low temperature	DD, L	$0.15 \times A_{dd} + 0.29$

a. A_{dd} is the surface area of the display door.

**TABLE G403.10.2.1(2)
WALK-IN COOLER AND FREEZER NONDISPLAY DOOR EFFICIENCY REQUIREMENTS^a**

CLASS DESCRIPTOR	CLASS	MAXIMUM ENERGY CONSUMPTION (kWh/day) ^a
Passage door, medium temperature	PD, M	$0.05 \times A_{nd} + 1.7$
Passage door, low temperature	PD, L	$0.14 \times A_{nd} + 4.8$
Freight door, medium temperature	FD, M	$0.04 \times A_{nd} + 1.9$
Freight door, low temperature	FD, L	$0.12 \times A_{nd} + 5.6$

a. A_{nd} is the surface area of the nondisplay door.

**TABLE G403.10.2.1(3)
WALK-IN COOLER AND FREEZER REFRIGERATION SYSTEM EFFICIENCY REQUIREMENTS**

CLASS DESCRIPTOR	CLASS	MINIMUM ANNUAL WALK-IN ENERGY FACTOR AWEF (Btu/W-h)
Dedicated condensing, medium temperature, indoor system	DC.M.I	5.61

Dedicated condensing, medium temperature, indoor system, > 9,000 Btu/h capacity	DC.M.I, > 9,000	5.61
Dedicated condensing, medium temperature, outdoor system	DC.M.I	7.60
Dedicated condensing, medium temperature, outdoor system, > 9,000 Btu/h capacity	DC.M.I, > 9,000	7.60

Revise as follows:

C403.10.4 Refrigeration systems. Refrigerated display cases, ~~walk-in refrigerated warehouse coolers~~ or ~~walk-in refrigerated warehouse freezers~~ that are served by remote compressors and remote condensers not located in a condensing unit, shall comply with Sections C403.10.4.1 and C403.10.4.2.

Exception: Systems where the working fluid in the refrigeration cycle goes through both subcritical and super-critical states (transcritical) or that use ammonia refrigerant are exempt.

C405.1 General (Mandatory). This section covers lighting system controls, the maximum lighting power for interior and exterior applications and electrical energy consumption. Dwelling units within multifamily buildings shall comply with Section R404.1. All other dwelling units shall comply with Section R404.1, or with Sections C405.2.4 and C405.3. Sleeping units shall comply with Section C405.2.4, and with Section R404.1 or C405.3. Lighting installed in ~~walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers~~ shall comply with the lighting requirements of Section ~~C403.10.1 or C403.10.2. C403.10.1.~~

Reason: The intent of this proposal is to avoid changing requirements, to the extent possible, while maintaining requirements for non-preempted equipment. This proposal coordinates with other proposals attempting to resolve preemption and testing uniformity issues. There are no non-preempted *walk-in coolers* and *walk-in freezers* in the IECC. Coolers and freezers under 3,000ft² fall under 10 CFR Part 431, Subpart R (as defined by 431.302):

“*Walk-in cooler and walk-in freezer* mean an enclosed storage space refrigerated to temperatures, respectively, above, and at or below 32 degrees Fahrenheit that can be walked into, and has a total chilled storage area of **less than 3,000 square feet**; however the terms do not include products designed and marketed exclusively for medical, scientific, or research purposes.” (emphasis added)

The IECC definitions (see proposal) limit *walk-in coolers* and *walk-in freezers* to **less than 3,000ft²**, matching the scope of the preemption. Having two sets of requirements - the CFR and the IECC - causes problems, both for building officials and product manufacturers. Having failed in the last cycle to provide an exception for equipment within the scope of the CFR, this proposal removes preempted equipment by removing all "walk-ins," since they are - by definition - preempted. Non-preempted "walk-in" coolers and freezers are defined in the IECC as *refrigerated warehouse coolers* and *refrigerated warehouse freezers*, being 3,000ft² or larger.

Because there still is legal uncertainty regarding the future of the federal preemption requirements, the prescriptive list in (renumbered) C403.10.1 is retained, if only for non-preempted (3,000ft²+) "walk-in" systems. Other proposals update and incorporate newly-effective federal requirements. Where defined *walk-in coolers* and *-freezers* have requirements in other sections, the defined term has been replaced with *refrigerated warehouse coolers* and *-freezers*, as applicable, to provide requirements for non-preempted equipment. The conditions currently regulated for *walk-in coolers* and *walk-in freezers* might not exist in all *refrigerated warehouse coolers* and *refrigerated warehouse freezers*, and would not be applicable in those cases. Additionally, a redundancy between C403.10.1 and C403.10.2 is being addressed by deleting X.1, and attempting to incorporate some clarity improvements to X.2 proposed by SEHPCAC (CE124-16) during the last development cycle.

The desire for language for non-U.S. jurisdictions, where <3,000ft² walk-ins are not preempted, is appreciated, but here causes conflict domestically for the overwhelming majority of code users, officials, and manufacturers

Bibliography: 10 CFR Part 431, Subpart R - Walk-in Coolers and Walk-in Freezers.
10 CFR 431.302 - Definitions concerning walk-in coolers and walk-in freezers.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The intent of this proposal is to align the code with the current regulatory hierarchy. Equipment already should meet these requirements, so cost should be unaffected or reduced, due to fewer enforcement conflicts.

Proposal # 4904

CE145-19

CE146-19

IECC: C403.10, C403.10.1, TABLE C403.10.1(1), TABLE C403.10.1(2), C403.10.3, Chapter 6CE (New)

Proponent: Amanda Hickman, representing AHRI (amanda@thehickmangroup.com)

2018 International Energy Conservation Code

Revise as follows:

C403.10 Refrigeration equipment performance. Refrigeration equipment shall have an energy use in kWh/day not greater than the values of Tables C403.10.1(1) and C403.10.1(2) when tested and rated in accordance with AHRI Standard 1200. performance shall be determined in accordance with sections C403.10.1 and C403.10.2 for commercial refrigerators, freezers, refrigerator-freezers, walk-in coolers, walk-in freezers and refrigeration equipment. The energy use shall be verified through certification under an approved certification program or, where a certification program does not exist, the energy use shall be supported by data furnished by the equipment manufacturer.

C403.10.1 Walk-in coolers, Commercial refrigerators, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers, refrigerator-freezers and refrigeration (Mandatory). Refrigeration equipment, defined in U.S. 10 CFR part 431.62, shall have an energy use in kWh/day not greater than the values of Table C403.10.1(1) when tested and rated in accordance with AHRI Standard 1200. Refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with this section. Walk-in coolers and walk-in freezers that are neither site-assembled nor site-constructed shall comply with the following:

1. ~~Be equipped with automatic door closers that firmly close walk-in doors that have been closed to within 1 inch (25 mm) of full closure.~~

Exception: Automatic closers are not required for doors more than 45 inches (1143 mm) in width or more than 7 feet (2134 mm) in height.

2. ~~Doorways shall have strip doors, curtains, spring-hinged doors or other method of minimizing infiltration when doors are open.~~
3. ~~Walk-in coolers and refrigerated warehouse coolers shall contain wall, ceiling, and door insulation of not less than R-25 and walk-in freezers and refrigerated warehouse freezers shall contain wall, ceiling and door insulation of not less than R-32.~~

Exception: Glazed portions of doors or structural members need not be insulated.

4. ~~Walk-in freezers shall contain floor insulation of not less than R-28.~~
5. ~~Transparent reach-in doors for walk-in freezers and windows in walk-in freezer doors shall be of triple-pane glass, either filled with inert gas or with heat-reflective treated glass.~~
6. ~~Windows and transparent reach-in doors for walk-in coolers shall be of double-pane or triple-pane, inert gas-filled, heat-reflective treated glass.~~
7. ~~Evaporator fan motors that are less than 1 hp (0.746 kW) and less than 460 volts shall use electronically commutated motors, brushless direct current motors, or 3-phase motors.~~
8. ~~Condenser fan motors that are less than 1 hp (0.746 kW) shall use electronically commutated motors, permanent split capacitor type motors or 3-phase motors.~~
9. ~~Where antisweat heaters without antisweat heater controls are provided, they shall have a total door rail, glass and frame heater power draw of not more than 7.1 W/ft² (76 W/m²) of door~~

- opening for *walk-in freezers* and 3.0 W/ft² (32 W/m²) of door opening for *walk-in coolers*.
10. Where antisweat heater controls are provided, they shall reduce the energy use of the antisweat heater as a function of the relative humidity in the air outside the door or to the condensation on the inner glass pane.
11. Lights in *walk-in coolers, walk-in freezers, refrigerated warehouse coolers* and *refrigerated warehouse freezers* shall either use light sources with an efficacy of not less than 40 lumens per watt, including ballast losses, or shall use light sources with an efficacy of not less than 40 lumens per watt, including ballast losses, in conjunction with a device that turns off the lights within 15 minutes when the space is not occupied.

Delete without substitution:

TABLE C403.10.1(1)
MINIMUM EFFICIENCY REQUIREMENTS: COMMERCIAL REFRIGERATION

EQUIPMENT TYPE	APPLICATION	ENERGY USE LIMITS (kWh per day) ^a	TEST PROCEDURE
Refrigerator with solid doors	Holding Temperature	$0.10 \cdot V + 2.04$	AHRI 1200
Refrigerator with transparent doors		$0.12 \times V + 3.34$	
Freezers with solid doors		$0.40 \times V + 1.38$	
Freezers with transparent doors		$0.75 \times V + 4.10$	
Refrigerators/freezers with solid doors		the greater of $0.12 \times V + 3.34$ or 0.70	
Commercial refrigerators	Pulldown	$0.126 \times V + 3.51$	

a. V = volume of the chiller or frozen compartment as defined in AHAM HRF-1.

Add new text as follows:

TABLE C403.10.1(1)
MINIMUM EFFICIENCY REQUIREMENTS: COMMERCIAL REFRIGERATORS AND FREEZERS AND REFRIGERATION

Equipment Category	Condensing Unit Configuration	Equipment Family	Rating Temp (F)	Operating Temp (F)	Equipment Classification ^c	Maximum daily energy consumption kWh/day ^{d,e}	Test Standard
		Vertical Open (VOP)	38 (M)	≥32	VOP.RC.M	$0.64 \times TDA + 4.07$	
			0 (L)	<32	VOP.RC.L	$2.20 \times TDA + 6.85$	
		Semivertical Open (SVO)	38 (M)	≥32	SVO.RC.M	$0.66 \times TDA + 3.18$	
			0 (L)	<32	SVO.RC.L	$2.20 \times TDA + 6.85$	

Remote Condensing Commercial Refrigerators and Commercial Freezers	Remote (RC)	Horizontal Open (HZO)	38 (M)	≥ 32	HZO.RC.M	$0.35 \times TDA + 2.88$	AHRI 1200			
			0 (L)	< 32	HZO.RC.L	$0.55 \times TDA + 6.88$				
		Vertical Closed Transparent (VCT)	38 (M)	≥ 32	VCT.RC.M	$0.15 \times TDA + 1.95$				
			0 (L)	< 32	VCT.RC.L	$0.49 \times TDA + 2.61$				
		Horizontal Closed Transparent (HCT)	38 (M)	≥ 32	HCT.RC.M	$0.16 \times TDA + 0.13$				
			0 (L)	< 32	HCT.RC.L	$0.34 \times TDA + 0.26$				
		Vertical Closed Solid (VCS)	38 (M)	≥ 32	VCS.RC.M	$0.10 \times V + 0.26$				
			0 (L)	< 32	VCS.RC.L	$0.21 \times V + 0.54$				
		Horizontal Closed Solid (HCS)	38 (M)	≥ 32	HCS.RC.M	$0.10 \times V + 0.26$				
			0 (L)	< 32	HCS.RC.L	$0.21 \times V + 0.54$				
		Service Over Counter (SOC)	38 (M)	≥ 32	SOC.RC.M	$0.44 \times TDA + 0.11$				
			0 (L)	< 32	SOC.RC.L	$0.93 \times TDA + 0.22$				
		Self-Contained Commercial Refrigerators and Commercial Freezers with and Without Doors	Self-Contained (SC)	Vertical Open (VOP)	38 (M)	≥ 32		VOP.SCSV.M	$1.69 \times TDA + 4.71$	AHRI 1200
					0 (L)	< 32		VOP.SC.L	$4.25 \times TDA + 11.82$	
Semivertical Open (SVO)	38 (M)			≥ 32	SVO.SC.M	$1.70 \times TDA + 4.59$				
	0 (L)			< 32	SVO.SC.L	$4.26 \times TDA + 11.51$				
Horizontal Open (HZO)	38 (M)			≥ 32	HZO.SC.M	$0.72 \times TDA + 5.55$				
	0 (L)			< 32	HZO.SC.L	$1.90 \times TDA + 7.08$				
Vertical Closed Transparent (VCT)	38 (M)			≥ 32	VCT.SC.M	$0.10 \times V + 0.86$				
	0 (L)			< 32	VCT.SC.L	$0.29 \times V + 2.95$				
Vertical Closed Solid (VCS)	38 (M)			≥ 32	VCS.SC.M	$0.05 \times V + 1.36$				
	0 (L)			< 32	VCS.SC.L	$0.22 \times V + 1.38$				

		Horizontal Closed Transparent (HCT)	38 (M) 0 (L)	≥ 32 < 32	HCT.SC.M HCT.SC.L	$0.06 \times V + 0.37$ $0.08 \times V + 1.23$	
		Horizontal Closed Solid (HCS)	38 (M) 0 (L)	≥ 32 < 32	HCS.SC.M HCS.SC.L	$0.05 \times V + 0.91$ $0.06 \times V + 1.12$	
		Service Over Counter (SOC)	38 (M) 0 (L)	≥ 32 < 32	SOC.SC.M SOC.SC.L	$0.52 \times TDA + 1.00$ $1.10 \times TDA + 2.10$	
Self-Contained Commercial Refrigerators with Transparent Doors for Pull-Down Temperature Applications	Self-Contained (SC)	Pull-Down (PD)	38 (M)	≥ 32	PD.SC.M	$0.11 \times V + 0.81$	AHRI 1200
Commercial Ice-Cream	Remote (RC)	Vertical Open (VOP)	-15 (l)	$\leq -5^b$	VOP.RC.I	$2.79 \times TDA + 8.70$	AHRI 1200
		Semivertical Open (SVO)	-15 (l)	$\leq -5^b$	SVO.RC.I	$2.79 \times TDA + 8.70$	
		Horizontal Open (HZO)	-15 (l)	$\leq -5^b$	HZO.RC.I	$0.7 \times TDA + 8.74$	
		Vertical Closed Transparent (VCT)	-15 (l)	$\leq -5^b$	VCT.RC.I	$0.58 \times TDA + 3.05$	
		Horizontal Closed Transparent (HCT)	-15 (l)	$\leq -5^b$	HCT.RC.I	$0.4 \times TDA + 0.31$	
		Vertical Closed Solid (VCS)	-15 (l)	$\leq -5^b$	VCS.RC.I	$0.25 \times V + 0.63$	
		Horizontal Closed Solid (HCS)	-15 (l)	$\leq -5^b$	HCS.RC.I	$0.25 \times V + 0.63$	
	Service Over Counter (SOC)	-15 (l)	$\leq -5^b$	SOC.RC.I	$1.09 \times TDA + 0.26$		
	Self-Contained (SC)	Vertical Open (VOP)	-15 (l)	$\leq -5^b$	VOP.SC.I	$5.4 \times TDA + 15.02$	

<u>Freezers</u>	<u>Semivertical Open (SVO)</u>	<u>-15 (I)</u>	<u>≤-5^b</u>	<u>SVO.SC.I</u>	<u>5.41 x TDA + 14.63</u>	<u>AHRI 1200</u>
	<u>Horizontal Open (HZO)</u>	<u>-15 (I)</u>	<u>≤-5^b</u>	<u>HZO.SC.I</u>	<u>2.42 x TDA + 9.00</u>	
	<u>Vertical Closed Transparent (VCT)</u>	<u>-15 (I)</u>	<u>≤-5^b</u>	<u>VCT.SC.I</u>	<u>0.62 x TDA + 3.29</u>	
	<u>Horizontal Closed Transparent (HCT)</u>	<u>-15 (I)</u>	<u>≤-5^b</u>	<u>HCT.SC.I</u>	<u>0.56 x TDA + 0.43</u>	
	<u>Vertical Closed Solid (VCS)</u>	<u>-15 (I)</u>	<u>≤-5^b</u>	<u>VCS.SC.I</u>	<u>0.34 x V + 0.88.</u>	
	<u>Horizontal Closed Solid (HCS)</u>	<u>-15 (I)</u>	<u>≤-5^b</u>	<u>HCS.SC.I</u>	<u>0.34 x V + 0.88.</u>	
	<u>Service Over Counter (SOC)</u>	<u>-15 (I)</u>	<u>≤-5^b</u>	<u>SOC.SC.I</u>	<u>1.53 x TDA + 0.36</u>	

a. The meaning of the letters in this column is indicated in the columns to the left.

b. Ice-cream freezer is defined in 10 CFR 431.62 as a commercial freezer that is designed to operate at or below -5 °F and that the manufacturer designs, markets, or intends for the storing, displaying, or dispensing of ice cream.

c. Equipment class designations consist of a combination (in sequential order separated by periods (AAA).(BB).(C)) of the following:

(AAA)—An equipment family code (VOP = vertical open, SVO = semivertical open, HZO = horizontal open, VCT = vertical closed transparent doors, VCS = vertical closed solid doors, HCT = horizontal closed transparent doors, HCS = horizontal closed solid doors, and SOC = service over counter); (BB)—An operating mode code (RC = remote condensing and SC = self-contained); and (C)—A rating temperature code (M = medium temperature [38 °F], L = low temperature [0 °F], or I = ice cream temperature [-15 °F]). For example, “VOP.RC.M” refers to the “vertical open, remote condensing, medium temperature” equipment class.

d. V is the volume of the case (ft³) as measured in AHRI Standard 1200, Appendix C.

e. TDA is the total display area of the case (ft²) as measured in AHRI Standard 1200, Appendix D.

Delete without substitution:

TABLE C403.10.1(2)
MINIMUM EFFICIENCY REQUIREMENTS: COMMERCIAL REFRIGERATORS AND FREEZERS

EQUIPMENT TYPE				ENERGY USE LIMITS (kWh/day) ^{a, b}	TEST PROCEDURE
Equipment Class ^c	Family Code	Operating Mode	Rating Temperature		
VOP.RC.M	Vertical open	Remote condensing	Medium	$0.82 \times TDA + 4.07$	AHRI 1200
SVO.RC.M	Semivertical open	Remote condensing	Medium	$0.83 \times TDA + 3.18$	
HZO.RC.M	Horizontal open	Remote condensing	Medium	$0.35 \times TDA + 2.88$	
VOP.RC.L	Vertical open	Remote condensing	Low	$2.27 \times TDA + 6.85$	
HZO.RC.L	Horizontal open	Remote condensing	Low	$0.57 \times TDA + 6.88$	
VGT.RC.M	Vertical transparent door	Remote condensing	Medium	$0.22 TDA + 1.95$	
VGT.RC.L	Vertical transparent door	Remote condensing	Low	$0.56 \times TDA + 2.61$	
SOC.RC.M	Service over counter	Remote condensing	Medium	$0.51 \times TDA + 0.11$	
VOP.SC.M	Vertical open	Self-contained	Medium	$1.74 \times TDA + 4.71$	
SVO.SC.M	Semivertical open	Self-contained	Medium	$1.73 \times TDA + 4.59$	
HZO.SC.M	Horizontal open	Self-contained	Medium	$0.77 \times TDA + 5.55$	
HZO.SC.L	Horizontal open	Self-contained	Low	$1.92 \times TDA + 7.08$	
VGT.SC.I	Vertical transparent door	Self-contained	Ice cream	$0.67 \times TDA + 3.29$	
VGS.SC.I	Vertical solid door	Self-contained	Ice cream	$0.38 \times V + 0.88$	
HGT.SC.I	Horizontal transparent door	Self-contained	Ice cream	$0.56 \times TDA + 0.43$	
SVO.RC.L	Semivertical open	Remote condensing	Low	$2.27 \times TDA + 6.85$	
VOP.RC.I	Vertical open	Remote condensing	Ice cream	$2.89 \times TDA + 8.7$	
SVO.RC.I	Semivertical open	Remote condensing	Ice cream	$2.89 \times TDA + 8.7$	
HZO.RC.I	Horizontal open	Remote condensing	Ice cream	$0.72 \times TDA + 8.74$	
VGT.RC.I	Vertical transparent door	Remote condensing	Ice cream	$0.66 \times TDA + 3.05$	
HGT.RC.M	Horizontal transparent door	Remote condensing	Medium	$0.16 \times TDA + 0.13$	

HGT.RC.L	Horizontaltransparent door	Remote condensing	Low	$0.34 \times TDA + 0.26$
HGT.RC.I	Horizontaltransparent door	Remote condensing	Ice cream	$0.4 \times TDA + 0.31$
VCS.RC.M	Vertical solid door	Remote condensing	Medium	$0.11 \times V + 0.26$
VCS.RC.L	Vertical solid door	Remote condensing	Low	$0.23 \times V + 0.54$
VCS.RC.I	Vertical solid door	Remote condensing	Ice cream	$0.27 \times V + 0.63$
HCS.RC.M	Horizontal solid door	Remote condensing	Medium	$0.11 \times V + 0.26$
HCS.RC.L	Horizontal solid door	Remote condensing	Low	$0.23 \times V + 0.54$
HCS.RC.I	Horizontal solid door	Remote condensing	Ice cream	$0.27 \times V + 0.63$
HCS.RC.I	Horizontal solid door	Remote condensing	Ice cream	$0.27 \times V + 0.63$
SOC.RC.L	Service over counter	Remote condensing	Low	$1.08 \times TDA + 0.22$
SOC.RC.I	Service over counter	Remote condensing	Ice cream	$1.26 \times TDA + 0.26$
VOP.SC.L	Vertical open	Self-contained	Low	$4.37 \times TDA + 11.82$
VOP.SC.I	Vertical open	Self-contained	Ice cream	$5.55 \times TDA + 15.02$
SVO.SC.L	Semivertical open	Self-contained	Low	$4.34 \times TDA + 11.51$
SVO.SC.I	Semivertical open	Self-contained	Ice cream	$5.52 \times TDA + 14.63$
HZO.SC.I	Horizontal open	Self-contained	Ice cream	$2.44 \times TDA + 9.0$
SOC.SC.I	Service over counter	Self-contained	Ice cream	$1.76 \times TDA + 0.36$
HCS.SC.I	Horizontal solid door	Self-contained	Ice cream	$0.38 \times V + 0.88$

- a. V = Volume of the case, as measured in accordance with Appendix C of AHRI 1200.
- b. TDA = Total display area of the case, as measured in accordance with Appendix D of AHRI 1200.
- e. Equipment class designations consist of a combination [in sequential order separated by periods (AAA).(BB).(C)] of:

(AAA)	An equipment family code where:		
	VOP	=	vertical open
	SVO	=	semivertical open
	HZO	=	horizontal open
	HCT	=	horizontal transparent doors
	HCS	=	horizontal solid doors
	SOC	=	service over counter
(BB)	An operating mode code:		

	RC	=	remote condensing
	SC	=	self-contained
(C)	A rating temperature code:		
	M	=	medium temperature (38°F)
	L	=	low temperature (0°F)
	I	=	ice-cream temperature (15°F)

For example, “VOP.RC.M” refers to the “vertical-open, remote-condensing, medium-temperature” equipment class.

C403.10.3 Refrigerated display cases (Mandatory). Site-assembled or site-constructed refrigerated display cases shall comply with the following:

1. Lighting and glass doors in refrigerated display cases shall be controlled by one of the following:
 - 1.1. Time-switch controls to turn off lights during nonbusiness hours. Timed overrides for display cases shall turn the lights on for up to 1 hour and shall automatically time out to turn the lights off.
 - 1.2. Motion-sensor controls on each display case section that reduce lighting power by not less than 50 percent within 3 minutes after the area within the sensor range is vacated.
2. Low-temperature display cases shall incorporate temperature-based defrost termination control with a time-limit default. The defrost cycle shall terminate first on an upper temperature limit breach and second upon a time limit breach.
3. Antisweat heater controls shall reduce the energy use of the antisweat heater as a function of the relative humidity in the air outside the door or to the condensation on the inner glass pane.

Add new text as follows:

DOE

U.S. Department of Energy
c/o Superintendent of Documents
1000 Independence Avenue SW
Washington DC 20585

U.S. 10 Part CFR 431, Subpart R: Commercial Refrigerators, Freezers and Refrigerator-Freezers

AHRI

Air-Conditioning, Heating, &
Refrigeration Institute
2111 Wilson Blvd, Suite 500
Arlington VA 22201

AHRI 1250-(I-P) 2014:

Standard for Performance Rating in Walk-in Coolers and Freezers

Reason: This proposal removes the conflict with current federal regulations and updates this section by replacing the outdated prescriptive language to be consistent with current DOE regulations. It also combines the current tables into one, which harmonizes with the federal regulations and recent updates made to ASHRAE 90.1.

Bibliography: 1. ENERGY INDEPENDENCE AND SECURITY ACT OF 2007, Section 312, Walk-in Coolers and

Walk-in Freezers.

2. Code of Federal Regulations, US 10 CFR 431.306

3. 2014-06-03 Energy Conservation Program: Energy Conservation Standards for Walk-In Coolers and Freezers; Final Rule

[https://www.ecfr.gov/cgi-bin/retrieveECFR?](https://www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=396fdb135febfc51995dca67c2cee17&mc=true&n=pt10.3.431&r=P ART&ty=HTML#sp10.3.431.c)

[gp=&SID=396fdb135febfc51995dca67c2cee17&mc=true&n=pt10.3.431&r=P ART&ty=HTML#sp10.3.431.c](https://www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=396fdb135febfc51995dca67c2cee17&mc=true&n=pt10.3.431&r=P ART&ty=HTML#sp10.3.431.c)

Cost Impact: The code change proposal will decrease the cost of construction

This proposal updates the requirements to the current federal mandate, clarifying that there are no additional requirements that need to be satisfied. Deleting the additional requirements will drastically reduce the cost to the consumer, and thereby reducing the cost of construction.

Proposal # 5379

CE146-19

CE147-19

IECC: C402.1, C403.10.1, C403.10.2, C403.10.2.1, TABLE C403.10.2.1(1), TABLE C403.10.2.1(2), TABLE C403.10.2.1(3)

Proponent: Thomas D. Culp, Ph.D., Birch Point Consulting LLC, representing self (culp@birchpointconsulting.com)

2018 International Energy Conservation Code

Revise as follows:

C402.1 General (Prescriptive). Building thermal envelope assemblies for buildings that are intended to comply with the code on a prescriptive basis in accordance with the compliance path described in Item 2 of Section C401.2, shall comply with the following:

1. The opaque portions of the building thermal envelope shall comply with the specific insulation requirements of Section C402.2 and the thermal requirements of either the *R*-value-based method of Section C402.1.3; the *U*-, *C*- and *F*-factor-based method of Section C402.1.4; or the component performance alternative of Section C402.1.5.
2. Roof solar reflectance and thermal emittance shall comply with Section C402.3.
3. Fenestration in building envelope assemblies shall comply with Section C402.4.
4. Air leakage of building envelope assemblies shall comply with Section C402.5.

Alternatively, where buildings have a vertical fenestration area or skylight area exceeding that allowed in Section C402.4, the building and building thermal envelope shall comply with Section C401.2, Item 1 or Section C401.2, Item 3.

Walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with Section C403.10.1 ~~or C403.10.2.~~

C403.10.1 Walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers (Mandatory). ~~Refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with this section. Walk-in coolers and walk-in freezers that are neither site assembled nor site constructed shall comply with the following:~~

~~1. Be equipped with automatic door closers that firmly close walk-in doors that have been closed to within 1 inch (25 mm) of full closure.~~

Exception: Automatic closers are not required for doors more than 45 inches (1143 mm) in width or more than 7 feet (2134 mm) in height.

~~2. Doorways shall have strip doors, curtains, spring-hinged doors or other method of minimizing infiltration when doors are open.~~

~~3. Walk-in coolers and refrigerated warehouse coolers shall contain wall, ceiling, and door insulation of not less than R-25 and walk-in freezers and refrigerated warehouse freezers shall contain wall, ceiling and door insulation of not less than R-32.~~

Exception: Glazed portions of doors or structural members need not be insulated.

~~4. Walk-in freezers shall contain floor insulation of not less than R-28.~~

~~5. Transparent reach-in doors for walk-in freezers and windows in walk-in freezer doors shall be of triple-pane glass, either filled with inert gas or with heat-reflective treated glass.~~

~~6. Windows and transparent reach-in doors for walk-in coolers shall be of double-pane or triple-~~

pane, inert gas-filled, heat-reflective treated glass-

7. Evaporator fan motors that are less than 1 hp (0.746 kW) and less than 460 volts shall use electronically commutated motors, brushless direct current motors, or 3-phase motors.

8. Condenser fan motors that are less than 1 hp (0.746 kW) shall use electronically commutated motors, permanent split capacitor type motors or 3-phase motors.

9. Where antisweat heaters without antisweat heater controls are provided, they shall have a total door rail, glass and frame heater power draw of not more than 7.1 W/ft² (76 W/m²) of door opening for *walk-in freezers* and 3.0 W/ft² (32 W/m²) of door opening for *walk-in coolers*.

10. Where antisweat heater controls are provided, they shall reduce the energy use of the antisweat heater as a function of the relative humidity in the air outside the door or to the condensation on the inner glass pane.

11. Lights in *walk-in coolers*, *walk-in freezers*, *refrigerated warehouse coolers* and *refrigerated warehouse freezers* shall either use light sources with an efficacy of not less than 40 lumens per watt, including ballast losses, or shall use light sources with an efficacy of not less than 40 lumens per watt, including ballast losses, in conjunction with a device that turns off the lights within 15 minutes when the space is not occupied.

C403.10.2 Walk-in coolers and walk-in freezers (Mandatory). ~~Site assembled or site constructed Refrigerated warehouse coolers, refrigerated warehouse freezers, walk-in coolers, and walk-in freezers~~ shall comply with the following:

1. Automatic door closers shall be provided that fully close walk-in doors that have been closed to within 1 inch (25 mm) of full closure.

Exception: Closers are not required for doors more than 45 inches (1143 mm) in width or more than 7 feet (2134 mm) in height.

2. Doorways shall be provided with strip doors, curtains, spring-hinged doors or other method of minimizing infiltration when the doors are open.
3. Walls shall be provided with insulation having a thermal resistance of not less than R-25, ceilings shall be provided with insulation having a thermal resistance of not less than R-25 and doors of *walk-in coolers* and *walk-in freezers* shall be provided with insulation having a thermal resistance of not less than R-32.

Exception: Insulation is not required for glazed portions of doors or at structural members associated with the walls, ceiling or door frame.

4. The floor of *walk-in freezers* shall be provided with insulation having a thermal resistance of not less than R-28.
5. Transparent reach-in doors for and windows in opaque *walk-in freezer* doors shall be provided with triple-pane glass having the interstitial spaces filled with inert gas or provided with heat-reflective treated ~~glass, glass, or vacuum insulating glazing.~~
6. Transparent reach-in doors for and windows in opaque *walk-in cooler* doors shall be double-pane heat-reflective treated glass having the interstitial space ~~gas filled, filled, or vacuum insulating glazing.~~
7. Evaporator fan motors that are less than 1 hp (0.746 kW) and less than 460 volts shall be electronically commutated motors or 3-phase motors.
8. Condenser fan motors that are less than 1 hp (0.746 kW) in capacity shall be of the electronically commutated or permanent split capacitor-type or shall be 3-phase motors.

Exception: Fan motors in *walk-in coolers* and *walk-in freezers* combined in a single enclosure greater than 3,000 square feet (279 m²) in floor area are exempt.

9. Antisweat heaters that are not provided with anti-sweat heater controls shall have a total door rail, glass and frame heater power draw not greater than 7.1 W/ft² (76 W/m²) of door opening for *walk-in freezers*, and not greater than 3.0 W/ft² (32 W/m²) of door opening for *walk-in coolers*.

10. Antisweat heater controls shall be configured to reduce the energy use of the antisweat heater as a function of the relative humidity in the air outside the door or to the condensation on the inner glass pane.
11. Light sources shall have an efficacy of not less than 40 lumens per Watt, including any ballast losses, or shall be provided with a device that automatically turns off the lights within 15 minutes of when the *walk-in cooler* or *walk-in freezer* was last occupied.

~~C403.10.2.1 Performance standards (Mandatory)~~. Effective January 1, 2020, Doors in walk-in coolers and walk-in freezers shall meet the requirements of Tables ~~C403.10.2.1~~ C403.10.1(1) , ~~C403.10.2.1~~ and C403.10.1(2) and ~~C403.10.2.1~~ .

Walk-in cooler and walk-in freezer refrigeration systems, except for walk-in process cooling refrigeration systems as defined in U.S. 10 CFR 431.302, shall meet the requirements of Table C403.10.1(3).

TABLE ~~C403.10.2.1~~ C403.10.1(1)
WALK-IN COOLER AND FREEZER DISPLAY DOOR EFFICIENCY REQUIREMENTS^a

CLASS DESCRIPTOR	CLASS	MAXIMUM ENERGY CONSUMPTION (kWh/day) ^a
Display door, medium temperature	DD, M	$0.04 \times A_{dd} + 0.41$
Display door, low temperature	DD, L	$0.15 \times A_{dd} + 0.29$

- a. A_{dd} is the surface area of the display door.

TABLE ~~C403.10.2.1~~ C403.10.1(2)
WALK-IN COOLER AND FREEZER NONDISPLAY DOOR EFFICIENCY REQUIREMENTS^a

CLASS DESCRIPTOR	CLASS	MAXIMUM ENERGY CONSUMPTION (kWh/day) ^a
Passage door, medium temperature	PD, M	$0.05 \times A_{nd} + 1.7$
Passage door, low temperature	PD, L	$0.14 \times A_{nd} + 4.8$
Freight door, medium temperature	FD, M	$0.04 \times A_{nd} + 1.9$
Freight door, low temperature	FD, L	$0.12 \times A_{nd} + 5.6$

- a. A_{nd} is the surface area of the nondisplay door.

TABLE ~~C403.10.2.1~~ C403.10.1(3)
WALK-IN COOLER AND FREEZER REFRIGERATION SYSTEM EFFICIENCY REQUIREMENTS

CLASS DESCRIPTOR	CLASS	MINIMUM ANNUAL WALK-IN ENERGY FACTOR AWEF (Btu/W-h) ^a
Dedicated condensing, medium temperature, indoor system	DC.M.I	5.61
Dedicated condensing, medium temperature, indoor system, > 9,000 Btu/h capacity	DC.M.I, > 9,000	5.61
Dedicated condensing, medium temperature, outdoor system	DC.M. <u>I</u> O	7.60
Dedicated condensing, medium temperature, outdoor system, > 9,000 Btu/h capacity	DC.M.I, > 9,000	7.60

Dedicated condensing, low temperature, indoor system, net capacity (q_{net}) < 6,500 Btu/h	DC.L.I., < 6,500	$9.091 \times 10^{-5} \times q_{net} + 1.81$
Dedicated condensing, low temperature, indoor system, net capacity (q_{net}) \geq 6,500 Btu/h	DC.L.I., \geq 6,500	2.40
Dedicated condensing, low temperature, outdoor system, net capacity (q_{net}) < 6,500 Btu/h	DC.L.O., < 6,500	$6.522 \times 10^{-5} \times q_{net} + 2.73$
Dedicated condensing, low temperature, outdoor system, net capacity (q_{net}) \geq 6,500 Btu/h	DC.L.O., \geq 6,500	3.15
Unit cooler, medium	UC.M	9.00
Unit cooler, low temperature, net capacity (q_{net}) < 15,500 Btu/h	UC.L., < 15,500	$1.575 \times 10^{-5} \times q_{net} + 3.91$
Unit cooler, low temperature, net capacity (q_{net}) \geq 15,500 Btu/h	UC.L., \geq 15,500	4.15

a. q_{net} is net capacity as determined in accordance with 10 CFR 431.304 and certified in accordance with 10 CFR part 429.

Reason: The purpose of this proposal is to clean up outdated language regarding walk-in cooler and walk-in freezer requirements, and make the requirements consistent with current federal regulations that either already came into effect June 5, 2017 or will come into effect July 10, 2020 prior to implementation of the 2021 IECC. Most importantly, the performance requirements for walk-in coolers and freezer in Tables C403.10.2.1(1) through (3) are updated to be consistent with 10 CFR 431.306. Additionally, the redundant itemized lists in Sections C403.10.1 and C403.10.2 are combined into one section. There is no reason to repeat the same requirements twice that apply to both site-built and prefabricated walk-in coolers and freezers (defined as < 3,000 ft²) and refrigerated warehouse coolers and freezers (>3,000 ft²). Finally, vacuum insulating glazing is added to the list of allowed glazing options in reach-in doors, as the current wording could inadvertently be misinterpreted as not including vacuum insulating glazing. The thermal resistance of vacuum insulating glazing is at least twice that of other options (e.g. R10 for vacuum insulating glazing vs. R3-5 for the other options), so this ensures there is no unintended barrier to using these higher performance products.

Links to the federal standards are as follows:

10 CFR 431.302 - Definitions concerning walk-in coolers and walk-in freezers. <https://www.law.cornell.edu/cfr/text/10/431.302>

10 CFR 431.304 - Uniform test method for the measurement of energy consumption of walk-in coolers and walk-in freezers. <https://www.law.cornell.edu/cfr/text/10/431.304>

10 CFR Part 429 - Certification, compliance, and enforcement for consumer products and commercial and industrial equipment. <https://www.law.cornell.edu/cfr/text/10/part-429>

Cost Impact: The code change proposal will increase the cost of construction. Increased product costs associated with the increased performance requirements were evaluated as part of the federal rulemaking process and deemed cost effective. For instance, see

CE148-19

IECC: C403.10.1, C403.10.2

Proponent: Thomas D. Culp, Ph.D., Birch Point Consulting LLC, representing the Glazing Industry Code Committee (culp@birchpointconsulting.com)

2018 International Energy Conservation Code

Revise as follows:

C403.10.1 Walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers (Mandatory). *Refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with this section. Walk-in coolers and walk-in freezers that are neither site assembled nor site constructed shall comply with the following:*

1. Be equipped with automatic door-closers that firmly close walk-in doors that have been closed to within 1 inch (25 mm) of full closure.
Exception: Automatic closers are not required for doors more than 45 inches (1143 mm) in width or more than 7 feet (2134 mm) in height.
2. Doorways shall have strip doors, curtains, spring-hinged doors or other method of minimizing infiltration when doors are open.
3. *Walk-in coolers and refrigerated warehouse coolers shall contain wall, ceiling, and door insulation of not less than R-25 and walk-in freezers and refrigerated warehouse freezers shall contain wall, ceiling and door insulation of not less than R-32.*
Exception: Glazed portions of doors or structural members need not be insulated.
4. *Walk-in freezers shall contain floor insulation of not less than R-28.*
5. Transparent reach-in doors for *walk-in freezers* and windows in *walk-in freezer* doors shall be of triple-pane glass, either filled with inert gas or with heat-reflective treated glass, or vacuum insulating glazing.
6. Windows and transparent reach-in doors for *walk-in coolers* shall be of double-pane or triple-pane, inert gas-filled, heat-reflective treated glass, or vacuum insulating glazing.
7. Evaporator fan motors that are less than 1 hp (0.746 kW) and less than 460 volts shall use electronically commutated motors, brushless direct-current motors, or 3-phase motors.
8. Condenser fan motors that are less than 1 hp (0.746 kW) shall use electronically commutated motors, permanent split capacitor-type motors or 3-phase motors.
9. Where antisweat heaters without antisweat heater controls are provided, they shall have a total door rail, glass and frame heater power draw of not more than 7.1 W/ft² (76 W/m²) of door opening for *walk-in freezers* and 3.0 W/ft² (32 W/m²) of door opening for *walk-in coolers*.
10. Where antisweat heater controls are provided, they shall reduce the energy use of the antisweat heater as a function of the relative humidity in the air outside the door or to the condensation on the inner glass pane.
11. Lights in *walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers* shall either use light sources with an efficacy of not less than 40 lumens per watt, including ballast losses, or shall use light sources with an efficacy of not less than 40 lumens per watt, including ballast losses, in conjunction with a device that turns off the lights within 15 minutes when the space is not occupied.

C403.10.2 Walk-in coolers and walk-in freezers (Mandatory). Site-assembled or site-constructed *walk-in coolers and walk-in freezers* shall comply with the following:

1. Automatic door closers shall be provided that fully close walk-in doors that have been closed to within 1 inch (25 mm) of full closure.
Exception: Closers are not required for doors more than 45 inches (1143 mm) in width or more than 7 feet (2134 mm) in height.
2. Doorways shall be provided with strip doors, curtains, spring-hinged doors or other method of minimizing infiltration when the doors are open.
3. Walls shall be provided with insulation having a thermal resistance of not less than R-25, ceilings shall be provided with insulation having a thermal resistance of not less than R-25 and doors of *walk-in coolers* and *walk-in freezers* shall be provided with insulation having a thermal resistance of not less than R-32.
Exception: Insulation is not required for glazed portions of doors or at structural members associated with the walls, ceiling or door frame.
4. The floor of *walk-in freezers* shall be provided with insulation having a thermal resistance of not less than R-28.
5. Transparent reach-in doors for and windows in opaque *walk-in freezer* doors shall be provided with triple-pane glass having the interstitial spaces filled with inert gas or provided with heat-reflective treated glass, or vacuum insulating glazing.
6. Transparent reach-in doors for and windows in opaque *walk-in cooler* doors shall be double-pane heat-reflective treated glass having the interstitial space gas filled, or vacuum insulating glazing.
7. Evaporator fan motors that are less than 1 hp (0.746 kW) and less than 460 volts shall be electronically commutated motors or 3-phase motors.
8. Condenser fan motors that are less than 1 hp (0.746 kW) in capacity shall be of the electronically commutated or permanent split capacitor-type or shall be 3-phase motors.
Exception: Fan motors in *walk-in coolers* and *walk-in freezers* combined in a single enclosure greater than 3,000 square feet (279 m²) in floor area are exempt.
9. Antisweat heaters that are not provided with anti-sweat heater controls shall have a total door rail, glass and frame heater power draw not greater than 7.1 W/ft² (76 W/m²) of door opening for *walk-in freezers*, and not greater than 3.0 W/ft² (32 W/m²) of door opening for *walk-in coolers*.
10. Antisweat heater controls shall be configured to reduce the energy use of the antisweat heater as a function of the relative humidity in the air outside the door or to the condensation on the inner glass pane.
11. Light sources shall have an efficacy of not less than 40 lumens per Watt, including any ballast losses, or shall be provided with a device that automatically turns off the lights within 15 minutes of when the *walk-in cooler* or *walk-in freezer* was last occupied.

Reason: The purpose of this proposal is to ensure the code does not prohibit the use of new vacuum insulating glazing products in reach-in doors for walk-in coolers and freezers. These high performance products have been recently commercialized by multiple manufacturers and are already being used in display doors for walk-in coolers, walk-in freezers, and stand-alone refrigerated display cases. However, items 5 and 6 of Sections C403.10.1 and C403.10.2 have specific limited options for reach-in doors: double pane glazing with argon and low-e glass for coolers, and triple pane glass with either argon or low-e glass for freezers. This is overly prescriptive and could be interpreted as not including vacuum insulating glazing, and introduces a barrier to these higher performance products. The thermal resistance of vacuum insulating glazing is at least twice that of other options (e.g. R10 for vacuum insulating glazing vs. R3-5 for the other options). Therefore, this proposal adds vacuum insulating glazing to the list of options for reach-in doors. These changes are necessary as it is important that an energy code not actually hinder the use of innovative, higher performance products. Note: a separate proposal includes a comprehensive update to the entire walk-in cooler and freezer section, updating the performance requirement tables. However, this simple proposal at least addresses the specific

problem for vacuum insulating glazing, in case the code development body does not approve the broader proposal.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. While vacuum insulating glazing is more expensive than traditional glazing options for display doors, this is not a requirement to use vacuum insulating glazing. This proposal simply removes a barrier so that vacuum insulating glazing may be considered as an option.

Proposal # 4902

CE148-19

CE149-19

IECC: C403.10.2, TABLE C403.10.2.1(1), TABLE C403.10.2.1(2), TABLE C403.10.2.1(3), DOE Chapter 06 (New), AHRI Chapter 06 (New)

Proponent: IECC: C403.10.2, TABLE C403.10.2.1(1), TABLE C403.10.2.1(2), TABLE C403.10.2.1(3), Chapter 6CE (New)

2018 International Energy Conservation Code

Revise as follows:

C403.10.2 Walk-in coolers and walk-in freezers (Mandatory). Walk-in cooler and walk-in freezer refrigeration systems, except for walk-in process cooling refrigeration systems as defined in U.S. 10 CFR 431.302, shall meet the requirements of Tables C403.10.2(1), C403.10.2(2), and C403.10.2(3). Site-assembled or site-constructed *walk-in coolers* and *walk-in freezers* shall comply with the following:

1. Automatic door closers shall be provided that fully close walk-in doors that have been closed to within 1 inch (25 mm) of full closure.

Exception: Closers are not required for doors more than 45 inches (1143 mm) in width or more than 7 feet (2134 mm) in height.

2. Doorways shall be provided with strip doors, curtains, spring-hinged doors or other method of minimizing infiltration when the doors are open.
3. Walls shall be provided with insulation having a thermal resistance of not less than R-25, ceilings shall be provided with insulation having a thermal resistance of not less than R-25 and doors of *walk-in coolers* and *walk-in freezers* shall be provided with insulation having a thermal resistance of not less than R-32.

Exception: Insulation is not required for glazed portions of doors or at structural members associated with the walls, ceiling or door frame.

4. The floor of *walk-in freezers* shall be provided with insulation having a thermal resistance of not less than R-28.
5. Transparent reach-in doors for and windows in opaque *walk-in freezer* doors shall be provided with triple-pane glass having the interstitial spaces filled with inert gas or provided with heat-reflective treated glass.
6. Transparent reach-in doors for and windows in opaque *walk-in cooler* doors shall be double-pane heat-reflective treated glass having the interstitial space gas-filled.
7. Evaporator fan motors that are less than 1 hp (0.746 kW) and less than 460 volts shall be electronically commutated motors or 3-phase motors.
8. Condenser fan motors that are less than 1 hp (0.746 kW) in capacity shall be of the electronically commutated or permanent split capacitor type or shall be 3-phase motors.

Exception: Fan motors in *walk-in coolers* and *walk-in freezers* combined in a single enclosure greater than 3,000 square feet (279 m²) in floor area are exempt.

9. Antisweat heaters that are not provided with anti-sweat heater controls shall have a total door rail, glass and frame heater power draw not greater than 7.1 W/ft² (76 W/m²) of door opening for *walk-in freezers*, and not greater than 3.0 W/ft² (32 W/m²) of door opening for *walk-in coolers*.

10. ~~Antisweat heater controls shall be configured to reduce the energy use of the antisweat heater as a function of the relative humidity in the air outside the door or to the condensation on the inner glass pane.~~
11. ~~Light sources shall have an efficacy of not less than 40 lumens per Watt, including any ballast losses, or shall be provided with a device that automatically turns off the lights within 15 minutes of when the walk-in cooler or walk-in freezer was last occupied.~~

**TABLE ~~G403.10.2.1~~ C403.10.2(1)
WALK-IN COOLER AND FREEZER DISPLAY DOOR EFFICIENCY REQUIREMENTS^a**

CLASS DESCRIPTOR	CLASS	MAXIMUM ENERGY CONSUMPTION (kWh/day) ^a
Display door, medium temperature	DD, M	$0.04 \times A_{dd} + 0.41$
Display door, low temperature	DD, L	$0.15 \times A_{dd} + 0.29$

- a. A_{dd} is the surface area of the display door.

**TABLE ~~G403.10.2.1~~ C403.10.2(2)
WALK-IN COOLER AND FREEZER NONDISPLAY DOOR EFFICIENCY REQUIREMENTS^a**

CLASS DESCRIPTOR	CLASS	MAXIMUM ENERGY CONSUMPTION (kWh/day) ^a
Passage door, medium temperature	PD, M	$0.05 \times A_{nd} + 1.7$
Passage door, low temperature	PD, L	$0.14 \times A_{nd} + 4.8$
Freight door, medium temperature	FD, M	$0.04 \times A_{nd} + 1.9$
Freight door, low temperature	FD, L	$0.12 \times A_{nd} + 5.6$

- a. A_{nd} is the surface area of the nondisplay door.

**TABLE ~~G403.10.2.1~~ C403.10.2(3)
WALK-IN COOLER AND FREEZER REFRIGERATION SYSTEM EFFICIENCY REQUIREMENTS**

CLASS DESCRIPTOR	CLASS	MINIMUM ANNUAL WALK-IN ENERGY FACTOR AWEF (Btu/W-h) ^a	Test Procedure
Dedicated condensing, medium temperature, indoor system	DC.M.I	5.61	AHRI 1250
Dedicated condensing, medium temperature, indoor system, > 9,000 Btu/h capacity	DC.M.I, > 9,000	5.61	
Dedicated condensing, medium temperature, outdoor system	DC.M.O	7.60	
Dedicated condensing, medium temperature, outdoor system, > 9,000 Btu/h capacity	DC.M.O, > 9,000	7.60	
Dedicated condensing, low temperature, indoor system, net capacity (q_{net}) < 6,500 Btu/h	DC.L.I, < 6,500	$9.091 \times 10^{-5} \times q_{net} + 1.81$	
Dedicated condensing, low temperature, indoor system, net capacity (q_{net}) ≥ 6,500 Btu/h	DC.L.I, ≥ 6,500	2.40	

Dedicated condensing, low temperature, outdoor system, net capacity (q_{net}) < 6,500 Btu/h	DC.L.O., < 6,500	$6.522 \times 10^{-5} \times q_{net} + 2.73$
Dedicated condensing, low temperature, outdoor system, net capacity (q_{net}) ≥ 6,500 Btu/h	DC.L.O., ≥ 6,500	3.15
Unit cooler, medium	UC.M	9.00
Unit cooler, low temperature, net capacity (q_{net}) < 15,500 Btu/h	UC.L., < 15,500	$1.575 \times 10^{-5} \times q_{net} + 3.91$
Unit cooler, low temperature, net capacity (q_{net}) ≥ 15,500 Btu/h	UC.L., ≥ 15,500	4.15

a. q_{net} is net capacity (Btu/hr) as determined in accordance with AHRI Standard 1250

Add new standard(s) as follows:

DOE

U.S. Department of Energy
c/o Superintendent of Documents
1000 Independence Avenue SW
Washington DC 20585

U.S. 10 Part CFR 431, Subpart R: Walk-in Coolers and Walk-in Freezers

AHRI

Air-Conditioning, Heating, &
Refrigeration Institute
2111 Wilson Blvd, Suite 500
Arlington VA 22201

AHRI 1250-(I-P) 2014: Standard for Performance Rating in Walk-in Coolers and Freezers

Reason: This proposal is intended to update language regarding walk-in cooler and walk-in freezer requirements to be consistent with current federal regulations that are already in effect as well as with those that will become effective in 2020, prior to the publishing of this code. This will also harmonize the IECC with recent updates made to ASHRAE 90.1.

This proposal reorganizes and cleans up language by deleting the prescriptive requirements and updates the tables that are out of sync with U.S.10 CFR 431. This will streamline the requirements thereby reducing confusion for code officials.

Bibliography: 1. ENERGY INDEPENDENCE AND SECURITY ACT OF 2007, Section 312, Walk-in Coolers and Walkin Freezers.

2. Code of Federal Regulations, US 10 CFR 431.306

3. 2014-06-03 Energy Conservation Program: Energy Conservation Standards for Walk-In Coolers and Freezers; Final Rule

<https://www.ecfr.gov/cgi-bin/retrieveECFR?>

[gp=&SID=396fdb3135feb3c51995dca67c2cee17&mc=true&n=pt10.3.431&r=P ART&ty=HTML#sp10.3.431.c](https://www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=396fdb3135feb3c51995dca67c2cee17&mc=true&n=pt10.3.431&r=P ART&ty=HTML#sp10.3.431.c)

Cost Impact: The code change proposal will decrease the cost of construction

This proposal updates the requirements to the current federal mandate, clarifying that there are no additional requirements that need to be satisfied. Deleting the additional requirements will drastically reduce the cost to the consumer, and thereby reducing the cost of construction.

Staff Analysis: A review of the standard proposed for inclusion in the code, AHRI 1250-(I-P) 2014, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 5402

CE149-19

CE150-19 Part I

PART I — IECC: C403.11.3.1

PART II — IECC: R403.4.1 (IRC N1103.4.1)

Proponent: Howard Ahern, representing self (howard.ahern@airexmfg.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

Revise as follows:

C403.11.3.1 Protection of piping insulation (Mandatory). Piping insulation exposed to the weather shall be protected from damage, including that caused by sunlight, moisture, wind, and physical damage. Protective barrier shall be removable for equipment maintenance ~~and wind,~~ and shall provide shielding from solar radiation that can cause degradation of the material. Adhesive tape shall not be permitted.

Proposal # 4565

CE150-19 Part I

CE150-19 Part II

IECC: R403.4.1 (IRC N1103.4.1)

Proponent: Howard Ahern, representing self (howard.ahern@airexmfg.com)

2018 International Energy Conservation Code

Revise as follows:

R403.4.1 (IRC N1103.4.1) Protection of piping insulation. Piping insulation exposed to weather shall be protected from damage, including that caused by sunlight, moisture, wind and physical damage. Protective barrier shall be removeable for equipment maintenance and wind. ~~The protection~~ shall provide shielding from solar radiation that can cause degradation of the material. Adhesive tape shall be prohibited.

Reason: This proposal will clarify the intent of section R403.4.1 The intent of this section is not only protection of pipe insulation from weather but to insure the insulations thermal conductivity energy savings integrity last the life of the mechanical system as per the intent of the code . In order to remove the opportunity for misunderstanding so that the code has its's intended result the term "equipment maintenance" must be clarified. The intent is in the original proponents reason statement of this requirement EC110-09/10 stated -" All AC units require periodic maintenance. The frequency varies with how hard the unit operates, exterior temperature, preventive maintenance program, and many others. In every occasion, every maintenance provides an excuse for the Freon line insulation to be touched and removed." The intent is clear that the protection be removable and independent of the pipe insulation for maintenance without damaging the pipe insulation.

Removing protection without damaging the insulation is stated in EC110-09/10 "Adhesives Tape is not permitted as it will limit maintenance and damage insulations permeability characteristics. Removal of tape damages the integrity of the original insulation into pieces, specially, if the insulation has reached thermo set state."

Protective covering must also protect from physical damage so if the protection covering does get damaged from stepping on it, dropping tools on it, birds, lawn trimmers etc.it can be replaced keeping the insulations thermal conductivity integrity and insuring the insulation system last the life of the mechanical system and avoiding the costly replacement of the insulation.

2012 & 2018 IECC Code and commentary both state that Equipment maintenance also include protection from physical damage to the pipe insulation.

The code section also requires the removal protection to shield from solar radiation that can cause degradation on of the insulation. This sometime get confused with UV protection that is under damage from "sunlight". The additional requirement to shield against solar radiation that is more than just UV , solar radiation also includes heat. Heat is a major factor in the degradation of insulation .UV testing can be unreliable as it depends on product placement.

"Insulation materials cannot endure physical impact or are fragile to many elements, i.e. weather. Weather impact on insulation is very high. The sun enhances the transforms the insulation from thermoplast (soft) foam to thermoset (brittle) foam property. The property change also impacts the thermal conductivity of the material and consequently its performance. Protective covers become the sacrificial lamb and provide the stability in properties of the insulation Maintenance of pipes insulation is often non-existence. Aged insulation is generally brittle, poorly reinstalled, and subject to damage to the weather"

Example of saving from protecting the insulation can be measured in Dr Kourmohammadi PE, Ph.D. CPD, CIPE, CFPE LEED AP

Paper on Protective covers which calculated the BTU and Electrical energy saving of exposed Freon lines for residential and multifamily purposes .

Freon lines exposed 3 ft to 5 ft

0.15/kwhr cost of electricity (peak demand cost can be at

0.25\$/kwhr)

10 hours operation

365 days

¾" Freon line

½" insulation property 0.020227 Btu/(hr F ft)

For the California region it amounted to a \$1.00 per foot annual savings

Example of cost saving average 5ft per unit in California with a population of 39 million and

If only half of the population for example had a heating and /Cooling system with an average of 5ft exposed piping with degraded or no insulation , Protected pipe insulation would amount to an yearly electrical saving of \$975,000,000

This is electrical saving and does not include the saving to home and building owners from not having acostly expenses of replacing the insulation for maintenance.

Bibliography: Impact and Advantages of Removable Insulation Protective Covers

Dr. "Saum" K. Nourmohammadi, PEx3, Ph.D. CPD, CIPE, CFPE,

LEED AP

2017 ASHRAE Handbook

2012, 2018 IECC Code & Commentary

Cost Impact: The code change proposal will not increase or decrease the cost of construction There are wide varieties of removable protective coverings and are available at most supply distributors. These can be as simple as sheet metal or plastic channels, or cladding, PVC covers, Jackets, aluminum covers etc. Many covering require much less labor compared to painting or banding and they are currently being used all over the US so there no increase in cost.

Proposal # 4566

CE150-19 Part II

CE151-19 Part I

PART I — IECC: SECTION C202, 202 (New), C403.11.1

PART II — IECC: R202 (IRC N1101.6), R403.3.1 (IRC N1103.3.1)

Proponent: Jay Peters, Codes and Standards International, representing AQC Industries, TheBlueDuct (Jay@BuildingCodesAndStandards.com); Sharon Bonesteel, Salt River Project, representing Salt River Project (sharon.bonesteel@srpnet.com); Greg Johnson, representing Coalition for Fair Energy Codes (gjohnsonconsulting@gmail.com); David A Eisenberg, DCAT, representing DCAT (strawnet@gmail.com); Brent Ursenbach, WC-3 Inc, Inc., representing Utah Governors Office of Energy Development, representing State of Utah, Governors Office of Energy Development (brentu@wc-3.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Add new definition as follows:

THERMAL DISTRIBUTION EFFICIENCY (TDE). The resistance to changes in air heat as air is conveyed through a distance of air duct. TDE is a heat loss calculation evaluating the difference in the heat of the air between the air duct inlet and outlet caused by differences in temperatures between the air in the duct and the duct material. TDE is expressed as a percent difference between the inlet and outlet heat in the duct.

Revise as follows:

C403.11.1 Duct and plenum insulation and sealing (Mandatory). Supply and return air ducts and plenums shall be insulated with not less than R-6 insulation where located in unconditioned spaces and where located outside the building with not less than R-8 insulation in Climate Zones 1 through 4 and not less than R-12 insulation in Climate Zones 5 through 8. Ducts located underground beneath buildings shall be insulated as required in this section or have an equivalent thermal distribution efficiency. Underground ducts utilizing the thermal distribution efficiency method shall be listed and labeled to indicate the R-Value equivalency. Where located within a building envelope assembly, the duct or plenum shall be separated from the building exterior or unconditioned or exempt spaces by not less than R-8 insulation in Climate Zones 1 through 4 and not less than R-12 insulation in Climate Zones 5 through 8.

Exceptions:

1. Where located within equipment.
2. Where the design temperature difference between the interior and exterior of the duct or plenum is not greater than 15°F (8°C).

Ducts, air handlers and filter boxes shall be sealed. Joints and seams shall comply with Section 603.9 of the International Mechanical Code.

Proposal # 4928

CE151-19 Part I

CE151-19 Part II

IECC: R202 (IRC N1101.6), R403.3.1 (IRC N1103.3.1)

Proponent: Jay Peters, Codes and Standards International, representing AQC Industries, TheBlueDuct (Jay@BuildingCodesAndStandards.com); Sharon Bonesteel, Salt River Project, representing Salt River Project (sharon.bonesteel@srpnet.com); Greg Johnson, representing Coalition for Fair Energy Codes (gjohnsonconsulting@gmail.com); David A Eisenberg, DCAT, representing DCAT (strawnet@gmail.com); Brent Ursenbach, WC-3 Inc, Inc., representing Utah Governors Office of Energy Development, representing State of Utah, Governors Office of Energy Development (brentu@wc-3.com)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Add new definition as follows:

THERMAL DISTRIBUTION EFFICIENCY (TDE). The resistance to changes in air heat as air is conveyed through a distance of air duct. TDE is a heat loss calculation evaluating the difference in the heat of the air between the air duct inlet and outlet caused by differences in temperatures between the air in the duct and the duct material. TDE is expressed as a percent difference between the inlet and outlet heat in the duct

Revise as follows:

R403.3.1 (IRC N1103.3.1) Insulation (Prescriptive). Supply and return ducts in attics shall be insulated to an *R*-value of not less than R-8 for ducts 3 inches (76 mm) in diameter and larger and not less than R-6 for ducts smaller than 3 inches (76 mm) in diameter. Supply and return ducts in other portions of the building shall be insulated to not less than *R*-6 for ducts 3 inches (76 mm) in diameter and not less than R-4.2 for ducts smaller than 3 inches (76 mm) in diameter. Ducts buried beneath a building shall be insulated as required per this section or have an equivalent thermal distribution efficiency. Underground ducts utilizing the thermal distribution efficiency method shall be listed and labeled to indicate the *R*-value equivalency.

Exception: Ducts or portions thereof located completely inside the building thermal envelope.

Reason: This proposal was unanimously approved by the membership at the Public Comment Hearing (PCH) based on the committee's recommendation to add a product labeling provision. It received strong support from industry (NSF, the Air Conditioning Contractors of America's National Code Committee, building and energy officials and the Membership during the PCH. The CE proposal is being resubmitted as approved with absolutely no changes or edits with hope that the membership and committee will both agree again to the merit. The residential proposal has been correlated with the commercial section for consistency. The technical aspects of the proposal were verified through rigorous testing by NSF utilizing the NSF Protocol P374. The Thermal Distribution Efficiency and R-Value equivalency is currently being printed on ducts to eliminate any confusion in the field, as requested by the committee. This modification requires the duct manufacturer to list the product and label it accordingly. *For example*, if a duct has been tested and certified to meet an R-10 equivalency, it will indicate on the label that the Thermal Distribution Efficiency = R10 Equivalency.

BACKGROUND: For decades, ICC ES PMG LC 1014 has been the only criteria used to certify underground ducts. NSF, ICC, UL and IAPMO all recognize ICC's LC1014, which specifies NSF P374 to calculate a duct's Thermal Distribution Efficiency. This provisions allows for a proven, energy efficient methodology to be used, and eliminates unnecessary insulation when a duct material exhibits an equally efficient method to deliver conditioned air, saving material and energy. This is not proprietary and multiple manufacturers have certified to ICC LC 1014 and the NSF Protocol for Thermal Distribution Efficiency. TDE is only used for ducts buried

beneath building and does not eliminate or restrict insulated ducts from their current compliance path utilizing the traditional R-value method. It is merely another path for cutting edge products to meet the intent of the code.

Bibliography: ICC ES Listing Criteria LC1014 Underground Ducts
NSF Protocol P374 Thermal Distribution Efficiency of Underground Ducts

Cost Impact: The code change proposal will decrease the cost of construction
By not requiring additional and unnecessary insulation on ducts underneath buildings, it could actually save construction costs.

Proposal # 5693

CE151-19 Part II

CE152-19

IECC: C403.11.2.3

Proponent: Brent Ursenbach, WC-3, representing State of Utah, Governors Office of Energy Development (brentu@wc-3.com)

2018 International Energy Conservation Code

Revise as follows:

C403.11.2.3 High-pressure duct systems (Mandatory). Ducts and plenums designed to operate at static pressures equal to or greater than 3 inches water gauge (747 Pa) shall be insulated and sealed in accordance with Section C403.11.1. In addition, ducts and plenums shall be leak tested in accordance with the SMACNA HVAC Air Duct Leakage Test Manual and shown to have a rate of air leakage (CL) less than or equal to 4.0 as determined in accordance with Equation 4-8.

$$CL = F/P^{0.65}$$

(Equation 4-8)

where:

F = The measured leakage rate in cfm per 100 square feet of duct surface.

P = The static pressure of the test.

Documentation shall be furnished by the designer demonstrating that representative sections totaling not less than 25 percent of the duct area have been tested and that all tested sections comply with the requirements of this section.

Reason: The designer does not perform the leak testing required by this section. Certainly the test requires documentation; however, it may be provided by the general contractor, mechanical contractor, test and balance contractor, or other qualified individuals or organizations, as approved by the AHJ.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal simply removes the designer as the sole provider of duct testing documentation. The testing requirements remain unchanged.

Proposal # 5629

CE152-19

CE153-19

IECC: C403.11.3

Proponent: donald sivigny, State of MN, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Energy Conservation Code

C403.11.3 Piping insulation (Mandatory). Piping serving as part of a heating or cooling system shall be thermally insulated in accordance with Table C403.11.3.

Exceptions:

1. Factory-installed piping within HVAC equipment tested and rated in accordance with a test procedure referenced by this code.
2. Factory-installed piping within room fan-coils and unit ventilators tested and rated according to AHRI 440 (except that the sampling and variation provisions of Section 6.5 shall not apply) and AHRI 840, respectively.
3. Piping that conveys fluids that have a design operating temperature range between 60°F (15°C) and 105°F (41°C).
4. Piping that conveys fluids that have not been heated or cooled through the use of fossil fuels or electric power.
5. Strainers, control valves, and balancing valves associated with piping 1 inch (25 mm) or less in diameter.
6. Direct buried piping that conveys fluids at or below 60°F (15°C).
7. In radiant heating systems, sections of piping intended by design to radiate heat.

Reason: Why is the proposed code change needed?

The table insulation requirements could be misinterpreted to require insulation on piping used for radiant heating, which would be counterproductive to how radiant heat systems work. This change clarifies that active sections of piping used for radiant heat do not require insulation,

Why is the proposed code change a reasonable solution? It clarifies the table requirements

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The Intent of this change is to not insulate radiant heating system piping to reduce the heat it provides to a space. That is the intent of a Radiant system. This change will save money by allowing the system to work as designed.

Proposal # 5132

CE153-19

CE154-19

IECC: C202 (New); C403.13(New); Table C403.13(New); Chapter 6CE DOE(NEW); DOD(NEW)

Proponent: Connor Barbaree, representing ASHRAE (cbarbaree@ashrae.org)

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Add new definition as follows:

Best Efficiency Point. The pump hydraulic power operating point, consisting of both flow and head conditions, that results in the maximum efficiency.

PEI_{CL}. The pump energy index for a constant load (hp) (kW).

PER_{CL}. The pump energy rating for a constant load (hp) (kW), determined in accordance with either testing for bare pumps, pumps sold with single-phase induction motors, and pumps sold with drivers other than electric motors, or testing for pumps sold with motors and rated using the testing-based approach, or testing for pumps sold with motors and rated using the calculation-based approach.

PER_{STD}. The *PER_{CL}* for a pump that is minimally compliant with Subpart Y of 10 CFR, Part 431, with the same flow and specific speed characteristics as the tested pump (hp/kW).

PEI_{VL}. The pump energy index for a variable load.

PER_{VL}. The pump energy rating for a variable load (hp) (kW) determined in accordance with testing for pumps sold with motors and continuous or non-continuous controls rated using the testing-based approach, or testing for pumps sold with motors and continuous controls rated using the calculation-based approach.

PUMP Equipment designed to move liquids that does or does not include entrained gases, free solids, and totally dissolved solids by physical or mechanical action and includes a bare pump and, if included by the manufacturer at the time of sale, mechanical equipment, driver, and controls.

Clean Water Pump. A device that is designed for use in pumping water with a maximum non-absorbent free solid content of 0.016 pounds per cubic foot (0.26 kilograms per cubic meter), and with a maximum dissolved solid content of 3.1 pounds per cubic foot (50 kilograms per cubic meter), provided that the total gas content of the water does not exceed the saturation volume, and disregarding any additives necessary to prevent the water from freezing at a minimum of 14°F (-10°C).

End Suction Close-Coupled (ESCC) Pump. A close-coupled, dry rotor, end suction device that has a shaft input power greater than or equal to 1.0 horsepower (0.75 kW) and less than or equal to 200 horsepower (150 kW) at its *Best Efficiency Point (BEP)* and full impeller diameter and that is not a dedicated-purpose pool pump. It is also a single-stage, rotodynamic pump in which the liquid enters the bare pump in a direction parallel to the impeller shaft and on the side opposite the bare pump's driver-end, and is then discharged through a volute in a plane perpendicular to the shaft.

End Suction Frame Mounted/Own Bearings (ESFM) Pump. A mechanically-coupled, dry rotor, end suction device that has a shaft input power greater than or equal to 1.0 horsepower (0.75 kW) and less than or equal to 200 horsepower (150 kW) at its *Best Efficiency Point (BEP)* and full impeller diameter and that is not a dedicated-purpose pool pump. It is also a single-stage, rotodynamic pump in which the liquid enters the bare

pump in a direction parallel to the impeller shaft and on the side opposite the bare pump's driver-end, and is then discharged through a volute in a plane perpendicular to the shaft.

In-Line (IL) Pump. A device that is either a twin-head pump or a single-stage, single-axis flow, dry rotor, rotodynamic pump that has a shaft input power greater than or equal to 1.0 horsepower (0.75 kW) and less than or equal to 200 horsepower (150 kW) at its *Best Efficiency Point (BEP)* and full impeller diameter, in which liquid is discharged through a volute in a plane perpendicular to the shaft. Such pumps do not include pumps that are mechanically coupled or close-coupled, have a pump power output that is less than or equal to 5.0 horsepower (3.7 kW) at its *Best Efficiency Point (BEP)* at full impeller diameter, and are distributed in commerce with a horizontal motor.

Radially Split, Multi-Stage, Vertical, In-Line Diffuser Casing (RSV) Pump. A device that is a vertically suspended, multi-stage, single axis flow, dry rotor, rotodynamic pump complies with all of the following:

1. Has a shaft input power greater than or equal to 1.0 horsepower (0.75 kW) and less than or equal to 200 horsepower (150 kW) at its *Best Efficiency Point (BEP)* and full impeller diameter and at the number of stages required for testing,
2. In which liquid is discharged in a place perpendicular to the impeller shaft.
3. For which each stage or bowl, consists of an impeller and diffuser.
4. For which no external part of such a pump is designed to be submerged in the pumped liquid.

Submersible Turbine (ST) Pump. A device that is a single-stage or multi-stage, dry rotor, rotodynamic pump that is designed to be operated with the motor and stage(s) fully submerged in the pumped liquid; that has a shaft input power greater than or equal to 1.0 horsepower (0.75 kW) and less than or equal to 200 horsepower (150 kW) at its *Best Efficiency Point (BEP)* and full impeller diameter and at the number of stages required for testing; and in which each stage of this pump consists of an impeller and diffuser, and liquid enters and exits each stage of the bare pump in a direction parallel to the impeller shaft.

Add new text as follows:

C403.13 Pumping equipment performance requirements (Mandatory). Clean water pumps meeting the following criteria shall meet the efficiency requirements shown in Table C403.13: when tested and rated in accordance with the applicable test procedure.

1. A flow rate of 25 gallons per minute (0.0016 cubic meters per second) or greater at its Best Efficiency Point (BEP) at full impeller diameter;
2. Maximum head of 459 feet (140 meters) at its Best Efficiency Point (BEP) at full impeller diameter and the number of stages required for testing;
3. Design temperature range from 14 to 248 °F (-10 to 120 °C);
4. Designed to operate with either:
 - 4.1. A 2- or 4-pole induction motor; or
 - 4.2. A non-induction motor with a speed of rotation operating range that includes speeds of rotation between 2,880 and 4,320 revolutions per minute and/or 1,440 and 2,160 revolutions per minute; and
 - 4.3. In either 4.1 or 4.2, the driver and impeller must rotate at the same speed;
5. For submersible turbine pumps, a 6-inch (15 centimeters) or smaller bowl diameter; and
6. For end suction close-coupled pumps and end suction frame mounted/own bearings pumps specific speed less than or equal to 5,000 rpm when calculated using U.S. customary units.

Exceptions:

1. Fire pumps.

2. Self-priming pumps.
3. Prime-assist pumps.
4. Magnet driven pumps.
5. Pumps designed to be used in a nuclear facility subject to 10 CFR part 50.
6. Pumps meeting the design and construction requirements set forth in MIL–P–17639F, MIL–P–17881D, MIL–P–17840C, MIL–P–18682D, and MIL–P–18472G.

Table C403.13
Efficiency Requirements Pumps

Maximum PEI for Pumps Manufactured on or after January 27, 2020

<u>Pump Type</u>	<u>Nominal Speed of Rotation (rpm)</u>	<u>Operating Mode</u>	<u>Maximum PEI^a</u>	<u>C-value^b</u>	<u>Test Procedure</u>
<u>End Suction, Close Coupled</u>	<u>1800</u>	<u>Constant Load</u>	<u>1.00</u>	<u>128.47</u>	<u>10 CFR Part 431</u>
<u>End Suction, Close Coupled</u>	<u>3600</u>	<u>Constant Load</u>	<u>1.00</u>	<u>130.42</u>	
<u>End Suction, Close Coupled</u>	<u>1800</u>	<u>Variable Load</u>	<u>1.00</u>	<u>128.47</u>	
<u>End Suction, Close Coupled</u>	<u>3600</u>	<u>Variable Load</u>	<u>1.00</u>	<u>130.42</u>	
<u>End Suction, Frame Mounted</u>	<u>1800</u>	<u>Constant Load</u>	<u>1.00</u>	<u>128.85</u>	
<u>End Suction, Frame Mounted</u>	<u>3600</u>	<u>Constant Load</u>	<u>1.00</u>	<u>130.99</u>	
<u>End Suction, Frame Mounted</u>	<u>1800</u>	<u>Variable Load</u>	<u>1.00</u>	<u>128.85</u>	
<u>End Suction, Frame Mounted</u>	<u>3600</u>	<u>Variable Load</u>	<u>1.00</u>	<u>130.99</u>	
<u>In-Line</u>	<u>1800</u>	<u>Constant Load</u>	<u>1.00</u>	<u>129.30</u>	
<u>In-Line</u>	<u>3600</u>	<u>Constant Load</u>	<u>1.00</u>	<u>133.84</u>	
<u>In-Line</u>	<u>1800</u>	<u>Variable Load</u>	<u>1.00</u>	<u>129.63</u>	
<u>In-Line</u>	<u>3600</u>	<u>Variable Load</u>	<u>1.00</u>	<u>133.20</u>	
<u>Radially Split, Vertical</u>	<u>1800</u>	<u>Constant Load</u>	<u>1.00</u>	<u>129.63</u>	
<u>Radially Split, Vertical</u>	<u>3600</u>	<u>Constant Load</u>	<u>1.00</u>	<u>133.20</u>	
<u>Radially Split, Vertical</u>	<u>1800</u>	<u>Variable Load</u>	<u>1.00</u>	<u>129.63</u>	
<u>Radially Split, Vertical</u>	<u>3600</u>	<u>Variable Load</u>	<u>1.00</u>	<u>133.20</u>	
<u>Submersible Turbine</u>	<u>1800</u>	<u>Constant Load</u>	<u>1.00</u>	<u>138.78</u>	
<u>Submersible Turbine</u>	<u>3600</u>	<u>Constant Load</u>	<u>1.00</u>	<u>134.85</u>	

Submersible Turbine	1800	Variable Load	1.00	138.78
Submersible Turbine	3600	Variable Load	1.00	134.85

a. For pumps with the Constant Load operating mode, the relevant PEI is PEI_{CL} . For pumps with the Variable Load operating mode the relevant PEI is PEI_{VL} .

b. The C-values shown in this table shall be used in the equation for PER_{STD} when calculating PEI_{CL} or PEI_{VL} .

Add new standard(s) as follows:

DOE

U.S. Department of Energy
c/o Superintendent of Documents
1000 Independence Avenue SW
Washington DC 20585

10 CFR Part 50: Domestic Licensing of Production and Utilization Facilities

DOD

U.S. Department of Defense
Naval Sea Systems Command
Department of the Navy
Washington Navy Yard
Washington DC 20362
US

MIL-P-18472G-1989: Pump, Centrifugal, Condensate, Feed Booster, Waste Heat Boiler and Distilling Plant

DOD

U.S. Department of Defense
Naval Sea Systems Command
Department of the Navy
Washington Navy Yard
Washington DC 20362
US

MIL-P-18682D-1984: Pump, Centrifugal, Main Condenser Circulating, Naval Shipboard

DOD

U.S. Department of Defense
Naval Sea Systems Command
Department of the Navy
Washington Navy Yard
Washington DC 20362
US

MIL-P-17881D-1972: Pump, Centrifugal, Boiler Feed, (Multi Stage)

DOD

U.S. Department of Defense
Naval Sea Systems Command
Department of the Navy
Washington Navy Yard
Washington DC 20362
US

DOD

U.S. Department of Defense
Naval Sea Systems Command
Department of the Navy
Washington Navy Yard
Washington DC 20362
US

MIL-P-17840-D-2018: Pump, Centrifugal, Close Coupled, Navy Standard for Use on Naval Ships

Reason: In January, 2016, the U.S. Department of Energy published a final rule for energy conservation standards for commercial and industrial clean water pumps that will go into effect as of January 27, 2020. This addendum provides a new table of information about the new efficiency requirements. It also provides new definitions that are needed to accompany the table.

This proposal will have an energy savings impact in those buildings that use clean water pumps. According to the DOE analysis, the simple payback for the pumps ranges from 0.8 to 3.1 years.

This information will help energy code officials ensure that installed clean water pumps are meeting the federal efficiency standards on or after January 2020.

The formula for efficiency is shown below (and is copied from the DOE Technical Support Document, December 2015):

<https://www.regulations.gov/document?D=EERE-2011-BT-STD-0031-0056>

$$\eta_{pump,STD} = -0.8500 * \ln(Q)^2 - 0.3800 * \ln(Ns) * \ln(Q) - 11.480 * \ln(Ns)^2 + 17.800 * \ln(Q) + 179.80 * \ln(Ns) - (C + 555.60)$$

Where:

Q = flow at BEP at full impeller diameter and nominal speed (gpm),

Ns = specific speed at 60 Hz and calculated using U.S. customary units, and

C = a constant that is set for the surface, which is set based on the speed of rotation and equipment type of the pump model.

“The minimally compliant PER is unique to each pump model and is a function of each pump model’s flow at BEP and specific speed. This function is an equation that represents the attainable hydraulic efficiency of pumps for a given flow and specific speed. All of the terms of the polynomial function are the same for all efficiency levels and classes of pumps for the DOE analysis, except for the constant parameter. This parameter, the “C-value,” is unique for each combination of equipment class and efficiency level. Changing the C-value moves the otherwise fixed-shape surface to higher or lower efficiency. Because the function was developed to represent the inherent pump efficiency trends as flow and specific speed change, the C-value can be used to define an efficiency level, which is equally stringent for all pumps across the scope of flow and specific speed. By adjusting the C-value, DOE can establish different efficiency levels that represent different efficiency percentiles.

For this final rule the three-dimensional polynomial efficiency equation discussed in the previous paragraph is

based on the EU minimum efficiency index (MEI) equation but is adapted to account for the use of English units and the 60 Hz electrical input power found in the United States. The converted equation is shown in Equation 5.1.”

Bibliography: U.S. Department of Energy, *Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Pumps*, Washington DC, December 2015.

<https://www.regulations.gov/document?D=EERE-2011-BT-STD-0031-0056>

U.S. Department of Energy, *Energy Conservation Program: Energy Conservation Standards for Pumps; Final Rule*, Washington DC, January 26, 2016. <https://www.regulations.gov/document?D=EERE-2011-BT-STD-0031-0060>

Cost Impact: The code change proposal will increase the cost of construction. Costs will increase due to the incremental cost increases associated with the new efficiency standards for clean water pumps. Based on analysis performed by the US Department of Energy, the incremental costs of increased efficiency of the federally regulated clean water pumps will be recovered with 3.1 years.

Analysis: A review of the standards proposed for inclusion in the code, 10 CFR part 50, MIL–P–17639F, MIL–P–17881D, MIL–P–17840C, MIL–P–18682D, and MIL–P–18472G. with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 4871

CE154-19

CE156-19

IECC: C404.2.1

Proponent: Eric Makela, New Buildings Institute, representing New Buildings Institute
(ericM@newbuildings.org)

2018 International Energy Conservation Code

Revise as follows:

C404.2.1 High input service water-heating systems. Gas-fired water-heating equipment installed in new buildings shall be in compliance with this section. Where a singular piece of water-heating equipment serves the entire building and the input rating of the equipment is 1,000,000 Btu/h (293 kW) or greater, such equipment shall have a thermal efficiency, E_t , of not less than ~~90~~92 percent. Where multiple pieces of water-heating equipment serve the building and the combined input rating of the water-heating equipment is 1,000,000 Btu/h (293 kW) or greater, the combined input-capacity-weighted-average thermal efficiency, E_t , shall be not less than 90 percent.

Exceptions:

1. Where not less than 25 percent of the annual service water-heating requirement is provided by on-site renewable energy or site-recovered energy, the minimum thermal efficiency requirements of this section shall not apply.
2. The input rating of water heaters installed in individual dwelling units shall not be required to be included in the total input rating of service water-heating equipment for a building.
3. The input rating of water heaters with an input rating of not greater than 100,000 Btu/h (29.3 kW) shall not be required to be included in the total input rating of service water-heating equipment for a building.

Reason: Section C404.2.1 addresses not just typical commercial service water heating loads like laundries; it also addresses larger boilers used for central heating in R-occupancies. Water heating is one of the largest loads in R-1 (hotels) and R-2 (multifamily) occupancies. It composes around 25-35% of the total building load in typical multifamily buildings. This makes this an important provision of the energy code. However, while federal minimums and boiler markets have advanced, this provision has not been updated. Therefore, the performance premium that this provision requires has eroded over time.

This proposal includes a modest increase in the efficiency requirement for C404.2.1 from 90% E_t to 92% E_t . This improvement can be met without making major technology shifts since achieving a 90% E_t already generally requires condensing technology. Of the 2782 boilers that meet the 1,000,000 Btu/h threshold, 852 meet the existing 90% requirement and 792 meet a requirement of 92% E_t , so market availability will be minimally impacted.

Savings for this proposal are significant. Using the high-rise multifamily model developed by Pacific Northwest National Lab's determination study of the 2015 IECC, savings from this proposal would range from 2.3%-4.0% whole-building energy savings depending on climate zone. While 2015 is not exactly the same as 2018, the water heating provisions are very similar so the savings should be reasonably representative of savings for 2018.

Cost Impact: The code change proposal will increase the cost of construction

This proposal could have a limited impact on cost. However, it only eliminates about 7% of the boilers that meet the existing requirement, so the impact should be minimal.

CE157-19

IECC: C404.4

Proponent: Mitchell Tidwell, Ridgeway Plumbing, Inc., representing Ridgeway Plumbing, Inc.

2018 International Energy Conservation Code

Revise as follows:

C404.4 Insulation of piping. Piping from a water heater to the termination of the heated water fixture supply pipe ~~The following piping shall be insulated to levels indicated in accordance with Table C403.11.3. On both the inlet and outlet piping of a storage water heater or heated water storage tank, the piping to a heat trap or the first 8 feet (2438 mm) of piping, whichever is less, shall be insulated. Piping that is heat traced shall be insulated in accordance with Table C403.11.3 or the heat trace manufacturer's instructions. Tubular pipe insulation shall be installed in accordance with the insulation manufacturer's instructions. Pipe insulation shall be continuous except where the piping passes through a framing member. The minimum insulation thickness requirements of this section shall not supersede any greater insulation thickness requirements necessary for the protection of piping from freezing temperatures or the protection of personnel against external surface temperatures on the insulation.~~

Exception: Tubular pipe insulation shall not be required on the following:

1. Recirculating system piping, other than the cold-water piping of demand recirculating systems, including the supply and return piping of a circulating tank type water heater.
2. The first 8 feet of outlet piping for a constant-temperature non-recirculating storage system.
3. The first 8 feet of branch piping connected to a recirculated, heat-traced, or impedance heated piping.
4. The inlet piping between the storage tank and a heat trap in a non-recirculating storage system.

Piping that is externally heated, such as heat trace or impedance heating, shall be insulated to levels indicated in Table C403.11.3 or the heat trace manufacturer's instructions.

1. ~~The tubing from the connection at the termination of the fixture supply piping to a plumbing fixture or plumbing appliance.~~
2. ~~Valves, pumps, strainers and threaded unions in piping that is 1 inch (25 mm) or less in nominal diameter.~~
3. ~~Piping from user-controlled shower and bath mixing valves to the water outlets.~~
4. ~~Gold water piping of a demand recirculation water system.~~
5. ~~Tubing from a hot drinking water heating unit to the water outlet.~~
6. ~~Piping at locations where a vertical support of the piping is installed.~~
7. ~~Piping surrounded by building insulation with a thermal resistance (R value) of not less than R-3.~~

Reason: The 2015 IECC established new insulation requirements for hot water piping. The code now requires that every inch of concealed hot water piping be insulated with minimum 1-inch thick insulation. This now includes even non-circulated hot water piping and branches. As the plumbing industry wakes up to the new requirements, they are proving to be excessive, expensive, and unworkable.

The level of hot water insulation now far exceeds that found in ASHRAE 90.1-2016. Although it has always made sense to insulate the hot water mains and returns of recirculating systems, there is little to gain by insulating non-circulated branch piping, which tends to cool rather quickly due to infrequent demand – whether insulated or not. Plumbing hot water pipes are typically 110-120° F, and are generally installed in interior wall cavities averaging 70° F. And much of today's water piping is plastic – CPVC or PEX - with insulative properties

that greatly exceed that of copper.

The additional cost of insulating all of these non-circulated branches far outweighs any perceived payback. Recirculating loops are typically located in roomy ceiling spaces; branch piping usually runs inside cramped 3-1/2-inch frame walls. With insulated pipe measuring 2-1/2 to 3 inches O.D., installation can be difficult and time-consuming inside congested walls (and *impossible* on single- or double-furred block walls.) The extra cost in labor and materials to insulate CPVC hot water pipes running inside a wall can be several times the cost of the pipe itself. Often there is just no way to comply with the code. Multi-family buildings are especially affected.

This proposal restores the actual ASHRAE 90.1 requirements. Hot water recirculating piping would be insulated. So would the first 8 feet of branch piping emanating from the circulating loop. So would the first 8 feet of outlet piping from the heated water source. This amount of hot water insulation is actually greater than previous ASHRAE standards. And it achieves a more reasonable balance between energy savings and installation costs.

I urge the committee to carefully consider the real world impact of the current hot water insulation requirements and to approve this sensible fix.

Cost Impact: The code change proposal will decrease the cost of construction

By eliminating unnecessary hot water branch piping insulation, this proposal will reduce the cost of plumbing by \$200 – \$300 per unit for a typical two-bathroom apartment.

Proposal # 4113

CE157-19

CE158-19

IECC: C404.5.2.1

Proponent: Michael Cudahy, PPFA, representing PPFA Plastic Pipe and Fittings Association (mikec@cmservices.com)

2018 International Energy Conservation Code

Revise as follows:

C404.5.2.1 Water volume determination. The volume shall be the sum of the internal volumes of pipe, fittings, valves, meters and manifolds between the nearest source of heated water and the termination of the fixture supply pipe. The volume in the piping shall be determined from the "Volume" column in Table ~~G404.5.1~~ C404.5.1 or from Table E202.1 of the International Plumbing Code. The volume contained within fixture shutoff valves, within flexible water supply connectors to a fixture fitting and within a fixture fitting shall not be included in the water volume determination. Where heated water is supplied by a recirculating system or heat-traced piping, the volume shall include the portion of the fitting on the branch pipe that supplies water to the fixture.

Reason: Table E202.1 in the IPC, "Internal Volume of Various Water Distribution Tubing" is well suited for this calculation and should be specifically included as an option in calculations for the section. The table is shown below.

TABLE E202.1 - INTERNAL VOLUME OF VARIOUS WATER DISTRIBUTION TUBING

OUNCES OF WATER PER FOOT OF TUBE								
Size Nominal, Inch	Copper Type M	Copper Type L	Copper Type K	CPVC CTS SDR 11	CPVC SCH 40	CPVC SCH 80	PE-RT SDR 9	Composite F 121
3/8	1.06	0.97	0.84	N/A	1.17	—	0.64	0.64
1/2	1.69	1.55	1.45	1.25	1.89	1.46	1.18	1.37
3/4	3.43	3.22	2.90	2.67	3.38	2.74	2.35	3.39
1	5.81	5.49	5.17	4.43	5.53	4.57	3.91	5.56
1 1/4	8.70	8.36	8.09	6.61	9.66	8.24	5.81	8.49
1 1/2	12.18	11.83	11.45	9.22	13.20	11.38	8.09	13.8
2	21.08	20.58	20.04	15.79	21.88	19.11	13.86	21.4

For SI: 1 ounce = 0.030 liter.

Bibliography: None

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The addition of the method of calculation is not expected to increase or decrease the cost of construction, it is simply a more accurate method for determining volume.

Staff Analysis: The table referenced is in Appendix E of the IPC.

CE159-19 Part I

PART I — IECC: C404.6.1, C404.7

PART II — IECC: R403.5.1.1 (IRC N1103.5.1.1), R403.5.2 (IRC N1103.5.2)

Proponent: Anthony Floyd, City of Scottsdale, representing City of Scottsdale (afloyd@scottsdaleaz.gov)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

Revise as follows:

C404.6.1 Circulation systems. Heated-water circulation systems shall be provided with a circulation pump. The system return pipe shall be a dedicated return pipe or a cold water supply pipe. Gravity and thermo-syphon circulation systems shall be prohibited. Controls for circulating hot water system pumps shall start the pump based on the identification of a demand for hot water within the occupancy. The controls shall automatically turn off the pump when the water in the circulation loop is at the desired temperature and when there is not a demand for hot water. The controls shall limit the temperature of the water entering the cold-water piping to not greater than 104°F (40°C).

~~C404.7~~ C404.6.1.1 Demand recirculation controls. Demand recirculation water systems shall have controls that comply with both of the following:

1. The controls shall start the pump upon receiving a signal from the action of a user of a fixture or appliance, sensing the presence of a user of a fixture or sensing the flow of hot or tempered water to a fixture fitting or appliance.
2. ~~The controls shall limit the temperature of the water entering the cold-water piping to not greater than 104°F (40°C).~~

Proposal # 5415

CE159-19 Part I

CE159-19 Part II

IECC: R403.5.1.1 (IRC N1103.5.1.1), R403.5.2 (IRC N1103.5.2)

Proponent: Anthony Floyd, City of Scottsdale, representing City of Scottsdale (afloyd@scottsdaleaz.gov)

2018 International Energy Conservation Code

Revise as follows:

R403.5.1.1 (IRC N1103.5.1.1) Circulation systems. Heated water circulation systems shall be provided with a circulation pump. The system return pipe shall be a dedicated return pipe or a cold water supply pipe. Gravity and thermosyphon circulation systems shall be prohibited. Controls for circulating hot water system pumps shall start the pump based on the identification of a demand for hot water within the occupancy. The controls shall automatically turn off the pump when the water in the circulation loop is at the desired temperature and when there is no demand for hot water. The controls shall limit the temperature of the water entering the cold-water piping to not greater than 104°F (40°C).

~~**R403.5.2 (IRC N1103.5.2)**~~ **R403.5.1.1.1 (IRC N1103.5.1.1.1) Demand recirculation water systems.** Demand recirculation water systems shall have controls that comply with both of the following:

1. The controls shall start the pump upon receiving a signal from the action of a user of a fixture or appliance, sensing the presence of a user of a fixture or sensing the flow of hot or tempered water to a fixture fitting or appliance.
2. ~~The controls shall limit the temperature of the water entering the cold water piping to not greater than 104°F (40°C).~~

Reason: This code change clarifies the requirements for heated water circulation and demand recirculation systems. Section R403.5.2 - 'Demand recirculation water systems' is moved and renumbered as a subsection to R403.5.1.1 - 'Circulation systems' because demand recirculation is a type of 'circulation system' with specific demand-initiated control requirements.

The temperature limit for cold-water return piping, item 2 of 'Demand recirculation water systems' is relocated to the body of section R403.5.1.1 (circulation systems) because this provision pertains to all heated water circulation systems that use cold-water piping as a return to the water-heating equipment.

This code change clarifies the intent of this section for the energy efficient delivery of hot water by correlating the existing provisions for circulation and demand recirculation water systems. These provisions are only applicable when heated water circulation and demand recirculation systems are installed.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This code change does not add any new requirements.

Proposal # 5417

CE159-19 Part II

CE160-19 Part I

PART I — IECC: Part I: C404.9.1, C404.9.3, C404.10

IECC Part II: R403.10 (N1103.10), R403.10.2 (N1103.10.2), R403.10.3(N1103.10.3), R403.12 (N1103.12)

PART II — IECC: R403.10 (IRC N1103.10), R403.10.1 (IRC N1103.10.1), R403.10.3 (IRC N1103.10.3), R403.12 (IRC N1103.12)

Proponent: Jennifer Hatfield, representing Association of Pool & Spa Professionals
(jen@jhatfieldandassociates.com)

2018 International Energy Conservation Code

C404.9 Energy consumption of pools and permanent spas (Mandatory). The energy consumption of pools and permanent spas shall be controlled by the requirements in Sections C404.9.1 through C404.9.3.

Revise as follows:

C404.9.1 Heaters. The electric power to all heaters shall be controlled by ~~an~~ a readily accessible on-off switch that is an integral part of the heater, mounted on the exterior of the heater, or external to and within 3 feet (914 mm) of the heater ~~in a location with ready access~~. Operation of such switch shall not change the setting of the heater thermostat. Such switches shall be in addition to a circuit breaker for the power to the heater. Gas-fired heaters shall not be equipped with continuously burning ignition pilots.

C404.9.2 Time switches. Time switches or other control methods that can automatically turn off and on heaters and pump motors according to a preset schedule shall be installed for heaters and pump motors. Heaters and pump motors that have built-in time switches shall be in compliance with this section.

Exceptions:

1. Where public health standards require 24-hour pump operation.
2. Pumps that operate solar- and waste-heat-recovery pool heating systems.

C404.9.3 Covers. Outdoor heated pools and outdoor permanent spas shall be provided with a vapor-retardant cover or other *approved* vapor-retardant means.

Exception: Where more than ~~75~~ 70 percent of the energy for heating, computed over an operating season of ~~not fewer than 3 calendar months~~, is ~~from site-recovered energy such as from a heat pump or on-site renewable solar energy system source~~, covers or other vapor-retardant means shall not be required.

C404.10 Energy consumption of portable Portable spas (Mandatory). The energy consumption of electric-powered portable spas shall be controlled by the requirements of APSP 14.

Proposal # 5571

CE160-19 Part I

CE160-19 Part II

IECC: R403.10 (IRC N1103.10), R403.10.1 (IRC N1103.10.1), R403.10.3 (IRC N1103.10.3), R403.12 (IRC N1103.12)

Proponent: Jennifer Hatfield, representing Association of Pool & Spa Professionals (jen@jhatfieldandassociates.com)

2018 International Energy Conservation Code

Revise as follows:

R403.10 (IRC N1103.10) Pools Energy consumption of pools and permanent spa energy consumption spas (Mandatory). The energy consumption of pools and permanent spas shall be controlled by the requirements in accordance with Sections R403.10.1 through R403.10.3.

R403.10.1 (IRC N1103.10.1) Heaters. The electric power to heaters shall be controlled by a readily *accessible* on-off switch that is an integral part of the heater, mounted on the exterior of the heater, or external to and within 3 feet (914 mm) of the heater. Operation of such switch shall not change the setting of the heater thermostat. Such switches shall be in addition to a circuit breaker for the power to the heater. Gas-fired heaters shall not be equipped with continuously burning ignition pilots.

R403.10.2 (IRC N1103.10.2) Time switches. Time switches or other control methods that can automatically turn off and on heaters and pump motors according to a preset schedule shall be installed for heaters and pump motors. Heaters and pump motors that have built-in time switches shall be in compliance with this section.

Exceptions:

1. Where public health standards require 24-hour pump operation.
2. Pumps that operate solar- and waste-heat-recovery pool heating systems.

R403.10.3 (IRC N1103.10.3) Covers. Outdoor heated pools and outdoor permanent spas shall be provided with a vapor-retardant cover or other *approved* vapor-retardant means.

Exception: Where more than ~~75~~ 70 percent of the energy for heating, computed over an operation season of ~~not less than three calendar months~~, is from a heat pump or ~~an on-site renewable solar energy system source~~, covers or other vapor-retardant means shall not be required.

R403.11 (IRC N1103.11) Portable spas (Mandatory). The energy consumption of electric-powered portable spas shall be controlled by the requirements of APSP-14.

R403.12 (IRC N1103.12) Residential pools and permanent residential ~~spas~~ spas (Mandatory). Residential The energy consumption of residential swimming pools and permanent residential spas ~~that are accessory to detached one- and two-family dwellings and townhouses three stories or less in height above grade plane and that are available only to the household and its guests~~ shall be controlled in accordance with the requirements of APSP 15.

Reason: This proposal aligns the energy efficiency provisions of the IECC for residential pools, spas and portable spas (hot tubs) with those found in the 2018 International Swimming Pool & Spa Code. A similar proposal has been submitted to ensure IECC commercial provisions are also aligned with the ISPSC pool & spa energy efficiency provisions found within Section 303.

Without this proposal a jurisdiction who adopts both the IECC and ISPSC will have conflicting code requirements addressing covers for outdoor heated pools and outdoor permanent spas. Therefore, this proposal is simply

making the exception language for a vapor-retardant cover consistent with what exists in the ISPSC. The ISPSC has always used a 70% threshold computed over an operation season – there is no minimum operating season in the ISPSC due to the fact depending on the part of the country, an operating season can be from as little as a few months to an entire year.

The reality is after the pool or spa is installed and final inspection has occurred, there is no way to ensure a cover is being put back on after every use; therefore, encouraging use of more energy efficient heating systems by providing an exception from the vapor-retardant cover provides a greater chance of energy savings. Having consistent language on how that exception is intended to work in the ISPSC, IECC Commercial and IECC Residential is critical.

The proposed change also adds in the word “mandatory” in section R403.12 for consistency with R403.10 and R403.11, as all provisions listed are mandatory with no other alternative. Further, R403.12 requires residential pools and permanent spas to meet the ANSI/APSP/ICC 15 Standard.

The remaining code proposal language is simply cleanup to reflect consistent verbiage used between the two I-codes, because the pool & spa energy efficiency language is not completely consistent when comparing the IECC to the ISPSC. Further, within the IECC the commercial and residential provisions slightly differ as well. Although the remaining differences are minor and may not affect the intent, eliminating differences do lessen the chance of interpretation errors.

By adopting this code change, a jurisdiction that adopts both the ISPSC and IECC, which is increasingly more likely and already exists in many cases (over 20 states and 160 localities have adopted the ISPSC), will not be left with conflicting code requirements. Rather, they will co-exist by providing consistent requirements that follow the original intent.

Bibliography: 2018 ISPSC, Section 303 and 2018 IECC, Section C404.9

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code change should not affect the cost of construction but for any costs associated with differing provisions found within the current ISPSC and IECC editions, if the change is not adopted. The proposal simply ensures the IECC has consistent energy efficiency requirements for residential pools and spas from what is found in the ISPSC.

Proposal # 5558

CE160-19 Part II

CE161-19

IECC: C202, C405.1, C405.2.3

Proponent: Jack Bailey, representing International Association of Lighting Designers (jbailey@oneluxstudio.com); Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers (glenn@lampartners.com)

2018 International Energy Conservation Code

Revise as follows:

GENERAL LIGHTING. ~~Lighting~~ Interior lighting that provides a substantially uniform level of illumination throughout an area. ~~General lighting shall not include decorative lighting or lighting that provides a dissimilar level of illumination to serve a specialized application or feature within such area.~~ a space.

C405.1 General (Mandatory). This section covers lighting system controls, the maximum lighting power for interior and exterior applications and electrical energy consumption. Dwelling units within multifamily buildings shall comply with Section R404.1. All other dwelling units shall comply with Section R404.1, or with Sections C405.2.4 and C405.3. Sleeping units shall comply with Section C405.2.4, and with Section R404.1 or C405.3. Lighting installed in walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with the lighting requirements of Section C403.10.1 or

~~C403.10.2.~~

C403.10.2. General lighting shall consist of all lighting included when calculating the total connected interior lighting power in accordance with Section C405.3.1 and which does not require specific application controls in accordance with Section C405.2.4.

C405.2.3 Daylight-responsive controls. Daylight-responsive controls complying with Section C405.2.3.1 shall be provided to control the ~~electric lights~~ general lighting within daylight zones in the following spaces:

1. Spaces with a total of more than 150 watts of ~~general~~ general lighting within sidelit zones complying with Section C405.2.3.2 ~~General lighting does not include lighting that is required to have specific application control in accordance with Section C405.2.4.~~
2. Spaces with a total of more than 150 watts of general lighting within toplit zones complying with Section C405.2.3.3.

Exceptions: Daylight responsive controls are not required for the following:

1. Spaces in health care facilities where patient care is directly provided. ~~2. Lighting that is required to have specific application control in accordance with Section C405.2.4.~~
3. Sidelit zones on the first floor above grade in Group A-2 and Group M occupancies.
4. New buildings where the total connected lighting power calculated in accordance with Section C405.3.1 is not greater than the adjusted interior lighting power allowance (LPA_{adj}) calculated in accordance with Equation 4-9

$$LPA_{adj} = \left[\frac{LPA_{norm} \times (1.0 - 0.4 \times UDZFA)}{TBFA} \right]$$

(Equation 4-9)

where:

LPA_{adj} = Adjusted building interior lighting power allowance in watts.

LPA_{norm} = Normal building lighting power allowance in watts calculated in accordance with Section C405.3.2 and reduced in accordance with Section C406.3 where Option 2 of Section C406.1 is used to comply with the requirements of Section C406.

UDZFA = Uncontrolled daylight zone floor area is the sum of all sidelit and toplit zones, calculated in accordance with Sections C405.2.3.2 and C405.2.3.3, that do not have daylight responsive controls.

TBFA = Total building floor area is the sum of all floor areas included in the lighting power allowance calculation in Section C405.3.2.

Reason: Users need a clear definition of the term general lighting, which is currently used at least 14 times in Section C405, but nowhere else in the code. The term general lighting establishes many of the lighting controls requirements in the code, so it is important that we have a meaning for this term which is clear and concise in all instances.

The current definition of general lighting includes technical requirements, which should not be located there by editorial convention. This proposal would relocate those technical requirements to C405.1, so that they will be applicable throughout Section C405.

Once this definition is updated, redundant provisions of C405.2.3 can be deleted.

The change from “electric” lighting to “general” lighting in the first sentence may be seen as limiting the scope of lighting controls requirements, but it is important that we use consistent terminology throughout this section of the code. Furthermore, we believe that daylight responsive controls requirements should be limited to general lighting. Daylight responsive control of other lighting, such as display and accent lighting, task lighting, lighting in sleeping units, etc. complex and problematic.

Cost Impact: The code change proposal will decrease the cost of construction

This proposal would slightly reduce the scope of daylight responsive controls requirements, which would slightly reduce the cost of construction.

Proposal # 4784

CE161-19

CE162-19

IECC: C405.1, C405.1.1 (New), C405.1.2 (New)

Proponent: Eric Makela, New Buildings Institute, representing New Buildings Institute
(ericM@newbuildings.org)

2018 International Energy Conservation Code

Revise as follows:

C405.1 General (Mandatory). ~~This section covers lighting~~ Lighting system controls, the maximum lighting power for interior and exterior applications and electrical energy consumption shall comply with this section. ~~Dwelling units within multifamily buildings shall comply with Section R404.1. All other dwelling units shall comply with Section R404.1, or with Sections C405.2.4 and C405.3. Sleeping units shall comply with Section C405.2.4, and with Section R404.1 or C405.3. Lighting installed in walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with the lighting requirements of Section C403.10.1 or C403.10.2.~~

Add new text as follows:

C405.1.1 Lighting for dwelling units. No less than 90 percent of the permanently installed lighting serving dwelling units shall be provided by lamps with an efficacy of not less than 65 lm/W or luminaires with an efficacy of not less than 45 lm/W, or shall comply with Sections C405.2.4 and C405.3.

C405.1.2 Lighting for refrigerated applications. Lighting installed in walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with the lighting requirements of Section C403.10.1 or C403.10.2.

Reason: The current language refers lighting in dwelling units to the lighting requirements in the residential section. The referenced residential code sections include a requirement that 90% of the lighting be provided by "high efficacy lamps." There are a handful of issues with the existing code requirements:

1. The definition of "high efficacy lamps" has not been updated to reflect the changes in the market due to increased federal minimums and greater availability/affordability of LED lighting. As a result the code has actually become less stringent as the baseline for lighting equipment is raised.
2. The categories in the definition of "high efficacy lamps" in the residential code is an artifact of incandescent and early compact fluorescent lamp wattages. As lamps have gotten more efficient, the higher wattage categories have become less meaningful. Even a "100W equivalent" LED lamp and "60W equivalent" CFL lamps generally uses 15W or less, which is the bottom category in the existing definition. As a result, the categories have become largely meaningless.
3. The definition is for high efficacy lamps. However, with the proliferation of LED lighting, the market is increasingly utilizing luminaires with integrated LEDs, which are not really lamps. This prevents this high-efficiency lighting solution from being used to meet the high efficacy requirement.

This proposal solves these problems by replacing the reference to the residential lamp efficacy requirements with built-in lighting requirements. Like the existing lighting requirement, this proposal would require that 90% of the lighting be provided by higher performance lighting, but it replaces the reference to "high efficacy lamps" with a built-in efficacy requirement. This requirement establishes minimums for both lamps and luminaires so that it is relevant to the current lighting market without the wattage bins that are no longer relevant to current technologies. The efficacy levels are widely available and are low enough that products with a wide array of color temperatures and CRIs can meet the requirement, providing lighting designers and customers with flexibility.

The proposal also structures the section for greater clarity. Requirements for dwelling unit lighting and refrigerated application have been somewhat shoe-horned into C405.1, leaving the section bloated and without focus. This proposal breaks the requirements for dwelling unit lighting and refrigerated applications into standalone sub-sections for greater clarity.

When modeled against IECC-2015 using the mid-rise and high-rise prototypes developed by Pacific Northwest National Lab for code determination studies, whole-building energy savings ranged from 0.1-0.5% and whole-building electricity savings ranged from 5.3-6.5%. While the 2018 IECC is not exactly the same baseline as 2015, the lighting requirements did not change and these results give a reasonable approximation of savings. Based on U.S. DOE studies, the cost savings by replacing all of the CFLs with higher efficacy LED lighting saves approximately \$6 per year per dwelling unit in overall regulated energy costs.

Cost Impact: The code change proposal will increase the cost of construction

This change could potentially increase the cost of construction because it requires higher efficacy lighting (lamps and/or fixtures), which will likely eliminate some lower-end CFL options and/or push builders to newer LED technologies. However, the cost of LEDs has been steadily declining over the last several years and is expected to continue to decline. Based on an analysis by the U.S. Department of Energy's Building Energy Codes Program conducted during the 2018 IECC Code Development cycle, the estimated and projected prices for LEDs were \$4.84 per lamp compared to CFLs at \$3.10 per lamp. However, the rapid expansion of the LED lighting market has changed the economics. A spot check of Home Depot in early 2019 showed that a warm white, 60W equivalent A-lamp is as low as \$1.24 for both CFL and LED when purchased in packs. And, LEDs are actually cheaper than CFLs at some sources. At 1000bulbs.com, an online retailer, the same lamps are \$1.79/bulb for CFL and \$0.99 for LED. Therefore, this code change may actually reduce the cost of construction.

Proposal # 5147

CE162-19

CE163-19

IECC: C202, C405.1, C405.2.1, C405.2.2, C405.2.4, C405.3.1, C405.3.2.2.1

Proponent: Jack Bailey, representing International Association of Lighting Designers (jbailey@oneluxstudio.com); Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers (glenn@lampartners.com)

2018 International Energy Conservation Code

Revise as follows:

GENERAL LIGHTING. ~~Lighting~~ Interior lighting that provides a substantially uniform level of illumination throughout an area. ~~General lighting shall not include decorative lighting or lighting that provides a dissimilar level of illumination to serve a specialized application or feature within such area.~~ a space.

C405.1 General (Mandatory). This section covers lighting system controls, the maximum lighting power for interior and exterior applications and electrical energy consumption.

Dwelling units within multifamily buildings shall comply with Section R404.1. All other *dwelling units* shall comply with Section R404.1, or with Sections C405.2.4 and C405.3. *Sleeping units* shall comply with Section C405.2.4, and with Section R404.1 or C405.3. Lighting installed in walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with the lighting requirements of Section C403.10.1 or C403.10.2.

General lighting shall consist of all lighting included when calculating the total connected interior lighting power in accordance with Section C405.3.1 and which does not require specific application controls in accordance with Section C405.2.4.

C405.2.1 Occupant sensor controls. Occupant *sensor controls* shall be installed to control lights in the following space types:

1. Classrooms/lecture/training rooms.
2. Conference/meeting/multipurpose rooms.
3. Copy/print rooms.
4. Lounges/breakrooms.
5. Enclosed offices.
6. Open plan office areas.
7. Restrooms.
8. Storage rooms.
9. Locker rooms.
10. Other spaces 300 square feet (28 m²) or less that are enclosed by floor-to-ceiling height partitions.
11. Warehouse storage areas.

Exception: Luminaires which are required to have specific application controls in accordance with C405.2.4..

C405.2.2 Time-switch controls. Each area of the building that is not provided with *occupant sensor controls* complying with Section C405.2.1.1 shall be provided with *time-switch controls* complying with Section C405.2.2.1.

Exceptions **Exception:**

1. Luminaires which are required to have specific application controls in accordance with

C405.2.4

2. Where a *manual control* provides light reduction in accordance with Section C405.2.2.2, *time-switch controls* shall not be required for the following:

- ~~1-~~ 2.1 Spaces where patient care is directly provided.
- ~~2-~~ 2.2 Spaces where an automatic shutoff would endanger occupant safety or security.
- ~~3-~~ 2.3 Lighting intended for continuous operation.
- ~~4-~~ 2.4 Shop and laboratory classrooms.

C405.2.4 Specific application controls. Specific application controls shall be provided for the following:

1. The following lighting shall be controlled by an occupant sensor complying with Section C405.2.1.1 or a time-switch control complying with Section C405.2.2.1. In addition, a *manual control* shall be provided to control such lighting separately from the *general lighting* in the space:
 - 1.1 Luminaires for which additional lighting power is claimed in accordance with C405.3.2.2.1.
 - ~~1-1-~~ 1.2 Display and accent.
 - ~~1-2-~~ 1.3 Lighting in display cases.
 - ~~1-3-~~ 1.4 Supplemental task lighting, including permanently installed under-shelf or under-cabinet lighting.
 - ~~1-4-~~ 1.5 Lighting equipment that is for sale or demonstration in lighting education.
 - 1.6 Display lighting for exhibits in galleries, museums and monuments that is in addition to *general lighting*.
2. *Sleeping units* shall have control devices or systems that are configured to automatically switch off all permanently installed luminaires and switched receptacles within 20 minutes after all occupants have left the unit.

Exceptions:

1. Lighting and switched receptacles controlled by card key controls.
 2. Spaces where patient care is directly provided.
3. Permanently installed luminaires within *dwelling units* shall be provided with controls complying with Section C405.2.1.1 or C405.2.2.2.
 4. Lighting for nonvisual applications, such as plant growth and food warming, shall be controlled by a time switch control complying with Section C405.2.2.1 that is independent of the controls for other lighting within the room or space.
 5. Task lighting for medical and dental purposes that is in addition to *general lighting* shall be provided with a *manual control*.

C405.3.1 Total connected interior lighting power. The total connected interior lighting power shall be determined in accordance with Equation 4-10.

$$TCLP = [LVL + BLL + LED + TRK + Other]$$

(Equation 4-10)

where:

TCLP = Total connected lighting power (watts).

LVL = For luminaires with lamps connected directly to building power, such as line voltage lamps, the rated

wattage of the lamp.

BLL = For luminaires incorporating a ballast or transformer, the rated input wattage of the ballast or transformer when operating that lamp.

LED = For light-emitting diode luminaires with either integral or remote drivers, the rated wattage of the luminaire.

TRK = For lighting track, cable conductor, rail conductor, and plug-in busway systems that allow the addition and relocation of luminaires without rewiring, the wattage shall be one of the following:

1. The specified wattage of the luminaires, but not less than 8 W per linear foot (25 W/lin m).
2. The wattage limit of the permanent current-limiting devices protecting the system.
3. The wattage limit of the transformer supplying the system.

Other = The wattage of all other luminaires and lighting sources not covered previously and associated with interior lighting verified by data supplied by the manufacturer or other *approved* sources.

The connected power associated with the following lighting equipment and applications is not included in calculating total connected lighting power.

1. Television broadcast lighting for playing areas in sports arenas.
2. Emergency lighting automatically off during normal building operation.
3. Lighting in spaces specifically designed for use by occupants with special lighting needs, including those with visual impairment and other medical and age-related issues.
4. Casino gaming areas.
5. Mirror lighting in dressing rooms.
6. Task lighting for medical and dental purposes that is in addition to *general lighting* ~~and controlled by an independent control device.~~
7. Display lighting for exhibits in galleries, museums and monuments that is in addition to *general lighting* ~~and controlled by an independent control device.~~
8. Lighting for theatrical purposes, including performance, stage, film production and video production.
9. Lighting for photographic processes.
10. Lighting integral to equipment or instrumentation and installed by the manufacturer.
11. Task lighting for plant growth or maintenance.
12. Advertising signage or directional signage.
13. Lighting for food warming.
14. Lighting equipment that is for sale.
15. Lighting demonstration equipment in lighting education facilities.
16. Lighting approved because of safety considerations.
17. Lighting in retail display windows, provided that the display area is enclosed by ceiling-height partitions.
18. Furniture-mounted supplemental task lighting that is controlled by automatic shutoff.
19. Exit signs.

C405.3.2.2.1 Additional interior lighting power. Where using the Space-by-Space Method, an increase in the interior lighting power allowance is permitted for specific lighting functions. Additional power shall be permitted only where the specified lighting is installed and ~~automatically controlled separately from the general lighting, to be turned off during nonbusiness hours.~~ controlled in accordance with C405.2.4. This additional power shall be used only for the specified luminaires and shall not be used for any other purpose. An increase in the interior

lighting power allowance is permitted in the following cases:

1. For lighting equipment to be installed in sales areas specifically to highlight merchandise, the additional lighting power shall be determined in accordance with Equation 4-11. Additional interior lighting power allowance = $1000 \text{ W} + (\text{Retail Area 1} \times 0.45 \text{ W/ft}^2) + (\text{Retail Area 2} \times 0.45 \text{ W/ft}^2) + (\text{Retail Area 3} \times 1.05 \text{ W/ft}^2) + (\text{Retail Area 4} \times 1.87 \text{ W/ft}^2)$
For SI units:

Additional interior lighting power allowance =
 $1000 \text{ W} + (\text{Retail Area 1} \times 4.8 \text{ W/m}^2) +$
 $(\text{Retail Area 2} \times 4.84 \text{ W/m}^2) + (\text{Retail Area 3}$
 $\times 11 \text{ W/m}^2) + (\text{Retail Area 4} \times 20 \text{ W/m}^2)$

(Equation 4-11)

where:

Retail Area 1 = The floor area for all products not listed in Retail Area 2, 3 or 4.

Retail Area 2 = The floor area used for the sale of vehicles, sporting goods and small electronics.

Retail Area 3 = The floor area used for the sale of furniture, clothing, cosmetics and artwork.

Retail Area 4 = The floor area used for the sale of jewelry, crystal and china.

Exception: Other merchandise categories are permitted to be included in Retail Areas 2 through 4, provided that justification documenting the need for additional lighting power based on visual inspection, contrast, or other critical display is approved by the code official.

2. For spaces in which lighting is specified to be installed in addition to the general lighting for the purpose of decorative appearance or for highlighting art or exhibits, provided that the additional lighting power shall be not more than 0.9 W/ft^2 (9.7 W/m^2) in lobbies and not more than 0.75 W/ft^2 (8.1 W/m^2) in other spaces.

Reason: All lighting controls requirements should be located in C405.2, and all lighting power requirements should be located in C405.3 and C405.4. We should not have lighting control requirements buried in exceptions within C405.3. This proposal consolidates all lighting control requirements in C405.2.

Furthermore, we need a clear definition of the term *general lighting*, which is currently used at least 14 times in Section C405, but nowhere else in the code. The term general lighting establishes many of the lighting controls requirements in the code, so it is important that we have a meaning for this term which is clear and concise in all instances.

The current definition of general lighting includes technical requirements, which should not be located in a definition (by editorial convention). This proposal would relocate those technical requirements to C405.1, so that they will be applicable throughout Section C405.

Do the proposed section references in C405.1 create a circular reference with C405.2.4? No! Consider one example - "task lighting for medical and dental purposes that is in addition to general lighting". There are two ways you could interpret this in a dental exam room:

First, if you wanted to try to game the code and call all lighting in a dental exam room "task lighting for dental purposes" then

1. This lighting cannot be exempt from your power calculations in C405.3.1 (because it is not separate from the

general lighting), and

2. This lighting is not exempt from the controls requirements in C405.2.1 and C405.2.2 (because it is not separate from the general lighting).

However, if you claim only the dental exam light as "task lighting for dental purposes" then

1. The dental exam light is exempt from your lighting power calculations in C405.3 (because it is separate from the general lighting), and

2. The dental exam light is required to be on a separate manual switch (only) by C405.2.4, while the general lighting in the room is required to comply with the automatic control requirements in C405.2.1 and C405.2.2.

A detailed review of the other references to general lighting in C405.2.4 is just as solid (but too tedious to include here!)

The exceptions under C405.2.1 and C405.2.2 are provided for clarity. For example, if you consider "lighting for plant growth", this is specifically required in C405.2.4 to have a time-switch control which is independent of the other lighting controls in the space. But if this lighting were located in an open office area that was required to have occupant sensor control per C405.2.1, then we need to clarify that the occupant sensor required under C405.2.1 does not control the "lighting for plant growth" (because a plant's need for lighting is unrelated to human occupancy in the space).

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Revisions for clarity

Proposal # 4788

CE163-19

CE164-19

IECC: C405.2.1.2

Proponent: Jonathan McHugh, representing McHugh Energy Consultants Inc. (jon@mchughenergy.com)

2018 International Energy Conservation Code

Revise as follows:

C405.2.1.2 Occupant sensor control function in ~~warehouses~~ warehouse storage areas. Lighting in warehouse storage areas shall be controlled as follows:

1. Lighting in each aisleway shall be controlled independently of lighting in all other aisleways and open areas.
2. Occupant sensors shall automatically reduce lighting power within each controlled area to an unoccupied setpoint of not more than 50 percent of full power within 20 minutes after all occupants have left the controlled area.
3. Lights shall be turned off during scheduled unoccupied periods by: occupant sensors or by time-switch control complying with Section C405.2.2.1.
4. Occupant sensors shall be permitted to automatically turn on lighting upon occupancy within each controlled area. During the occupied schedule period or during times when the manual time switch override is enabled, the time switch control will enable lighting to be controlled by occupant sensors as described in Item 2.
5. Where lighting is also controlled by daylight responsive controls, the controls shall be configured so that the fraction of full power of the lighting shall not exceed the lesser of: the fraction of power allowed by this section and the fraction of power allowed by Section C405.2.3.1.

~~In warehouses, the lighting in aisleways and open areas shall be controlled with occupant sensors that automatically reduce lighting power by not less than 50 percent when the areas are unoccupied. The occupant sensors shall control lighting in each aisleway independently and shall not control lighting beyond the aisleway being controlled by the sensor.~~

Reason: This proposal increases savings. Prior to this change lights could be left on at 50% of power during scheduled unoccupied periods. However the least cost control, an occupancy sensor that turns lights off, does not increase the cost beyond the current code requirements.

There are a number of different alternatives that will also comply and provide partial lighting of unoccupied aisles during occupied hours.

- A partial off occupancy sensing system (dim all the lights or turn at least half the lights off when occupancy is sensed) in conjunction with a timeclock control that turns lights off after hours and reverts to the occupancy control in item 2 during occupied hours or when the timeclock override switch is enabled.
- An occupancy sensing system that receives a time signal and varies the unoccupied light output to partial off during the scheduled occupied period and to full off during the scheduled unoccupied period (unless it is over ridden).

Almost all warehouses will have daylit areas due to skylights being prescriptively required by Section C402.4.2 for enclosed spaces larger than 2,500 square feet directly under a roof and with a ceiling height greater than 15 feet. As a result it is desirable to be clear how the required occupancy sensors controls interact with daylight responsive controls. The daylight control requirements in Item 5 of Section C405.2.3.1, "shall be configured to completely shut off all controlled lights." With a 3% prescriptive skylight to floor ratio for half of the warehouse, these spaces will have enough daylight to turn off the lights around half the daylight hours of the year. This proposal specifies that when the two controls interact, the resulting power level is the lesser of the power levels

specified for each control.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
If the occupancy sensing control is turning lights off then there is no cost increase.

If occupancy sensing is not full off then compliance with this proposal will have the relatively small cost of adding a timeclock control.

The rest of the requirements are clarification of how the controls are intended to perform and thus do not add cost.

Proposal # 5600

CE164-19

CE165-19

IECC: C405.2.1.2

Proponent: Jack Bailey, representing International Association of Lighting Designers (jbailey@oneluxstudio.com); Glenn Heinmiller, representing International Association of Lighting Designers (glenn@lampartners.com)

2018 International Energy Conservation Code

Revise as follows:

C405.2.1.2 Occupant sensor control function in warehouses ~~warehouse storage areas.~~ Lighting in warehouse storage areas shall be controlled as follows:

1. Lighting in each aisleway shall be controlled independently of lighting in all other aisleways and open areas.
2. Occupant sensors shall automatically reduce lighting power within each controlled area to an unoccupied setpoint of not more than 50 percent of full power within 20 minutes after all occupants have left the controlled area.
3. Lights which are not turned off by occupant sensors shall be turned off by time-switch control complying with Section C405.2.2.1.
4. Occupant sensors shall be permitted to automatically turn on lighting upon occupancy within each controlled area. Time-switch controls shall not turn lights on to greater than 50 percent of full power.

~~In warehouses, the lighting in aisleways and open areas shall be controlled with occupant sensors that automatically reduce lighting power by not less than 50 percent when the areas are unoccupied. The occupant sensors shall control lighting in each aisleway independently and shall not control lighting beyond the aisleway being controlled by the sensor.~~

Reason: There are some gaps in the current code. Specifically:

1. We should refer to “warehouse storage areas” as this is the relevant space type in Table C405.3.2(2), and this is the space type which is listed in C405.2.1 (the charging language).
2. Current code does not require that lights ever be turned completely off. This proposal would require shutoff by either occupant sensor or time-switch control.
3. Current code does not specify how long it takes for lighting to set back to 50 percent when aisles become unoccupied. This proposal specifies 20 minutes, which conforms to other requirements in the code.
4. Current code does not specify how lights should be turned on. This proposal specifies that automatic-on occupant sensors are permitted, but that time-switch controls (if provided) cannot turn lights on to more than 50%.

We are using the language “to an unoccupied setpoint of not more than 50 percent of full power” for consistency with a separate proposal for Section C405.2.3.1 which clarifies how daylight responsive controls will interact with the partial-off occupancy sensors described here.

There are a variety of ways that people may implement lighting controls to comply with this requirement. At the low end, automatic-on, automatic-off occupant sensors are the cheapest way to comply. These are allowed under current code, and will continue to be allowed if this proposal is approved. At the high end, a time-switch will be used to turn all lights in the warehouse on to 50% (or lower) at the beginning of a shift, and off at the end of a shift. During the shift, occupant sensors will switch the lights from 50% (or lower) when no activity is sensed to 100% when activity is sensed.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

As outlined above, the least expensive option for complying with current code will continue to be allowed as a strategy to comply with code if this revision is approved.

Proposal # 4794

CE165-19

CE166-19

IECC: C405.2.1.2

Proponent: Marilyn Williams, representing National Electrical Manufacturers Association
(mar_williams@nema.org)

2018 International Energy Conservation Code

Revise as follows:

C405.2.1.2 Occupant sensor control function in warehouses- warehouses storage areas. Lighting in warehouse storage areas shall be controlled as follows:

1. Lighting in each aisleway shall be controlled independently of lighting in all other aisleways and open areas.
2. Occupant sensors shall ~~In warehouses, the lighting in aisleways and open areas shall be controlled with occupant sensors that~~ automatically reduce lighting power within each controlled area by not less than 50 percent within 20 minutes after all occupants have left the controlled area. ~~when the areas are unoccupied. The~~
3. Lights which are not turned off by occupant sensors shall be turned off by time-switch control complying with Section C405.2.2.1. ~~control lighting in each aisleway independently and shall not control lighting beyond the aisleway being controlled by the sensor.~~
4. A manual control shall be provided to allow occupants to turn off lights in the space.

Reason: Revising this language will:

1. Reduce inconsistency and application confusion with warehouse lighting control
2. Reduce energy use (as written could increase energy through interpretation errors)
3. Increase code interpretation
4. Resolve compliance in application, approval and inspection
5. Will not change the intent or requirements of the code provision

The proposal is editorial, and intended to clarify correct application of occupancy sensors, and associated controls for warehouse storage areas. Warehouse spaces were added to the occupancy controls list of space types (C405.2.1) in the 2015 IECC update. Yet, warehouses were excluded from the specific requirements of the main occupancy sensor control functions. Because of this, and the unique control requirements, several elements of how occupancy sensors should operate in the warehouse environment are given no direction or completely left out of the section. This created the following compliance confusion that is resolved with this proposed revision.

1. How long should the area remain unoccupied before lighting would reduce by at least 50% lighting power?
2. How should lighting in warehouses ultimately be turned off?
3. Do manual control devices apply to warehouses or not?

Similar to the enumerated items put into the 2018 IECC version for open office plan spaces, this editorial

change provides clarity to how to apply lighting controls in warehouses storage area spaces. The proposed change clarifies control by item numbers as follows:

1. Item one simplifies language on control independent between aisleways and open areas.
2. Item two language aligns the time delay or "time out" for occupants leaving the warehouse area and turning off or reducing the lighting to 20 minutes. This aligns with the time delay for all other occupancy sensor spaces (C405.2.1.1), newer open plan office spaces (405.2.1.3) and maintains energy efficiency by reducing lighting power.
3. Item three revised language clarifies that the warehouse lighting automatically turns off according to methods already presented in the code (occupancy sensor or time-switch controls) but leaves the decision of automatic shut-off control method to the building design professional.
4. Item four clarifies control is available for the end user to turn lighting off.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Proposed language is a clarification and editorial in nature. There is no cost impact for implementation and increases energy efficiency through reducing confusion and increasing compliance.

Proposal # 4372

CE166-19

CE167-19

IECC: C405.2.1.1

Proponent: Jack Bailey, representing International Association of Lighting Designers (jbailey@oneluxstudio.com); Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers (glenn@lampartners.com)

2018 International Energy Conservation Code

Revise as follows:

C405.2.1.1 Occupant sensor control function. Occupant sensor controls in warehouses shall comply with Section C405.2.1.2. Occupant sensor controls in open plan office areas shall comply with Section C405.2.1.3. Occupant sensor controls for all other spaces specified in Section C405.2.1 shall comply with the following:

1. They shall automatically turn off lights within 20 minutes after all occupants have left the space.
2. They shall be manual on or controlled to automatically turn on the lighting to not more than 50-percent power.
3. They shall incorporate a manual control to allow occupants to turn off lights.

Exception: Full automatic-on controls with no manual control shall be permitted to control lighting in public corridors, interior parking areas, stairways, restrooms, ~~primary building entrance areas and lobbies, locker rooms, lobbies, library stacks,~~ and areas where manual on manual operation would endanger the safety or security of the room or building occupants. ~~3. They shall incorporate a manual control to allow occupants to turn off lights.~~ occupant safety or security.

Reason: The code currently requires that *readily accessible* manual controls be provided to allow occupants to turn the lights off in the space types listed in this exception. We don't believe this should be required by the code, because the occupant sensors will already turn the lights off when no occupants are present, meaning that the accessible manual control would only be used to turn off lights when occupants are present. This could compromise safety for building occupants in these types of spaces.

We have changed the terminology "primary building entrance areas and lobbies" to read "lobbies" because we believe that all space types listed in this section of the code should be correlated with the space-by-space LPD table C405.3.2(2).

The safety and security language that is currently in this section of the code is a bit odd. The language proposed here, "areas where manual operation would endanger occupant safety or security" matches the language in C405.2.2 exception 2.

Cost Impact: The code change proposal will decrease the cost of construction

This proposal will reduce the cost of construction by eliminating the requirement for a manual control device in the indicated space types. We anticipate only a minimal impact on energy efficiency because we expect these manual controls are rarely used.

Proposal # 4837

CE167-19

CE168-19

IECC: C405.2.1, C405.2.1.1, C405.2.1.2

Proponent: Marilyn Williams, representing National Electrical Manufacturers Association
(mar_williams@nema.org)

2018 International Energy Conservation Code

Revise as follows:

C405.2.1 Occupant sensor controls. Occupant *sensor controls* shall be installed to control lights in the following space types complying with Sections C405.2.1.1, C405.2.1.2, and C405.2.1.3:

1. ~~Classrooms/lecture/training rooms.~~
2. ~~Conference/meeting/multipurpose rooms.~~
3. ~~Copy/print rooms.~~
4. ~~Lounges/breakrooms.~~
5. ~~Enclosed offices.~~
6. ~~Open plan office areas.~~
7. ~~Restrooms.~~
8. ~~Storage rooms.~~
9. ~~Locker rooms.~~
10. ~~Other spaces 300 square feet (28 m²) or less that are enclosed by floor-to-ceiling height partitions.~~
11. ~~Warehouse storage areas.~~

C405.2.1.1 Occupant sensor control function in automatic-full-off spaces. ~~Occupant sensor controls in warehouses shall comply with Section C405.2.1.2. Occupant sensor controls in open plan office areas shall comply with Section C405.2.1.3. Occupant sensor controls for all other spaces specified in Section C405.2.1 shall comply with the following:~~

Lighting in these space types shall be controlled as follows:

Classrooms/lecture/training rooms.

Conference/meeting/multipurpose rooms.

Copy/print rooms.

Lounges/breakrooms.

Enclosed offices.

Restrooms.

Storage rooms 1000 square feet (90 m²) or less that are enclosed by floor-to-ceiling height partitions.

Locker rooms.

Other spaces 300 square feed (28 m²) or less that are enclosed by floor-to-ceiling height partitions.

1. ~~They shall automatically turn off lights~~ Lighting shall automatically turn off within 20 minutes after

- all occupants have left the space.
2. ~~They~~ Lighting shall be manual on or controlled to automatically turn on ~~the lighting~~ to not more than 50-percent power.

Exception: Full automatic-on controls shall be permitted to control lighting in ~~public corridors, stairways, restrooms, primary building entrance areas and~~ lobbies, and areas where manual-on operation would endanger the safety or security of the room or building occupants..

3. ~~They shall incorporate a~~ A manual control shall be provided to allow occupants to turn off lights in the space.

C405.2.1.2 Occupant sensor control function in warehouses automatic-partial-off spaces. Lighting in these space types shall be controlled as follows:

Warehouse storage areas.

Storage rooms greater than 1000 square feet (90 m²) that are enclosed by floor-to-ceiling height partitions.

Classroom labs.

Corridors.

1. ~~Lighting shall~~ In warehouses, the lighting in aisleways and open areas shall be controlled with occupant sensors that automatically reduce lighting power within each controlled area by not less than 50 percent when the areas are unoccupied. The within 20 minutes after all occupants have left the controlled area.
2. Lights which are not turned off by occupant sensors shall be turned off by time-switch control complying with Section C405.2.21.
3. A manual control shall be provided to allow occupants to turn off lights in the space.
4. In warehouse storage areas, lighting in each aisleway shall be controlled independently and shall not control lighting beyond the aisleway being controlled by the sensor. of lighting in all other aisleways and open areas.

Exception: Spaces where the lighting power is 150 Watts or less.

Reason: Revising this language will:

1. Increase energy efficiency in buildings
2. Reduce inconsistency and application confusion with warehouse lighting control.
3. Increase code interpretation and usability
4. Resolve compliance in application, approval and inspection.

see attachment for further information for reason

Cost Impact: The code change proposal will increase the cost of construction

The cost impact for added controls only applies to storage rooms greater than 1000 square feet, library stacks, classroom labs, and corridors. There will be no cost impact to warehouse storage areas or other space types as the revision is an editorial clarification for those spaces.

CE169-19

IECC: C405.2.1, C405.2.1.1, C405.2.1.4(New)

Proponent: Jack Bailey, representing International Association of Lighting Designers (jbailey@oneluxstudio.com); Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers (glenn@lampartners.com)

2018 International Energy Conservation Code

Revise as follows:

C405.2.1 Occupant sensor controls. Occupant *sensor controls* shall be installed to control lights in the following space types:

1. Classrooms/lecture/training rooms.
2. Conference/meeting/multipurpose rooms.
3. Copy/print rooms.
4. Lounges/breakrooms.
5. Enclosed offices.
6. Open plan office areas.
7. Restrooms.
8. Storage rooms.
9. Locker rooms.
10. Corridors
11. Warehouse storage areas
- 12.~~10.~~ Other spaces 300 square feet (28 m²) or less that are enclosed by floor-to-ceiling height partitions.

C405.2.1.1 Occupant sensor control function. Occupant sensor controls in warehouses shall comply with Section C405.2.1.2. Occupant sensor controls in open plan office areas shall comply with Section C405.2.1.3. Occupant sensor controls in corridors shall comply with Section C405.2.1.4. Occupant sensor controls for all other spaces specified in Section C405.2.1 shall comply with the following:

1. They shall automatically turn off lights within 20 minutes after all occupants have left the space.
2. They shall be manual on or controlled to automatically turn on the lighting to not more than 50-percent power.

Exception: Full automatic-on controls shall be permitted to control lighting in ~~public corridors~~, stairways, restrooms, primary building entrance areas and lobbies, and areas where manual-on operation would endanger the safety or security of the room or building occupants.

3. They shall incorporate a manual control to allow occupants to turn off lights.

Add new text as follows:

C405.2.1.4 Occupant sensor control function in corridors Occupant sensor controls in corridors shall uniformly reduce lighting power to not more than 50 percent of full power within 20 minutes after all occupants have left the space.

Exception: Corridors provided with less than two foot-candles of illumination on the floor at the darkest point with all lights on.

Reason: To save energy. Current code requires that occupant sensors be installed in any corridor which is smaller than 300 square feet (60 feet long for a 5 foot wide corridor). These will usually be automatic-on, automatic-off occupant sensors with manual override switch. C405.2 exception 2 exempts corridors which are *exit passageways* (see IBC) are exempt.

There should be one uniform requirement for occupant sensor control of lights in corridors regardless of whether they are smaller than 300 square feet, and we propose that this requirement should allow for lights to remain continuously “on” at a reduced level to alleviate safety concerns about people entering dark corridors before the lights will turn on.

By allowing corridor lighting to remain “on” at 50% when unoccupied, this proposal will also avoid most potential conflicts with the IBC, which requires that lighting in a corridor be maintained at a minimum of 1 foot-candle (at the darkest point) whenever spaces served by the corridor are occupied. An exception is also provided for corridors with less than 2 foot-candles of illumination at the darkest point when all lights are on, so that we are not requiring controls in darker corridors where there will be no opportunity for light reduction. The majority of corridors are lighted to > 2 fc minimum, so occupancy sensors will still be widely required in corridors.

This proposal is technology-neutral, in that it requires a 50% reduction in lighting power, but does not specify whether this is achieved by switching alternate fixtures, or by uniformly dimming all fixtures.

Cost Impact: The code change proposal will increase the cost of construction. Construction costs will be increased in projects which are required to add occupant sensors (i.e. those with corridors greater than 300 sf).

At 0.66 watts/sf (see C405.3.2(2)) a >300 sf corridor will have >200 watts of lighting installed. A 50% reduction would be >100 watt when lights are set back. Assuming 20 hours/day of light reduction (corridors are infrequently occupied), this yields a savings of at least 730 kwh/year (\$77.82 per year at the national average rate of \$0.1066/kwh).

See https://www.eia.gov/electricity/annual/html/epa/_02_07.html for national average cost of electricity.

A 60 foot corridor can be controlled from one \$80 occupant sensor. Even with installation and wiring costs added in, this will have an attractive payback.

Proposal # 4776

CE169-19

CE170-19

IECC: C405.2.1.3, C405.2.3.1

Proponent: Jack Bailey, representing International Association of Lighting Designers (jbailey@oneluxstudio.com); Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers (glenn@lampartners.com)

2018 International Energy Conservation Code

Revise as follows:

C405.2.1.3 Occupant sensor control function in open plan office areas. Occupant sensor controls in open plan office spaces less than 300 square feet (28 m²) in area shall comply with Section C405.2.1.1. Occupant sensor controls in all other open plan office spaces shall comply with all of the following:

1. The controls shall be configured so that general lighting can be controlled separately in control zones with floor areas not greater than 600 square feet (55 m²) within the open plan office space.
2. The controls shall automatically turn off general lighting in all control zones within 20 minutes after all occupants have left the open plan office space.
3. The controls shall be configured so that general lighting power in each control zone is reduced by not less than 80 percent of the full zone general lighting power in a reasonably uniform illumination pattern within 20 minutes of all occupants leaving that control zone. Control functions that switch control zone lights completely off when the zone is vacant meet this requirement.
4. ~~The controls shall be configured such that any daylight responsive control will activate open plan office space general lighting or control zone general lighting only when occupancy for the same area is detected.~~

C405.2.3.1 Daylight-responsive control function. Where required, daylight-responsive controls shall be provided within each space for control of lights in that space and shall comply with all of the following:

1. Lights in toplit zones in accordance with Section C405.2.3.3 shall be controlled independently of lights in sidelit zones in accordance with Section C405.2.3.2.
2. Daylight responsive controls within each space shall be configured so that they can be calibrated from within that space by authorized personnel.
3. Calibration mechanisms shall be in a location with ready access.
4. Where located in offices, classrooms, laboratories and library reading rooms, daylight responsive controls shall dim lights continuously from full light output to 15 percent of full light output or lower.
5. Daylight responsive controls shall be configured to completely shut off all controlled lights.
6. When occupant sensor controls have reduced the lighting power to an unoccupied setpoint in accordance with Sections C405.2.1.2 through C405.2.1.4, daylight responsive controls shall continue to adjust electric light levels in response to available daylight, but shall be configured to not increase the lighting power above the specified unoccupied setpoint.
7. Lights in sidelit zones in accordance with Section C405.2.3.2 facing different cardinal orientations [within 45 degrees (0.79 rad) of due north, east, south, west] shall be controlled independently of each other.

Exception: Up to 150 watts of lighting in each space is permitted to be controlled together with lighting in a daylight zone facing a different cardinal orientation.

Reason: The code allows “partial-off” occupant sensors in warehouses and open office areas. A separate

proposal being heard in this cycle would also require that partial-off occupant sensors be provided in corridors (although few corridors have >150W of lighting within a daylight zone).

For lights which will be controlled by both partial-off occupant sensors and daylight responsive controls, it is important that both controls work together to achieve maximum energy savings. Specifically that:

1. Daylight responsive controls continue to reduce light levels in response to daylight in spaces which are unoccupied.
2. Daylight responsive controls do not increase light levels above the unoccupied setpoint (either 50% or 20% depending on the space type) in spaces which are unoccupied.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Since “partial-off” occupant sensors are not required for warehouses and open office areas (auto-off is the cheaper way to comply with code), there is no added cost or complexity here for the code-minimum controls solution.

Proposal # 4989

CE170-19

CE171-19

IECC: C405.2.1.3

Proponent: Jack Bailey, representing International Association of Lighting Designers (jbailey@oneluxstudio.com); Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers (glenn@lampartners.com)

2018 International Energy Conservation Code

Revise as follows:

C405.2.1.3 Occupant sensor control function in open plan office areas. Occupant sensor controls in open plan office spaces less than 300 square feet (28 m²) in area shall comply with Section C405.2.1.1. Occupant sensor controls in all other open plan office spaces shall comply with all of the following:

1. The controls shall be configured so that *general lighting* can be controlled separately in control zones with floor areas not greater than 600 square feet (55 m²) within the open plan office space.
2. General lighting in each control zone shall be permitted to automatically turn on upon occupancy within the control zone. General lighting in other unoccupied zones within the open plan office space shall be permitted to turn on to no more than 20 percent of full power or remain unaffected.
- ~~2-3.~~ The controls shall automatically turn off *general lighting* in all control zones within 20 minutes after all occupants have left the open plan office space.
- ~~3.~~ ~~The controls shall be configured so that general lighting power.~~
4. General lighting in each control zone is reduced by not less than 80 percent of the full zone general lighting power in a reasonably uniform illumination pattern within 20 minutes of all occupants leaving that control zone. Control functions that switch control zone lights completely off when the zone is vacant meet this requirement. shall turn off or uniformly reduce lighting power to an unoccupied setpoint of not more than 20 percent of full power within 20 minutes after all occupants have left the control zone.
- ~~4-5.~~ The controls shall be configured such that any daylight responsive control will activate open plan office space general lighting or control zone general lighting only when occupancy for the same area is detected.

Reason: The code is silent about how lights are to be turned on in open office areas. Since the “on” function in occupant sensors is something that we are usually quite concerned with in the code, this silence is unusual, and users of the code will make their own (different) assumptions about how to interpret this silence. The addition of new item 2 above clarifies this.

Revision of item 4 is editorial in nature, and intended to conform the language in this section more closely with other code provisions related to occupant sensors. The language “to an unoccupied setpoint of not more than 20 percent of full power” is for consistency with a separate proposal for Section C405.2.3.1 which clarifies how daylight responsive controls will interact with the partial-off occupancy sensors described here. Regardless of whether that separate proposal is approved, this language still makes sense and describes the intended result.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. These changes reduce the potential for confusion and inconsistency in application of the code.

Proposal # 4774

CE171-19

CE172-19

IECC: C405.2.1.3

Proponent: Jack Bailey, representing International Association of Lighting Designers (jbailey@oneluxstudio.com); Glenn Heinmiller, representing International Association of Lighting Designers (glenn@lampartners.com)

2018 International Energy Conservation Code

Revise as follows:

C405.2.1.3 Occupant sensor control function in open plan office areas. Occupant sensor controls in open plan office spaces less than 300 square feet (28 m²) in area shall comply with Section C405.2.1.1. Occupant sensor controls in all other open plan office spaces shall comply with all of the following:

1. The controls shall be configured so that general lighting can be controlled separately in control zones with floor areas not greater than 600 square feet (55 m²) within the open plan office space.
Exception: Where general lighting is turned off by time-switch control complying with Section C405.2.2.1
2. The controls shall automatically turn off general lighting in all control zones within 20 minutes after all occupants have left the open plan office space.
3. The controls shall be configured so that general lighting power in each control zone is reduced by not less than 80 percent of the full zone general lighting power in a reasonably uniform illumination pattern within 20 minutes of all occupants leaving that control zone. Control functions that switch control zone lights completely off when the zone is vacant meet this requirement.
4. The controls shall be configured such that any daylight responsive control will activate open plan office space general lighting or control zone general lighting only when occupancy for the same area is detected.

Reason: Private offices are often configured so that occupants need to pass through open office areas to get to restrooms, printers, pantries, etc. and to exit the building. When an occupant in a private office works later than the last occupant of the open office space, they will find the lights have been set back or turned off by the occupant sensors in the open office area that they need to pass through. This is not necessarily a safety or security issue, because there will likely be some night lighting, and lights can be turned on for safe passage through the space, but it does create a perception issue. If you are the person working in the private office when the rest of the lights shut off, you may feel like (a) it is unsafe to remain, or (b) you have worked too late and it is time to go home. Some organizations won't like this.

The reason why the code currently allows lights in unoccupied areas of an open office to remain on at a reduced level is to that the last person working late in the open office area does not feel like they are all alone in a pool of light in the middle of a dark room. The proposed change would apply the same reasoning for the last person working late in a private office. The situation is very similar, and especially if the private office has a glass office front.

It is possible to achieve this same result with networked lighting controls that tie private office occupant sensors together with open office occupant sensors, but this is quite expensive. Achieving this with time scheduling results in reduced energy savings, but also reduced first cost and less controls complexity

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This exception allows more flexibility, but does not alter the lowest-cost path of compliance (which remains automatic-on, automatic-off occupant sensors).

CE173-19

IECC: C405.2.1.3

Proponent: Jonathan McHugh, representing McHugh Energy Consultants Inc. (jon@mchughenergy.com)

2018 International Energy Conservation Code

Revise as follows:

C405.2.1.3 Occupant sensor control function in open plan office areas. Occupant sensor controls in open plan office spaces less than 300 square feet (28 m²) in area shall comply with Section C405.2.1.1. Occupant sensor controls in all other open plan office spaces shall comply with all of the following:

1. The controls shall be configured so that general lighting can be controlled separately in control zones with floor areas not greater than 600 square feet (55 m²) within the open plan office space.
2. General lighting in each control zone shall be allowed to automatically turn on upon occupancy within the control zone. General lighting in other unoccupied zones within the open plan office space shall be allowed to turn on to no more than 20 percent of full power or remain unaffected.
3. The controls shall automatically turn off general lighting in all control zones within 20 minutes after all occupants have left the open plan office space. Controls shall automatically return lighting to their previous settings if occupancy is detected within 30 seconds of lights being turned off.
4. General lighting in each control zone shall turn off or uniformly reduce lighting power to no more than 20 percent of full power within 20 minutes after all occupants have left the
3. ~~The controls shall be configured so that general lighting power in each control zone is reduced by not less than 80 percent of the full zone general lighting power in a reasonably uniform illumination pattern within 20 minutes of all occupants leaving that control zone. Control functions that switch control zone lights completely off when the zone is vacant meet this requirement.~~
4. ~~5. The For general lighting also served by daylight responsive controls as required by Section C405.2.3, the occupant sensor control and the daylight responsive controls shall be configured such that any daylight responsive control will activate open plan office space general lighting or control zone general lighting only when occupancy for the same area is detected, so that power does not exceed the lesser of: the allowed power in Section C405.2.3.1 and the allowed power in Items 2 through 4 of this section.~~

Reason:

Item 2 clarifies what happen when occupancy is detected.

Revision of item 3 addresses the concern that lights are turned completely off and manual-on sensors are used, this could be a safety issue as the last occupant either walks through a dark open office area or must find switches to turn the lights on. This proposal will address this safety issue with the specification that manual on control function is overridden to automatic on if the motion is sensed within 30 seconds of lights being turned off. This capability can be accomplished with networked controls and also simpler controls.

Item 5 clarifies that luminaires controlled by both occupancy sensors and daylight responsive controls are controlled to the lower power level of the two controls.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal has not effect on cost. This proposal clarifies the existing language.

CE174-19

IECC: C405.2, C405.2.2, C405.2.2.1, C405.2.2.2, C405.2.3, C405.2.3.1

Proponent: Marilyn Williams, representing National Electrical Manufacturers Association
(mar_williams@nema.org)

2018 International Energy Conservation Code

Revise as follows:

C405.2 Lighting controls (Mandatory). Lighting systems shall be provided with controls that comply with one of the following.

1. Lighting controls as specified in Sections C405.2.1 through ~~C405.2.6~~ C405.2.7.
2. Luminaire level lighting controls (LLLC) and lighting controls as specified in Sections C405.2.1, ~~C405.2.4~~ C405.2.3, C405.2.5 and ~~C405.2.5~~ C405.2.6. The LLLC luminaire shall be independently capable of:
 - 2.1. Monitoring occupant activity to brighten or dim lighting when occupied or unoccupied, respectively.
 - 2.2. Monitoring ambient light, both electric light and daylight, and brighten or dim artificial light to maintain desired light level.
 - 2.3. For each control strategy, configuration and reconfiguration of performance parameters including; bright and dim setpoints, timeouts, dimming fade rates, sensor sensitivity adjustments, and wireless zoning configurations.

Exceptions: Lighting controls are not required for the following:

1. Areas designated as security or emergency areas that are required to be continuously lighted.
2. Interior exit stairways, interior exit ramps and exit passageways.
3. Emergency egress lighting that is normally off.

C405.2.2 Time-switch controls. Each area of the building that is not provided with *occupant sensor controls* complying with Section C405.2.1.1 shall be provided with *time-switch controls* complying with Section C405.2.2.1.

~~**Exception:** Where a *manual control* provides light reduction in accordance with Section C405.2.2.2, *time-switch controls* shall not be required for the following:~~

1. Spaces where patient care is directly provided.
2. Spaces where an automatic shutoff would endanger occupant safety or security.
3. Lighting intended for continuous operation.
4. Shop and laboratory classrooms.

~~**C405.2.2.1 Time-switch control function.** Each space provided with *time-switch controls* shall be provided with a *manual control* for light reduction in accordance with Section C405.2.2.2. *Time-switch controls* shall include incorporate an override switching device that complies with the following:~~

1. Have a minimum 7-day clock.
2. Be capable of being set for seven different day types per week.
3. Incorporate an automatic holiday "shutoff" feature, which turns off all controlled lighting loads for

- not fewer than 24 hours and then resumes normally scheduled operations.
4. Have program backup capabilities, which prevent the loss of program and time settings for not fewer than 10 hours, if power is interrupted.
 5. Include an override switch that complies with the following:
 - 5.1. The override switch shall be a manual control.
 - 5.2. The override switch, when initiated, shall permit the controlled lighting to remain on for not more than 2 hours.
 - 5.3. Any individual override switch shall control the lighting for an area not larger than 5,000 square feet (465 m²).

Exceptions:

1. Within mall concourses, auditoriums, sales areas, manufacturing facilities and sports arenas:
 - 1.1. The time limit shall be permitted to be greater than 2 hours, provided that the switch is a captive key device..
 - 1.2. The area controlled by the override switch shall not be limited to 5,000 square feet (465 m²) provided that such area is less than 20,000 square feet (1860 m²).
2. ~~Where provided with *manual control*, the following areas are not required to have light reduction control:~~
 - 2.1. ~~Spaces that have only one luminaire with a rated power of less than 100 watts.~~
 - 2.2. ~~Spaces that use less than 0.6 watts per square foot (6.5 W/ m²).~~
 - 2.3. ~~Corridors, lobbies, electrical rooms and or mechanical rooms.~~

~~C405.2.2.2 Light-reduction controls.~~ ~~Spaces required to have light reduction controls shall have a *manual control* that allows the occupant to reduce the connected lighting load in a reasonably uniform illumination pattern by not less than 50 percent. Lighting reduction shall be achieved by one of the following or another *approved* method:~~

- ~~1. Controlling all lamps or luminaires.~~
- ~~2. Dual switching of alternate rows of luminaires, alternate luminaires or alternate lamps.~~
- ~~3. Switching the middle lamp luminaires independently of the outer lamps.~~
- ~~4. Switching each luminaire or each lamp.~~

~~Exception:~~ ~~Light reduction controls are not required in *daylight zones* with *daylight responsive controls* complying with Section C405.2.3.~~

C405.2.3 Daylight-responsive controls. Each area of the building shall have light reduction controls complying with Section C405.2.3.1_ ~~shall be provided to control the electric lights within *daylight zones* in the following spaces~~

Exceptions: Where provided with manual control, the following areas are not required to have light reduction control:

1. Spaces that have only one luminaire with a total rated power of less than 100 watts.
2. Spaces that use less than 0.6 watts per square foot (6.5 W/m²).
3. Corridors, lobbies, electrical rooms and or mechanical rooms.
4. Daylight zones with daylight responsive controls complying with Section C405.2.4 more than 150 watts of general lighting within sidelit zones complying with Section C405.2.3.2 *General*

~~lighting does not include lighting that is required to have specific application control in accordance with Section C405.2.4. 2. Spaces with a total of more than 150 watts of general lighting within toplit zones complying with Section C405.2.3.3.~~

Exceptions: Daylight responsive controls are not required for the following:

1. Spaces in health care facilities where patient care is directly provided.
2. Lighting that is required to have specific application control in accordance with Section C405.2.4.
3. Sidelit zones on the first floor above grade in Group A-2 and Group M occupancies.
4. New buildings where the total connected lighting power calculated in accordance with Section C405.3.1 is not greater than the adjusted interior lighting power allowance (LPA_{adj}) calculated in accordance with Equation 4-9

$$LPA_{adj} = \left[\frac{LPA_{norm} \times (1.0 - 0.4 \times UDZFA)}{TBFA} \right]$$

(Equation 4-9)

where:

LPA_{adj} = Adjusted building interior lighting power allowance in watts.

LPA_{norm} = Normal building lighting power allowance in watts calculated in accordance with Section C405.3.2 and reduced in accordance with Section C406.3 where Option 2 of Section C406.1 is used to comply with the requirements of Section C406.

$UDZFA$ = Uncontrolled daylight zone floor area is the sum of all sidelit and toplit zones, calculated in accordance with Sections C405.2.3.2 and C405.2.3.3, that do not have daylight responsive controls.

$TBFA$ = Total building floor area is the sum of all floor areas included in the lighting power allowance calculation in Section C405.3.2.

C405.2.3.1 Daylight-responsive Light-reduction control function. Light-reduction controls shall have a manual control that allows the occupant to turn the lights completely off, and to an intermediate step that reduces the connected lighting load by not less than 50 percent. Lighting reduction shall be achieved by one of the following or another approved method:

1. Controlling all lamps or luminaires.
2. Dual switching of alternate rows of luminaires, alternate luminaires or alternate lamps.
3. Switching the middle lamp luminaires independently of the outer lamps.
4. Switching each luminaire or each lamp.

Where required, *daylight-responsive controls* shall be provided within each space for control of lights in that space and shall comply with all of the following:

1. Lights in *toplit zones* in accordance with Section C405.2.3.3 shall be controlled independently of lights in *sidelit zones* in accordance with Section C405.2.3.2.
2. *Daylight responsive controls* within each space shall be configured so that they can be calibrated from within that space by authorized personnel.
3. Calibration mechanisms shall be in a location with *ready access*.
4. Where located in offices, classrooms, laboratories and library reading rooms, *daylight responsive controls* shall dim lights continuously from full light output to 15 percent of full light

output or lower.

5. *Daylight responsive controls* shall be configured to completely shut off all controlled lights.
6. Lights in *sidelit zones* in accordance with Section C405.2.3.2 facing different cardinal orientations [within 45 degrees (0.79 rad) of due north, east, south, west] shall be controlled independently of each other.

Exception: Up to 150 watts of lighting in each space is permitted to be controlled together with lighting in a daylight zone facing a different cardinal orientation.

Reason: Revising this language will:

1. Reduce inconsistency and confusion with light-reduction control requirements
2. Reduce energy use
3. Increase code interpretation simplicity
4. Resolve compliance in application, approval and inspection
5. Improve the occupant's ability to operate their lighting
6. Will not change the intent or requirements of the code provision.

Beginning with the 2015 IECC, light reduction controls has been a significant area of confusion in the lighting control section. Much of this is founded in the editing from the 2012 IECC to the 2015 IECC. As an example, some of the exceptions to light reduction control are found in the C405.2.2.1 Time-switch control function section. This proposed change puts these exceptions under the light reduction control section, instead of the Time-switch control function section. This will simplify reading and interpretation of the code, as one would not expect to find code provision exceptions residing in a different section.

The proposal simplifies code language by eliminating confusing and redundant pre-condition phrases in the exceptions to C405.2.2 Time-switch control, and C405.2.2.1 Time-switch control function, by removing "in accordance with Section C405.2.2.2 Light reduction control".

Removing the light reduction control from being a subsection of C405.2.2 Time-switch controls, into its own section C405.2.3, as was done with the C405.2.5 Manual Controls section in the 2018 IECC cycle, will help clarify ambiguity within the electrical and lighting design community. Some interpret that the light reduction control requirements only apply to spaces where the lighting shut-off is accomplished through time-switch control. Some jurisdictions, like the City of Houston, have written clarifying position statements to overcome the confusion with how this code section is written. The verbal interpretation given by the ICC technical support line has supported the interpretation that light reduction control applies to all spaces, regardless of lighting shut-off method, and regardless of its sub-paragraphing under the time-switch control provision.

The proposal applies light reduction control for good occupant controllability of lighting in the space and for increased energy efficiency to all buildings spaces not listed in the exceptions.

This would align the IECC with other energy efficiency codes and reduce the significant application and inspection confusion that currently exists with how this provision is written.

Cost Impact: The code change proposal will increase the cost of construction
Baselining the cost of construction at where light reduction control is applicable to all spaces, except spaces where exempt, the cost remains the same as current code and the energy efficiency benefits remain the same.

Proposal # 4382

CE174-19

CE175-19

IECC: C405.2, C405.2.2, C405.2.2.1, C405.2.2.2, C405.2.3.1, C405.2.3(New), C405.2.4, C405.2.3, C405.2.5

Proponent: Jack Bailey, representing International Association of Lighting Designers (jbailey@oneluxstudio.com); Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers (glenn@lampartners.com)

2018 International Energy Conservation Code

Revise as follows:

C405.2 Lighting controls (Mandatory). Lighting systems shall be provided with controls that comply with one of the following.

1. Lighting controls as specified in Sections C405.2.1 through ~~C405.2.6~~ C405.2.7.
2. Luminaire level lighting controls (LLLC) and lighting controls as specified in Sections C405.2.1, ~~C405.2.4~~ C405.2.5 and ~~C405.2.5~~ C405.2.6. The LLLC luminaire shall be independently capable of:
 - 2.1. Monitoring occupant activity to brighten or dim lighting when occupied or unoccupied, respectively.
 - 2.2. Monitoring ambient light, both electric light and daylight, and brighten or dim artificial light to maintain desired light level.
 - 2.3. For each control strategy, configuration and reconfiguration of performance parameters including; bright and dim setpoints, timeouts, dimming fade rates, sensor sensitivity adjustments, and wireless zoning configurations.

Exceptions: Lighting controls are not required for the following:

1. Areas designated as security or emergency areas that are required to be continuously lighted.
2. Interior exit stairways, interior exit ramps and exit passageways.
3. Emergency egress lighting that is normally off.

C405.2.2 Time-switch controls. Each area of the building that is not provided with *occupant sensor controls* complying with Section C405.2.1.1 shall be provided with *time-switch controls* complying with Section C405.2.2.1.

Exception Exceptions: ~~Where a manual control provides light reduction in accordance with Section C405.2.2.2; time-switch controls shall not be required for the following:~~

1. Spaces where patient care is directly provided.
2. Spaces where an automatic shutoff would endanger occupant safety or security.
3. Lighting intended for continuous operation.
4. Shop and laboratory classrooms.

C405.2.2.1 Time-switch control function. ~~Each space provided with time-switch controls shall be provided with a manual control for light reduction in accordance with Section C405.2.2.2. Time-switch controls shall include an override switching device that complies with comply with the all of the following:~~

1. Automatically turn lights off when the space is scheduled to be unoccupied.
2. Have a minimum 7-day clock.

3. Be capable of being set for seven different day types per week.
4. Incorporate an automatic holiday “shutoff” feature, which turns off all controlled lighting loads for not fewer than 24 hours and then resumes normally scheduled operations.
5. Have program backup capabilities, which prevent the loss of program and time settings for not fewer than 10 hours, if power is interrupted.
6. Include an override switch that complies with the following:
 - 6.1. The override switch shall be a manual control.
 - 6.2. The override switch, when initiated, shall permit the controlled lighting to remain on for not more than 2 hours.
 - 6.3.. Any individual override switch shall control the lighting for an area not larger than 5,000 square feet (465 m²).

Exception Exceptions:

1. Within mall concourses, auditoriums, sales areas, manufacturing facilities and sports arenas:
 - 1.1. The time limit shall be permitted to be greater than 2 hours, provided that the switch is a captive key device.
 - 1.2. The area controlled by the override switch shall not be limited to 5,000 square feet (465 m²) provided that such area is less than 20,000 square feet (1860m²).
2. ~~Where provided with *manual control*, the following areas are not required to have light reduction control:~~
 - 2.1. ~~Spaces that have only one luminaire with a rated power of less than 100 watts.~~
 - 2.2. ~~Spaces that use less than 0.6 watts per square foot (6.5 W/m²).~~
 - 2.3. ~~Corridors, lobbies, electrical rooms and or mechanical rooms.~~

~~**C405.2.2.2 C405.2.3.1 Light-reduction controls- control function.**~~ Spaces required to have light-reduction controls shall have a *manual control* that allows the occupant to reduce the connected lighting load in a reasonably uniform illumination pattern by not less than 50 percent. Lighting reduction shall be achieved by one of the following or another *approved* method:

1. Controlling all lamps or luminaires.
2. Dual switching of alternate rows of luminaires, alternate luminaires or alternate lamps.
3. Switching the middle lamp luminaires independently of the outer lamps.
4. Switching each luminaire or each lamp.

~~**Exception:** Light reduction controls are not required in *daylight zones with daylight responsive controls* complying with Section C405.2.3.~~

Add new text as follows:

405.2.3 Light reduction controls Where not provided with occupant sensor controls complying with Section C405.2.1.1, *general lighting* shall be provided with light reduction controls complying with C405.2.3.1.

Exceptions:

1. Luminaires controlled by daylight responsive controls complying with C405.2.4.

2. Luminaires controlled by special application controls complying with C405.2.5.
3. Where provided with manual control, the following areas are not required to have light reduction control::
 - 3.1. Spaces that have only one luminaire with a rated power of less than 100 watts.
 - 3.2. Spaces that use less than 0.6 watts per square foot (6.5 W/m².)
 - 3.3. Corridors, lobbies, electrical rooms and or mechanical rooms.

Revise as follows:

~~C405.2.4~~ C405.2.5 Specific application controls. Specific application controls shall be provided for the following:

1. The following lighting shall be controlled by an occupant sensor complying with Section C405.2.1.1 or a time-switch control complying with Section C405.2.2.1. In addition, a manual control shall be provided to control such lighting separately from the general lighting in the space:
 - 1.1. Display and accent.
 - 1.2. Lighting in display cases.
 - 1.3. Supplemental task lighting, including permanently installed under-shelf or under-cabinet lighting.
 - 1.4. Lighting equipment that is for sale or demonstration in lighting education.
2. *Sleeping units* shall have control devices or systems that are configured to automatically switch off all permanently installed luminaires and switched receptacles within 20 minutes after all occupants have left the unit.

Exceptions:

1. Lighting and switched receptacles controlled by card key controls.
 2. Spaces where patient care is directly provided.
3. Permanently installed luminaires within *dwelling units* shall be provided with controls complying with Section C405.2.1.1 or ~~C405.2.2.2, C405.2.3.1.~~
 4. Lighting for nonvisual applications, such as plant growth and food warming, shall be controlled by a time switch control complying with Section C405.2.2.1 that is independent of the controls for other lighting within the room or space.

~~C405.2.3~~ C405.2.4 Daylight-responsive controls. *Daylight-responsive controls* complying with Section C405.2.3.1 shall be provided to control the electric lights within *daylight zones* in the following spaces:

1. Spaces with a total of more than 150 watts of *general lighting* within sidelit zones complying with Section C405.2.3.2 *General lighting* does not include lighting that is required to have specific application control in accordance with Section C405.2.4.
2. Spaces with a total of more than 150 watts of *general lighting* within toplit zones complying with Section C405.2.3.3.

Exceptions: Daylight responsive controls are not required for the following:

1. Spaces in health care facilities where patient care is directly provided.
2. Lighting that is required to have specific application control in accordance with Section C405.2.4.
3. Sidelit zones on the first floor above grade in Group A-2 and Group M occupancies.

4. New buildings where the total connected lighting power calculated in accordance with Section C405.3.1 is not greater than the adjusted interior lighting power allowance (LPA_{adj}) calculated in accordance with Equation 4-9

$$LPA_{adj} = \frac{LPA_{norm} \times (1.0 - 0.4 \times UDZFA / TBFA)}{TBFA}$$

(Equation 4-9)

where:

LPA_{adj} = Adjusted building interior lighting power allowance in watts.

LPA_{norm} = Normal building lighting power allowance in watts calculated in accordance with Section C405.3.2 and reduced in accordance with Section C406.3 where Option 2 of Section C406.1 is used to comply with the requirements of Section C406.

$UDZFA$ = Uncontrolled daylight zone floor area is the sum of all sidelit and toplit zones, calculated in accordance with Sections C405.2.3.2 and C405.2.3.3, that do not have daylight responsive controls.

$TBFA$ = Total building floor area is the sum of all floor areas included in the lighting power allowance calculation in Section C405.3.2.

Reason: The existing Section C405.2.2 is not straightforward. One of the biggest reasons is that it includes scoping and technical requirements for two different energy savings strategies: switching lights off by time scheduling, and light reduction controls to allow occupants to operate lights at a lower level. The applicability of the requirements for these two strategies is similar, but not identical, resulting in a lot of complicated exceptions. This proposal would untangle these requirements by putting the light reduction controls in a new section C405.2.3. This will dramatically improve the reading of Section C405.2.2 and eliminate several instances where we establish a new control requirement through an exception.

The deletion of exceptions language under C405.2.2 appears to remove the requirement for light reduction controls from the four listed applications, but this requirement is actually maintained (since these applications are not provided with occupant sensor controls, they would still be required to have light reduction controls).

This proposal does not change the applicability or stringency of controls requirements. It is a purely editorial change which makes the code easier to use and enforce.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal does not change the applicability or stringency of controls requirements. It is a purely editorial change which makes the code easier to use and enforce.

Proposal # 4779

CE175-19

CE176-19

IECC: C405.2, C405.2.2

Proponent: Jack Bailey, representing International Association of Lighting Designers (jbailey@oneluxstudio.com); Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers (glenn@lampartners.com)

2018 International Energy Conservation Code

Revise as follows:

C405.2 Lighting controls (Mandatory). Lighting systems shall be provided with controls that comply with one of the following.

1. Lighting controls as specified in Sections C405.2.1 through C405.2.6.
2. Luminaire level lighting controls (LLLC) and lighting controls as specified in Sections C405.2.1, C405.2.4 and C405.2.5. The LLLC luminaire shall be independently capable of:
 - 2.1. Monitoring occupant activity to brighten or dim lighting when occupied or unoccupied, respectively.
 - 2.2. Monitoring ambient light, both electric light and daylight, and brighten or dim artificial light to maintain desired light level.
 - 2.3. For each control strategy, configuration and reconfiguration of performance parameters including; bright and dim setpoints, timeouts, dimming fade rates, sensor sensitivity adjustments, and wireless zoning configurations.

Exceptions: Lighting controls are not required for the following:

1. ~~Areas designated as security or emergency areas that are required to be continuously lighted. Spaces where an automatic shutoff would endanger occupant safety or security.~~
2. Interior exit stairways, interior exit ramps and exit passageways.
3. Emergency egress lighting that is normally off.

C405.2.2 Time-switch controls. Each area of the building that is not provided with *occupant sensor controls* complying with Section C405.2.1.1 shall be provided with *time-switch controls* complying with Section C405.2.2.1.

Exception: Where a *manual control* provides light reduction in accordance with Section C405.2.2.2, *time-switch controls* shall not be required for the following:

1. ~~Spaces~~ spaces where patient care is directly provided.
2. ~~Spaces where an automatic shutoff would endanger occupant safety or security.~~
3. ~~Lighting intended for continuous operation.~~
4. ~~Shop and laboratory classrooms.~~

Reason: The “safety” exception in C405.2 is quite important. If written too narrowly, it can compromise safety. But if written too broadly, it can become a loophole that creates unnecessary exceptions from the lighting controls requirements in the code. Let’s examine the current language.

Areas “designated as security or emergency areas”. Designated by whom? Such designations are shown on floor plans? Is this meant to be limited to 911 call centers and prisons? Or is this meant to include bank branches and fire stations? Refuge areas? Muster points?

“That are required to be continuously lighted”. Required by whom? What jurisdiction requires that lights operate continuously in buildings which are unoccupied? Jurisdictional **lighting** requirements are common – for bank ATM areas, hospitals, swimming pools, kitchens, parking lots, etc. as well as for egress lighting required by IBC. But these requirements are almost always limited in duration – either while the space or building is occupied, while a certain activity is occurring, or after dark for exterior areas. There is almost never a requirement that lights operate continuously. So if this “requirement” that the space be continuously lighted does not come from the jurisdiction, does it come from the building owner?

It is also possible that the current exception does not cover all spaces where lighting controls could endanger occupants. For example, dangerous work is performed in some (but not all) laboratories and workshops.

The proposed language, “Spaces where an automatic shutoff would endanger occupant safety or security” is already an exception from the time-switch controls requirements in section C405.2.2, and it makes sense to apply this language more broadly as the exception from occupant sensor and daylight responsive controls requirements as well.

An “automatic shutoff” could be planned or unplanned, and could be the result of a malfunctioning control system (e.g. occupant sensors shut off lights in an occupied space).

“Would” endanger is strong language. There is no guarantee that any shutoff would endanger occupants, but this is better than the permissive language alternates “could”, “may” etc.

And finally, it is the “occupants” who would need to be endangered. We are not using this as an excuse to leave lights burning continuously for “security” lighting to secure an empty room. In the 21st century we have better ways to secure spaces than leaving the lights on all the time and having a guard walk by occasionally to look in.

Once we have made this change in C405.2 then we can eliminate some additional exceptions in C405.2.2.

- “Lighting intended for continuous operation” has always been problematic. “Intended” by whom? Since it is quite rare for an authority to have such a requirement, this is usually interpreted to mean that a building owner “requires” (i.e. “wants”) the lighting to be operated continuously. If an authority has such a requirement, then that requirement would supercede this code (per C101.3). But even if this is an owner “requirement” at the time the space is built, requirements change over time. A store which is intended to be 24-hour operation may well change to 18-hour operation during an economic downturn, or close and be re-opened by someone else who runs a 12-hour operation.
- “Shop and laboratory classrooms” – if there is a safety concern then the proposed Exception 1 to C405.2 would provide an exemption. It should be noted, however, that in practice many spaces of this type are currently provided with occupant sensors.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The intent of this proposal is to make existing exceptions clearer and more enforceable, not to change the scope of these exceptions.

Proposal # 4778

CE176-19

CE177-19

IECC: C405.2.2.1

Proponent: Glenn Heinmiller, Lam Partners, representing Self (glenn@lampartners.com); Jack Bailey (jbailey@oneluxstudio.com)

2018 International Energy Conservation Code

Revise as follows:

C405.2.2.1 Time-switch control function. Each space provided with *time-switch controls* shall be provided with a ~~manual control~~ for light reduction control in accordance with Section C405.2.2.2. Time-switch controls shall include an override switching device that complies with the following:

1. Have a minimum 7-day clock.
2. Be capable of being set for seven different day types per week.
3. Incorporate an automatic holiday “shutoff” feature, which turns off all controlled lighting loads for not fewer than 24 hours and then resumes normally scheduled operations.
4. Have program backup capabilities, which prevent the loss of program and time settings for not fewer than 10 hours, if power is interrupted.
5. Include an override switch that complies with the following:
 - 5.1. The override switch shall be a manual control.
 - 5.2. The override switch, when initiated, shall permit the controlled lighting to remain on for not more than 2 hours.
 - 5.3. Any individual override switch shall control the lighting for an area not larger than 5,000 square feet (465 m²).

Exceptions:

1. Within mall concourses, auditoriums, sales areas, manufacturing facilities and sports arenas:
 - 1.1. The time limit shall be permitted to be greater than 2 hours, provided that the switch is a captive key device.
 - 1.2. The area controlled by the override switch shall not be limited to 5,000 square feet (465 m²) provided that such area is less than 20,000 square feet (1860 m²).
2. Where provided with manual control, the following areas are not required to have light reduction control:
 - 2.1. Spaces that have only one luminaire with a rated power of less than 100 watts.
 - 2.2. Spaces that use less than 0.6 watts per square foot (6.5 W/m²).
 - 2.3. Corridors, lobbies, electrical rooms and or mechanical rooms.

Reason: This proposal clarifies of the intent of the code by replacing a confusing phrase with the correct term. The phrase “manual control for lighting reduction” is confusing. It should be replaced with “light-reduction control” which is what this paragraph is referring to. Light-reduction controls are described in C405.2.2.2

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is only a clarification.

Proposal # 4665

CE177-19

CE178-19

IECC: C405.2.2.1

Proponent: Marilyn Williams, representing National Electrical Manufacturers Association
(mar_williams@nema.org)

2018 International Energy Conservation Code

Revise as follows:

C405.2.2.1 Time-switch control function. Each space provided with *time-switch controls* shall be provided with a *manual control* for light reduction in accordance with Section C405.2.2.2. Time-switch *controls* shall include an override switching device that complies with the following:

1. Have a minimum 7-day clock.
2. Be capable of being set for seven different day types per week.
3. Incorporate an automatic holiday “shutoff” feature, which turns off all controlled lighting loads for not fewer than 24 hours and then resumes normally scheduled operations.
4. Have program backup capabilities, which prevent the loss of program and time settings for not fewer than 10 hours, if power is interrupted.
5. Include an override switch that complies with the following:
 - 5.1. The override switch shall be a manual control.
 - 5.2. The override switch, when initiated, shall permit the controlled lighting to remain on for not more than 2 hours.
 - 5.3. Any individual override switch shall control the lighting for an area not larger than 5,000 square feet (465 m²).

Exceptions:

1. Within mall concourses, auditoriums, sales areas, manufacturing facilities and sports arenas:
 - 1.1. The time limit shall be permitted to be greater than 2 hours, provided that the switch is a captive key device.
 - 1.2. The area controlled by the override switch shall not be limited to 5,000 square feet (465 m²) provided that such area is less than 20,000 square feet (1860 m²).
2. Where provided with *manual control*, the following areas are not required to have light reduction control:
 - 2.1. Spaces that have only one luminaire with a rated power of less than ~~100-60~~ watts.
 - 2.2. Spaces that use less than ~~0.6-0.45~~ watts per square foot (~~6.5-4.9~~ W/m²).
 - 2.3. Corridors, lobbies, electrical rooms and or mechanical rooms.

Reason: Revising this language will:

- 1 Update the code for use of LED lighting
2. Reduce energy use

As lighting has become more efficient with the use of LEDs, the lighting power density and wattage of luminaires has reduced significantly. However, the Light Reduction Control exception found under C405.2.2.1, has not adjusted accordingly. Both the one luminaire wattage exception (2.1) and the space lighting power density exception (2.2), are the same values as published under the 2009 IECC version. These values use a fluorescent lighting power baseline that is not consistent with either current lighting allowances used in the code

today, nor with the solid state technology that is now the building standard.

The wattage exception for a single luminaire is adjusted to 60 watts, well above the wattage of a standard single 2x4 LED fixture found on the market today. The lighting power exception has been adjusted down by 25% to 0.45 watts per square foot. This aligns with the reduction changes in lighting power density allowance from the 2009 IECC to the proposed values from ASHRAE 90.1-2019.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. There is no cost impact. This editorial change clarifies the code intent and will improve compliance and consistency for energy efficient control of lighting.

Proposal # 4386

CE178-19

CE179-19

IECC: C405.2.2.2

Proponent: Jack Bailey, representing International Association of Lighting Designers (jbailey@oneluxstudio.com); Glenn Heinmiller, representing International Association of Lighting Designers (glenn@lampartners.com)

2018 International Energy Conservation Code

Revise as follows:

C405.2.2.2 Light-reduction controls. Spaces required to have light-reduction controls shall have a manual control ~~controls~~ that ~~allows~~ allow the ~~occupant to~~ occupants to ~~turn the lights off, and~~ reduce the connected lighting load ~~in a reasonably uniform illumination pattern by not less than 50 percent.~~ Lighting reduction shall be ~~achieved by~~ using one of the following or another approved method:

1. ~~Controlling all lamps or luminaires.~~ Continuous dimming of all luminaires from full output to less than 20 percent of full power.
2. ~~Dual switching of alternate rows of luminaires, alternate luminaires or alternate lamps.~~ Switching all luminaires to a reduced output of not less than 30 percent, and not more than 70 percent of full power.
3. ~~Switching the middle lamp luminaires independently of the outer lamps.~~ Switching alternate luminaires or alternate rows of luminaires to achieve a reduced output of not less than 30 percent, and not more than 70 percent of full power.
4. ~~Switching each luminaire or each lamp.>~~

Exception: ~~Light reduction controls are not required in daylight zones with daylight responsive controls complying with Section C405.2.3.~~

Reason: The existing code language referring to switching of “lamps” is outdated. Modern LED luminaires no longer have lamps and are not referred to in this way. When the 2021 IECC is adopted in 2022 and 2023 this terminology will seem archaic. The proposed language is technology neutral, in that it describes a result which can be achieved using either LED or obsolete lighting technologies like fluorescent.

This proposal also incorporates the word “dimming” to clarify that dimming is an acceptable strategy for “light reduction controls”. While dimming is permitted by #1 in the existing code, a surprisingly large number of code users do not understand this because the word “dimming” is not specifically used.

Finally, this proposal fixes a problem with the existing language. As currently written, there is not actually a requirement for an intermediate step between “on” and “off” because “off” is “a reduction of not less than 50 percent”. This proposal specifically requires that an intermediate step be provided between “on” and “off”.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal is editorial.

Proposal # 4781

CE179-19

CE180-19

IECC: C405.2.2.1

Proponent: Jack Bailey, representing International Association of Lighting Designers (jbailey@oneluxstudio.com); Glenn Heinmiller, representing Self (glenn@lampartners.com)

2018 International Energy Conservation Code

Revise as follows:

C405.2.2.1 Time-switch control function. Each space provided with *time-switch controls* shall be provided with a *manual control* for light reduction in accordance with Section C405.2.2.2. Time-switch *controls* shall include ~~an override switching device that complies with~~ comply with all of the following:

1. Automatically turn off the lights when the space is scheduled to be unoccupied.
2. Have a minimum 7-day clock.
3. Be capable of being set for seven different day types per week.
4. Incorporate an automatic holiday “shutoff” feature, which turns off all controlled lighting loads for not fewer than 24 hours and then resumes normally scheduled operations.
5. Have program backup capabilities, which prevent the loss of program and time settings for not fewer than 10 hours, if power is interrupted.
6. Include an override switch that complies with the following:
 - 6.1. The override switch shall be a manual control.
 - 6.2. The override switch, when initiated, shall permit the controlled lighting to remain on for not more than 2 hours.
 - 6.3. Any individual override switch shall control the lighting for an area not larger than 5,000 square feet (465 m²).

Exceptions:

1. Within mall concourses, auditoriums, sales areas, manufacturing facilities and sports arenas:
 - 1.1. The time limit shall be permitted to be greater than 2 hours, provided that the switch is a captive key device.
 - 1.2. The area controlled by the override switch shall not be limited to 5,000 square feet (465 m²) provided that such area is less than 20,000 square feet (1860 m²).
2. Where provided with *manual control*, the following areas are not required to have light reduction control:
 - 2.1. Spaces that have only one luminaire with a rated power of less than 100 watts.
 - 2.2. Spaces that use less than 0.6 watts per square foot (6.5 W/m²).
 - 2.3. Corridors, lobbies, electrical rooms and or mechanical rooms.

Reason: Somehow this section of the code fails to state the obvious: that time-switch controls automatically turn lights off when the space is scheduled to be unoccupied. Instead there is a confusing statement about an “override switching device”, which is describes a relay, but which is usually interpreted by users of the code to be describing a switch which is accessible to occupants. This is doubly-confusing because the list of requirements under C405.2.2.1 is described as establishing requirements for the “override switching device” only, and not for the time-switch system as a whole.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This editorial change clarifies the code intent and will improve compliance and consistency for energy efficient

automatic lighting shut off control.

Proposal # 4782

CE180-19

CE181-19

IECC: C405.2.2.2

Proponent: Marilyn Williams, representing National Electrical Manufacturers Association
(mar_williams@nema.org)

2018 International Energy Conservation Code

Revise as follows:

C405.2.2.2 Light-reduction controls. Spaces required to have light-reduction controls shall have a *manual control* that allows the occupant to reduce the connected lighting load by not less than 50 percent in a reasonably uniform illumination pattern ~~by not less than 50 percent.~~ with an intermediate step in addition to full on or off, or with continuous dimming control. Lighting reduction shall be achieved by one of the following or another *approved* method:

1. Controlling all lamps or luminaires.
2. Dual switching of alternate rows of luminaires, alternate luminaires or alternate lamps.
3. Switching the middle lamp luminaires independently of the outer lamps.
4. Switching each luminaire or each lamp.

Exception: Light reduction controls are not required in *daylight zones* with *daylight responsive controls* complying with Section C405.2.3.

Reason: Revising this language will:

1. Increase energy efficiency
2. Reduce inconsistency and confusion with light-reduction control requirements
3. Increase code interpretation, application and enforcement
4. Correct an unintended loophole

The ability to reduce light level either by lighting load on/off switch control or by continuous dimming, provides energy savings as well as lighting adjustability benefits for the occupant. The intent of the provision is to allow space occupants to manually reduce their lighting level by at least 50% of lighting load for personal preference, to avoid glare or simply because full lighting levels is not needed in the space. The light-reduction control requirement has a loophole which allows provision compliance without meeting the intent. Manual lighting controls which turns lighting all the way off, can be interpreted as a reduction of the lighting load of "not less than 50 percent." The way the language is written, full shut off would comply with the provision, but would not meet the intent of the code.

The proposed language would indicate light-reduction control is an intermediate step, in addition to lighting full on and full off control steps, typically provided by manual control requirements. This language eliminates the present loop hole allowing no light reduction control, as the code intends just the opposite. The proposed language also clarifies that continuous dimming would comply with the control requirement while providing further adjustability benefits to the space occupants.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is an editorial change to clarify the code's intent. It will improve compliance and consistency for energy efficient control of lighting.

CE182-19

IECC: C405.2.2.2

Proponent: Marilyn Williams, representing National Electrical Manufacturers Association
(mar_williams@nema.org)

2018 International Energy Conservation Code

Revise as follows:

C405.2.2.2 Light-reduction controls. Spaces required to have light-reduction controls shall have a *manual control* that allows the occupant to reduce the connected lighting load in a reasonably uniform illumination pattern by not less than 50 percent. Lighting reduction shall be achieved by one of the following or another *approved* method:

1. Controlling all lamps or luminaires.
2. Dual switching of alternate rows of luminaires, alternate luminaires or alternate lamps.
3. Switching the middle lamp luminaires independently of the outer lamps.
4. Switching each luminaire or each lamp.

~~**Exception:** Light reduction controls are not required in *daylight zones with daylight responsive controls* complying with Section C405.2.3.~~

Reason: Revising this language will:

1. Reduce inconsistency and confusion with light-reduction control requirements
2. Reduct energy use
3. Increase code interpretation simplicity
4. Resolve compliance in application, approval and inspection
5. Improve the occupant's ability to operate their lighting

As the controllability of lighting with LED luminaires has simplified both light reduction and automatic daylight responsive controls, this exception is no longer warranted. Removing this exception allows the light-reduction control provision to become more consistent with user controllability of lighting in areas that have automatic daylight responsive controls. This is a win-win, as the occupants retain more controllability in the space and allows the space to operate more energy efficient by giving occupants control to reduct lighting below levels that daylighting responsive control may adjust them.

A practical example is in an office building. Light level reduction control provides the space user manual control to reduce the lighting through dimming the luminaire or uniformaly switching off some fixtures. However, when the space is required to have daylight responsive controls, the controllability and energy savings may be unnecessarily removed due to this exception. The cost of the lighting controls to accomplish both provisions are the same devices with today's LED lighting control technology.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is an editorial change to clarify the code's intent. It will improve compliance and consistency for energy efficient control of lighting.

CE183-19

IECC: C405.2.2.2

Proponent: Marilyn Williams, National Electrical Manufacturers Association, representing National Electrical Manufacturers Association

2018 International Energy Conservation Code

Revise as follows:

C405.2.2.2 Light-reduction controls. Spaces required to have light-reduction controls shall have a *manual control* that allows the occupant to reduce the general lighting connected lighting load in a reasonably uniform illumination pattern by not less than 50 percent. Lighting reduction shall be achieved by one of the following or another *approved* method:

1. Controlling all lamps or luminaires.
2. Dual switching of alternate rows of luminaires, alternate luminaires or alternate lamps.
3. Switching the middle lamp luminaires independently of the outer lamps.
4. Switching each luminaire or each lamp.

Exception: Light reduction controls are not required in *daylight zones* with *daylight responsive controls* complying with Section C405.2.3.

Reason: Revising this language will:

1. Reduce inconsistency and confusion with light-reduction control requirements
2. Increase code interpretation simplicity.
3. Will not change the intent or requirements of the code provision.

The International Energy Conservation Code has never clarified which type of lighting the C405.2.2.2 Light Reduction Control requirement applies. Other energy efficiency codes explicitly indicate that light reduction control only applies to what is defined as the "general lighting" (defined in the section C202 General Definitions) in the space. It has been common practice and common interpretation of the IECC light reduction control section to only apply its requirements to space general lighting. Yet, since this is not specifically stated, it could be enforced on other lighting in the space and cause inappropriate confusion and added cost to the construction of buildings.

Application specific lighting or other lighting considered "non-general" lighting, typically cannot be uniformly controlled, nor does it offer a uniform level of illumination to a space that could be easily reduced by at least 50%. These types of lights include under cabinet, supplemental task luminaires, decorative luminaires, wall sconces, display lighting, case lighting, accent lighting and others. The definition of general lighting, states in part, "shall not include decorative lighting or lighting that provides a dissimilar level of illumination to serve a specialized application or feature with such area", highlights lighting not conducive to "reasonably uniform illumination pattern" that is required by the provision.

Specifically including and explicitly providing the language, "general lighting" in the requirement will reduce the interpretation issues and have the code state correctly, what lighting is required to follow light reduction controls. It will also stop mis-application of the requirement intent and reduce construction cost where this mis-application would have otherwise occurred.

This editorial change clarifies the code intent and will improve compliance and consistency for energy efficient control of lighting.

Cost Impact: The code change proposal will decrease the cost of construction

The decrease in the cost of construction is a result of clarifying the appropriate lighting required to have reduced level lighting control and not include the cost of controls for non-general lighting unnecessary, where it is a clear mis-application.

Proposal # 4903

CE183-19

CE184-19

IECC: C405.2.3, C405.2.3.1, C405.2.3.2, FIGURE C405.2.3.2

Proponent: Marilyn Williams, representing National Electrical Manufacturers Association
(mar_williams@nema.org)

2018 International Energy Conservation Code

Revise as follows:

C405.2.3 Daylight-responsive controls. *Daylight-responsive controls* complying with Section C405.2.3.1 shall be provided to control the ~~electric lights~~ general lighting within *daylight zones* in the following spaces:

1. Spaces with a total of more than ~~150~~ 120 watts of *general lighting* within sidelit zones complying with Section C405.2.3.2 ~~*General lighting* does not include lighting that is required to have specific application control in accordance with Section C405.2.4.~~
2. Spaces with a total of more than 240 watts of *general lighting* within the primary and secondary sidelit zones complying with Section C405.2.3.2.
3. Spaces with a total of more than ~~150~~ 120 watts of *general lighting* within toplit zones complying with Section C405.2.3.3.

Exceptions: Daylight responsive controls are not required for the following:

1. Spaces in health care facilities where patient care is directly provided.
2. Lighting that is required to have specific application control in accordance with Section C405.2.4.
3. Sidelit zones on the first floor above grade in Group A-2 and Group M occupancies.
4. New buildings where the total connected lighting power calculated in accordance with Section C405.3.1 is not greater than the adjusted interior lighting power allowance (LPA_{adj}) calculated in accordance with Equation 4-9

$$LPA_{adj} = \left[\frac{LPA_{norm}}{TBFA} \times (1.0 - 0.4 \times UDZFA) \right]$$

(Equation 4-9)

where:

LPA_{adj} = Adjusted building interior lighting power allowance in watts.

LPA_{norm} = Normal building lighting power allowance in watts calculated in accordance with Section C405.3.2 and reduced in accordance with Section C406.3 where Option 2 of Section C406.1 is used to comply with the requirements of Section C406.

$UDZFA$ = Uncontrolled daylight zone floor area is the sum of all sidelit and toplit zones, calculated in accordance with Sections C405.2.3.2 and C405.2.3.3, that do not have daylight responsive controls.

$TBFA$ = Total building floor area is the sum of all floor areas included in the lighting power allowance calculation in Section C405.3.2.

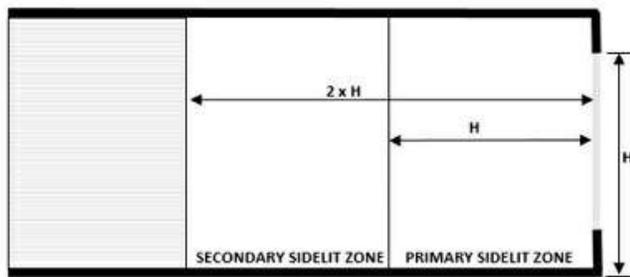
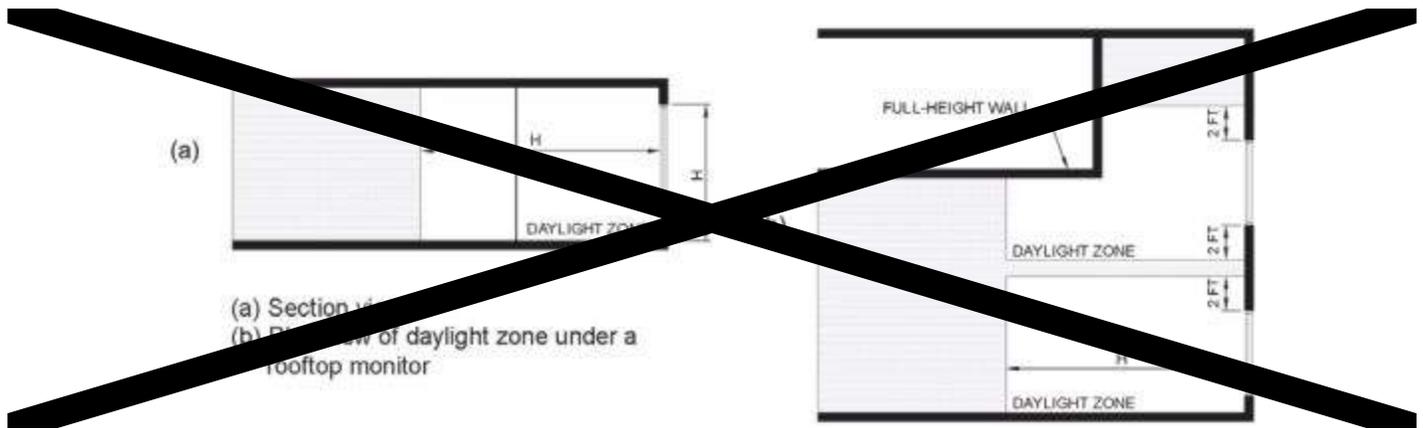
C405.2.3.1 Daylight-responsive control function. Where required, *daylight-responsive controls* shall be provided within each space for control of lights in that space and shall comply with all of the following:

1. Lights in *toplit zones* in accordance with Section C405.2.3.3 shall be controlled independently of lights in *sidelit zones* in accordance with Section C405.2.3.2.
2. Lights in the primary sidelit zone shall be controlled independent of lighting in the secondary sidelit zone.
3. *Daylight responsive controls* within each space shall be configured so that they can be calibrated from within that space by authorized personnel.
4. Calibration mechanisms shall be in a location with *ready access*.
5. Where located in offices, classrooms, laboratories and library reading rooms, *daylight responsive controls* shall dim lights continuously from full light output to 15 percent of full light output or lower.
6. *Daylight responsive controls* shall be configured to completely shut off all controlled lights.
7. Lights in *sidelit zones* in accordance with Section C405.2.3.2 facing different cardinal orientations [within 45 degrees (0.79 rad) of due north, east, south, west] shall be controlled independently of each other.

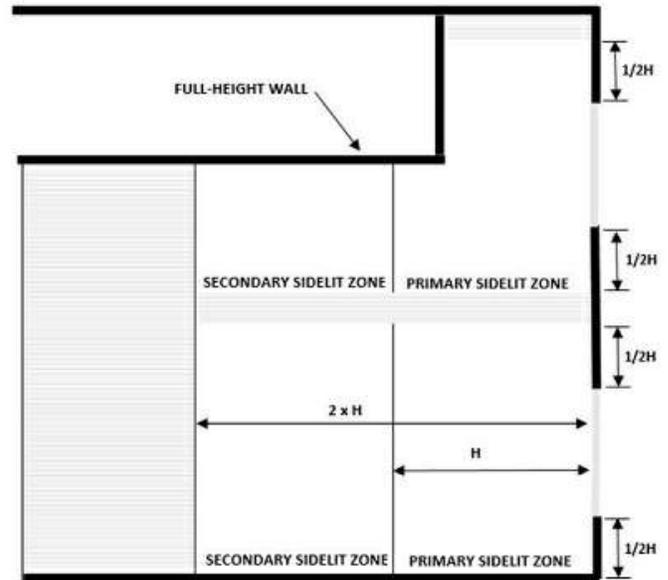
Exception: Up to 150 watts of lighting in each space is permitted to be controlled together with lighting in a daylight zone facing a different cardinal orientation.

C405.2.3.2 Sidelit zone. The sidelit ~~zone~~ is zones are the floor area adjacent to vertical *fenestration* that complies with all of the following:

1. Where the fenestration is located in a wall, the primary sidelit zone shall extend laterally to the nearest full-height wall, or up to 1.0 times the height from the floor to the top of the fenestration, and longitudinally from the edge of the fenestration to the nearest full-height wall, or up to ~~2 feet (610 mm)~~; 1/2 the height from the floor to the top of the fenestration, whichever is less, as indicated in Figure C405.2.3.2.
2. The secondary sidelit zone is directly adjacent to the primary sidelit zone and shall extend laterally up to 2.0 times, the height from the floor to the top of the fenestration, or to the nearest full height wall, and longitudinally from the edge of the fenestration to the nearest full height wall, or up to 0.5 times the height from the floor to the top of the fenestration, whichever is less, as indicated in Figure C405.2.3.2.
3. The area of the fenestration is not less than 24 square feet (2.23 m²).
4. The distance from the fenestration to any building or geological formation that would block *access to daylight* is greater than the height from the bottom of the fenestration to the top of the building or geologic formation.
5. The visible transmittance of the fenestration is not less than 0.20.



(a) Section View



(b) Plan View

**FIGURE C405.2.3.2
SIDELIT ZONE**

Reason: Increases energy efficiency and aligns with ASHRAE 90.1 and Title 24 Part 6.

General lighting is what must be controlled in a daylight zone, controlled task lighting or decorative lighting can be controlled too but should not be mandatory to do so. Also, the proposal strikes this sentence, "General lighting does not include lighting that is required to have specific application control in accordance with Section C405.2.4" because it's not needed as the definition of general lighting already says this.

The proposal also slightly lowers the wattage threshold to match what's already been vetted in the Title 24 Part 6 standard. The new 120W threshold better aligns with the use of energy efficient LED lighting and still provide for increased cost-effective energy savings (see cost impact in the attachment)

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposed change increases energy efficiency cost-effectively by reducing additional lighting load when lighting is offset by daylight. It increases the cost of construction through the addition of daylight responsive controls for the spaces that use at least 120W of lighting power in a daylight zone, instead of the existing IECC threshold of 150W. Also, note that the addition of a secondary daylight zone does not increase the cost as the same daylight responsive control system to control the lighting in the primary daylight zone can be used to control the lighting in the secondary daylight zone. So, no additional equipment is needed.

CE185-19

IECC: C405.2.3.1

Proponent: Jack Bailey, One Lux Studio, representing International Association of Lighting Designers (jbailey@oneluxstudio.com); Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers (glenn@lampartners.com)

2018 International Energy Conservation Code

Revise as follows:

C405.2.3.1 Daylight-responsive control function. Where required, daylight-responsive controls shall be provided within each space for control of lights in that space and shall comply with all of the following:

1. Lights in toplit zones in accordance with Section C405.2.3.3 shall be controlled independently of lights in sidelit zones in accordance with Section C405.2.3.2.
2. Daylight responsive controls within each space shall be configured so that they can be calibrated from within that space by authorized personnel.
3. Calibration mechanisms shall be in a location with ready access.
4. ~~Where located in offices, classrooms, laboratories and library reading rooms, daylight~~ Daylight responsive controls shall dim lights continuously from full light output to 15 percent of full light output or lower.
5. Daylight responsive controls shall be configured to completely shut off all controlled lights.
6. Lights in sidelit zones in accordance with Section C405.2.3.2 facing different cardinal orientations [within 45 degrees (0.79 rad) of due north, east, south, west] shall be controlled independently of each other.

Exception: Up to 150 watts of lighting in each space is permitted to be controlled together with lighting in a daylight zone facing a different cardinal orientation.

Reason: Currently daylight responsive controls are only required to dim lights in offices, classrooms, laboratories, and library reading rooms. In all other spaces, daylight responsive controls are only required to switch lights off.

Switching lights off leaves a lot of potential energy savings "on the table", as the daylight responsive controls will only save energy when there is sufficient daylight to entirely replace the electric lights. In some installations this may never happen. By contrast, when dimming is required, there will be energy savings whenever there is any useful daylight in the space. Making this change will result in additional energy savings in literally every installation.

This change is feasible today because of the incredibly fast penetration of LED technology into the marketplace. LED luminaires are already almost universally dimmable, and taking advantage of this capability will usually mean running a couple of additional wires. This cost is trivial compared to the cost of installing and commissioning the control systems to begin with.

Functionally, we know that dimming is preferred by building occupants, since the change in light levels is less noticeable, so this will also qualitatively improve the lighting, and increase user acceptance of the controls.

Cost Impact: The code change proposal will increase the cost of construction. Dimming is already the preferred strategy for daylight responsive control of interior lights, and is almost universally used in new construction. With increasing penetration of LED technology in coming years, the cost increase compared to switching will be trivial. But still, there will be some additional cost.

CE186-19

IECC: C405.2.3

Proponent: Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers (glenn@lampartners.com); Jack Bailey, representing International Association of Lighting Designers (jbailey@oneluxstudio.com)

2018 International Energy Conservation Code

Revise as follows:

C405.2.3 Daylight-responsive controls. *Daylight-responsive controls* complying with Section C405.2.3.1 shall be provided to control the electric lights within *daylight zones* in the following spaces:

1. Spaces with a total of more than 150 watts of *general lighting* within sidelit zones complying with Section C405.2.3.2 *General lighting* does not include lighting that is required to have specific application control in accordance with Section C405.2.4.
2. Spaces with a total of more than 150 watts of *general lighting* within toplit zones complying with Section C405.2.3.3.

Exceptions: Daylight responsive controls are not required for the following:

1. Spaces in health care facilities where patient care is directly provided.
2. Lighting that is required to have specific application control in accordance with Section C405.2.4.
3. Sidelit zones on the first floor above grade in Group A-2 and Group M occupancies.
4. ~~New buildings where the total connected lighting power calculated in accordance with Section C405.3.1 is not greater than the adjusted interior lighting power allowance (LPA_{adj}) calculated in accordance with Equation 4-9~~

~~$$LPA_{adj} = [LPA_{norm} \times (1.0 - 0.4 \times UDZFA / TBFA)]$$~~

~~(Equation 4-9)~~

~~where:~~

~~LPA_{adj} = Adjusted building interior lighting power allowance in watts.~~

~~LPA_{norm} = Normal building lighting power allowance in watts calculated in accordance with Section C405.3.2 and reduced in accordance with Section C406.3 where Option 2 of Section C406.1 is used to comply with the requirements of Section C406.~~

~~$UDZFA$ = Uncontrolled daylight zone floor area is the sum of all sidelit and toplit zones, calculated in accordance with Sections C405.2.3.2 and C405.2.3.3, that do not have daylight responsive controls.~~

~~$TBFA$ = Total building floor area is the sum of all floor areas included in the lighting power allowance calculation in Section C405.3.2.~~

Reason: Exception #4 was added to IECC 2018. It created unnecessary complexity with no benefit. It does not improve energy efficiency or the usability of the code -- and actually does the opposite. Exception #4 attempts to solve a problem that does not exist. The "problem" is assumed to be that the installation of daylight responsive controls is an unreasonable burden. This was not the case three years ago, and is not the case

today. Designers have not, and are not, asking for this exception. We believe that this exception will hurt energy efficiency in the long run by discouraging the use of daylight responsive controls. While designers welcome alternate paths around unreasonable requirements, we do not welcome alternate paths that provide no benefit and only make the code more complex and confusing.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Because this proposal eliminates an option to avoid the small cost of installing daylight responsive controls (if certain power density limits are met), it could conceivably increase the cost of construction slightly. But this assumes that the option would commonly be taken. We believe that the option currently in the code is unlikely to be used. Daylight responsive controls are standard practice today and we believe will likely be installed anyhow, regardless of whether or not this option is available. Therefore a possible small increase in construction cost is only a hypothetical and not a given.

Proposal # 4594

CE186-19

CE187-19

IECC: C405.2.3, C405.2.3.1, C405.2.3.2, FIGURE C405.2.3.2

Proponent: Jonathan McHugh, representing McHugh Energy Consultants Inc. (jon@mchughenergy.com)

2018 International Energy Conservation Code

Revise as follows:

C405.2.3 Daylight-responsive controls. *Daylight-responsive controls* complying with Section C405.2.3.1 shall be provided to control the electric lights general lighting within the following daylight zones in the following spaces:

1. ~~Spaces with~~ Primary sidelit zones where a total of more than 150 watts of *general lighting per space* are within sidelit zones complying with Section C405.2.3.2 *General lighting* does not include lighting that is required to have specific application control in accordance with Section C405.2.4.
2. Secondary sidelit zones where a total of more than 300 watts of general lighting per space are within the primary and secondary sidelit zones complying with Section C405.2.3.2.
3. Toplit zones where ~~Spaces with~~ a total of more than 150 watts of *general lighting per space* are within toplit zones complying with Section C405.2.3.3.

Exceptions: Daylight responsive controls are not required for the following:

1. Spaces in health care facilities where patient care is directly provided.
2. Lighting that is required to have specific application control in accordance with Section C405.2.4.
3. Sidelit zones on the first floor above grade in Group A-2 and Group M occupancies.
4. ~~New buildings where the total connected lighting power calculated in accordance with Section C405.3.1 is not greater than the adjusted interior lighting power allowance (LPA_{adj}) calculated in accordance with Equation 4-9~~

~~$$LPA_{adj} = \frac{[LPA_{norm} \times (1.0 - 0.4 \times UDZFA / TBFA)]}{1}$$~~

~~(Equation 4-9)~~

~~where:~~

~~LPA_{adj} = Adjusted building interior lighting power allowance in watts.~~

~~LPA_{norm} = Normal building lighting power allowance in watts calculated in accordance with Section C405.3.2 and reduced in accordance with Section C406.3 where Option 2 of Section C406.1 is used to comply with the requirements of Section C406.~~

~~$UDZFA$ = Uncontrolled daylight zone floor area is the sum of all sidelit and toplit zones, calculated in accordance with Sections C405.2.3.2 and C405.2.3.3, that do not have daylight responsive controls.~~

~~$TBFA$ = Total building floor area is the sum of all floor areas included in the lighting power allowance calculation in Section C405.3.2.~~

C405.2.3.1 Daylight-responsive control function. Where required, *daylight-responsive controls* shall be provided within each space for control of lights in that space and shall comply with all of the following:

1. Lights in *toplit zones* in accordance with Section C405.2.3.3 shall be controlled independently of lights in *sidelit zones* in accordance with Section C405.2.3.2.
2. Lights in the primary sidelit zone shall be controlled independently of lights in the secondary sidelit zone.
3. *Daylight responsive controls* within each space shall be configured so that they can be calibrated from within that space by authorized personnel.
4. Calibration mechanisms shall be in a location with *ready access*.
5. Where located in offices, classrooms, laboratories and library reading rooms, *daylight responsive controls* shall dim lights continuously from full light output to 15 percent of full light output or lower.
6. *Daylight responsive controls* shall be configured to completely shut off all controlled lights.
7. Lights in *sidelit zones* in accordance with Section C405.2.3.2 facing different cardinal orientations [within 45 degrees (0.79 rad) of due north, east, south, west] shall be controlled independently of each other.

Exception: Up to 150 watts of lighting in each space is permitted to be controlled together with lighting in a daylight zone facing a different cardinal orientation.

C405.2.3.2 Sidelit zone. The sidelit zone is the floor area adjacent to vertical *fenestration* that complies with all of the following:

1. Where the fenestration is located in a wall, the sidelit zone shall extend laterally to the nearest full-height wall, or up to 1.0 times the height from the floor to the top of the fenestration, and longitudinally from the edge of the fenestration to the nearest full-height wall, or up to 2 feet (610 mm), whichever is less, as indicated in Figure C405.2.3.2.
2. The secondary sidelit zone is directly adjacent to the primary sidelit zone and shall extend laterally to 2.0 times the height from the floor to the top of the fenestration or to the nearest full height wall whichever is less, and longitudinally from the edge of the fenestration to the nearest full height wall, or up to 2 feet whichever is less, as indicated in Figure C405.2.3.2. If the adjacent primary sidelit zone ends at a full height wall, there is no secondary sidelit zone beyond the wall.
3. The area of the fenestration is not less than 24 square feet (2.23 m²).
4. The distance from the fenestration to any building or geological formation that would block *access to daylight* is greater than the height from the bottom of the fenestration to the top of the building or geologic formation.
5. The visible transmittance of the fenestration is not less than 0.20.

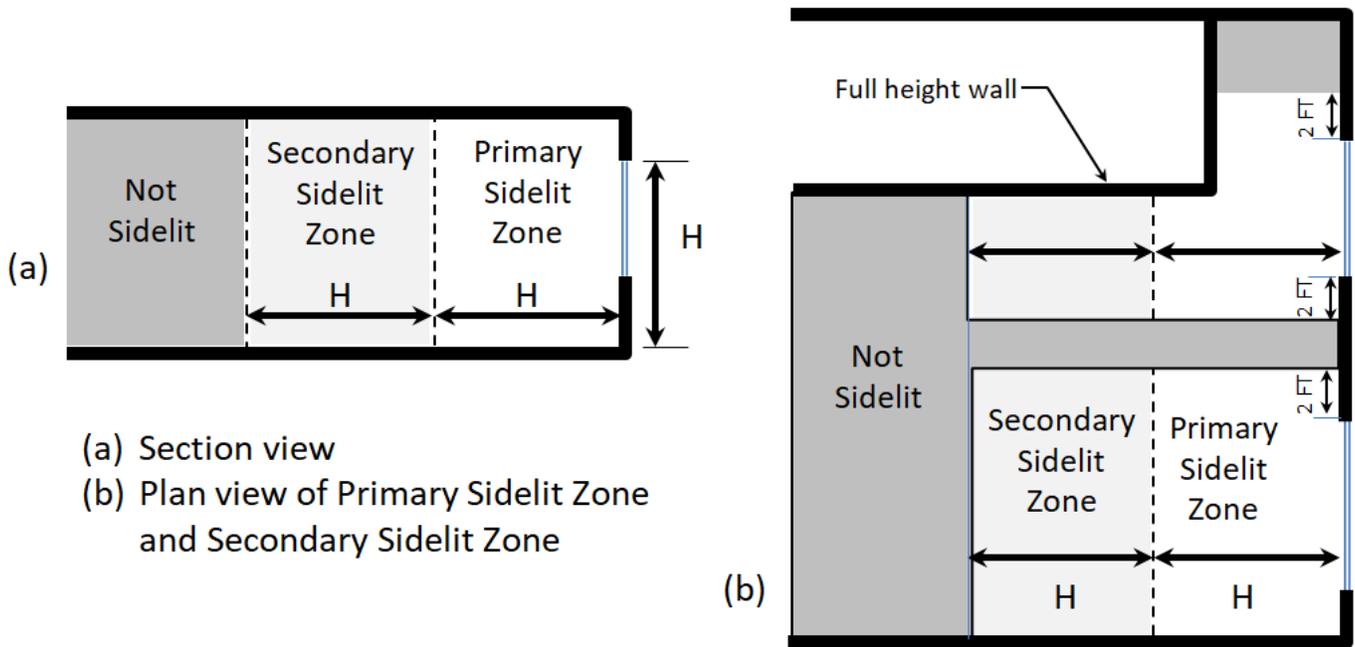
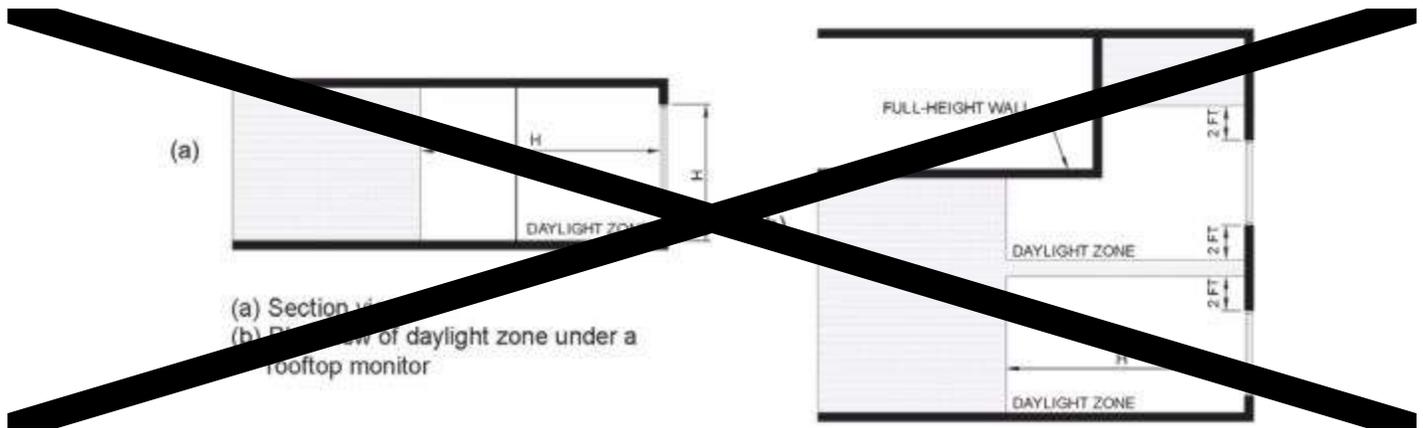


FIGURE C405.2.3.2
PRIMARY AND SECONDARY SIDELIT ZONE

Reason: The addition of the secondary sidelit zone to the 2021 IECC would align the IECC with ASHRAE 90.1, California's Title 24 and the Washington State Energy Code. Adding the secondary sidelit zone would increase the energy savings from sidelighting by approximately 33% for little marginal cost since many daylight controls are multi-channel and can use one photosensor and one controller to set different daylight response curves for each channel.

Exception 4 to C405.2.3 is not needed as the measure is cost-effective whenever the total wattage in the daylight zones exceed the 150 watt threshold. Removing this exception would reduce the complexity of enforcing the code.

Cost Impact: The code change proposal will increase the cost of construction

The PNNL cost study found that the secondary sidelit zone only requires an extra power pack since the same sensor and a multi-channel controller can be used. From the CASE study they documented that the addition of the power pack increased the cost of the control system by 25% while doubling the controlled area (but saving about a third of the energy as the secondary zone is further away from windows).

CE188-19

IECC: C405.2.3.1

Proponent: Jonathan McHugh, representing McHugh Energy Consultants Inc. (jon@mchughenergy.com)

2018 International Energy Conservation Code

Revise as follows:

C405.2.3.1 Daylight responsive control function. Where required, daylight-responsive *controls* shall be provided within each space for control of lights in that space and shall comply with all of the following:

1. Lights in *toplit zones* in accordance with Section C405.2.3.3 shall be controlled independently of lights in *sidelit zones* in accordance with Section C405.2.3.2.
2. *Daylight responsive controls* within each space shall be configured so that they can be calibrated from within that space by authorized personnel.
3. Calibration mechanisms shall be in a location with *ready access*.
4. Where located in offices, classrooms, laboratories and library reading rooms, *daylight responsive controls* shall dim lights continuously from full light output to 15 percent of full light output or lower. In all other spaces, *daylight responsive controls* shall dim lights continuously from full output to 20 percent of full light output or reduce power to between 30 and 70 percent of full power by controlling all luminaires to a reduced light output or by switching alternate luminaires.
5. *Daylight responsive controls* shall be configured to completely shut off all controlled lights.
6. Lights in *sidelit zones* in accordance with Section C405.2.3.2 facing different cardinal orientations [within 45 degrees (0.79 rad) of due north, east, south, west] shall be controlled independently of each other.

Exception: Up to 150 watts of lighting in each space is permitted to be controlled together with lighting in a daylight zone facing a different cardinal orientation.

Reason: Currently the IECC daylight-responsive controls requirements includes dimming for a few spaces and for all other spaces, a minimally compliant daylight-responsive control only need turn the lights off under full daylight availability. For light sources that are difficult to dim continuously (such as HID), the savings associated with daylight controls is substantially less than it could be with multi-level controls. Multi-level controls increase energy savings by approximately 50% as compared to on/off controls. This is documented in the CASE sidelighting and skylighting reports. By allowing other forms of multi-level controls besides continuous dimming, the code is being technology neutral and accommodating light sources that are hard to dim. Requiring multi-levels switching or continuous dimming for daylighting controls is aligned with most other energy codes in the United States including ASHRAE 90.1.

Bibliography:

CASE (Codes and Standards Enhancement Updates to Title 24 Treatment of Skylights. 2005 California Title 24 Building Energy Efficiency Standards. May 2002.

https://mchughenergy.com/papers/2002-05-17_SKY-LT_PROP_T24.pdf

CASE (Codes and Standards Enhancement) Draft Report Sidelighting – Daylighting Requirements for Sidelit Areas near Windows. 2008 California Title 24 Building Energy Efficiency Standards July 6, 2006

https://mchughenergy.com/papers/2006-07-07_DRAFT_SIDELIGHTING_REP.pdf

HMG/PNNL 90.1 Skylighting Requirements Code Change Proposal, Submitted to ASHRAE 90.1 Standard

Envelope and Lighting Subcommittees June 2008.

https://mchughenergy.com/papers/PNNL_Daylight901_pt4.pdf

Cost Impact: The code change proposal will increase the cost of construction

As documented in the HMG/PNNL (2008) report “As a result of discussion with the ASHRAE 90.1 Lighting Subcommittee, the following variable and fixed costs were associated with dimming and switching controls systems. For switching control systems the additional circuiting costs associated with bi-level switching is \$0.108/sf...” In comparison for warehouse spaces, the added life cycle savings from using multi-level controls instead of On/Off controls are around \$0.25/sf (CASE 2002) and in sidelit spaces the life cycle savings are around \$0.50/sf. (CASE 2006). Thus the added costs are well outweighed by the life cycle savings.

Proposal # 5574

CE188-19

CE189-19

IECC: C405.2.3, C405.2.3.1, C405.2.3.2, FIGURE C405.2.3.2

Proponent: Marilyn Williams, representing National Electrical Manufacturers Association
(mar_williams@nema.org)

2018 International Energy Conservation Code

Revise as follows:

C405.2.3 Daylight-responsive controls. *Daylight-responsive controls* complying with Section C405.2.3.1 shall be provided to control the electric lights within *daylight zones* in the following spaces:

1. Spaces with a total of more than 150 watts of *general lighting* within the primary sidelit zones complying with Section C405.2.3.2. ~~*General lighting* does not include lighting that is required to have specific application control in accordance with Section C405.2.4.~~
2. Spaces with a total of more than ~~150~~ 300 watts of *general lighting* within ~~toplit~~ the primary and secondary sidelit zones complying with Section ~~C405.2.3.3~~ C405.2.3.2.

Exceptions: Daylight responsive controls are not required for the following:

1. Spaces in health care facilities where patient care is directly provided.
2. Lighting that is required to have specific application control in accordance with Section C405.2.4.
3. Sidelit zones on the first floor above grade in Group A-2 and Group M occupancies.
4. New buildings where the total connected lighting power calculated in accordance with Section C405.3.1 is not greater than the adjusted interior lighting power allowance (LPA_{adj}) calculated in accordance with Equation 4-9

$$LPA_{adj} = \left[\frac{LPA_{norm}}{TBFA} \times (1.0 - 0.4 \times UDZFA) \right]$$

(Equation 4-9)

where:

LPA_{adj} = Adjusted building interior lighting power allowance in watts.

LPA_{norm} = Normal building lighting power allowance in watts calculated in accordance with Section C405.3.2 and reduced in accordance with Section C406.3 where Option 2 of Section C406.1 is used to comply with the requirements of Section C406.

$UDZFA$ = Uncontrolled daylight zone floor area is the sum of all sidelit and toplit zones, calculated in accordance with Sections C405.2.3.2 and C405.2.3.3, that do not have daylight responsive controls.

$TBFA$ = Total building floor area is the sum of all floor areas included in the lighting power allowance calculation in Section C405.3.2.

C405.2.3.1 Daylight-responsive control function. Where required, *daylight-responsive controls* shall be provided within each space for control of lights in that space and shall comply with all of the following:

1. Lights in *toplit zones* in accordance with Section C405.2.3.3 shall be controlled independently of

lights in sidelit zones in accordance with Section C405.2.3.2.

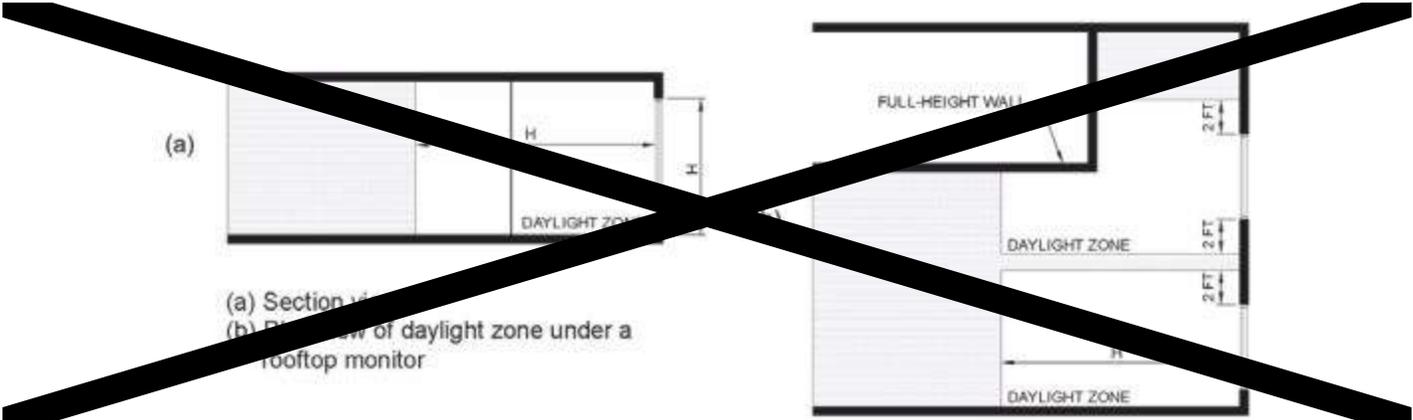
2. Lights in the primary sidelit zone shall be controlled independent of lighting in the secondary sidelit zone.
3. *Daylight responsive controls* within each space shall be configured so that they can be calibrated from within that space by authorized personnel.
4. Calibration mechanisms shall be in a location with *ready access*.
5. Where located in offices, classrooms, laboratories and library reading rooms, *daylight responsive controls* shall dim lights continuously from full light output to 15 percent of full light output or lower.
6. *Daylight responsive controls* shall be configured to completely shut off all controlled lights.
7. Lights in *sidelit zones* in accordance with Section C405.2.3.2 facing different cardinal orientations [within 45 degrees (0.79 rad) of due north, east, south, west] shall be controlled independently of each other.

Exception: Up to 150 watts of lighting in each space is permitted to be controlled together with lighting in a daylight zone facing a different cardinal orientation.

C405.2.3.2 Sidelit primary and secondary zone. The sidelit ~~zone is~~ zones are the floor area adjacent to vertical *fenestration* that complies with all of the following:

1. Where the fenestration is located in a wall, the primary sidelit zone shall extend laterally to the nearest full-height wall, or up to 1.0 times the height from the floor to the top of the fenestration, and longitudinally from the edge of the fenestration to the nearest full-height wall, or up to ~~2 feet (610 mm)~~ 0.5 times the height from the floor to the top of the fenestration, whichever is less, as indicated in Figure C405.2.3.2.
2. The secondary sidelit zone is directly adjacent to the primary sidelit zone and shall extend laterally from 1.0 times to 2.0 times the height from the floor to the top of the fenestration to the nearest full height wall, or up to 1.0 times the height from the floor to the top of the fenestration, and longitudinally from the edge of the fenestration to the nearest full height wall, or up to 0.5 times the height from the floor to the top of the fenestration, whichever is less, as indicated in Figure C405.2.3.2. If the adjacent primary sidelit zone ends at a full height wall, there is no secondary sidelit zone beyond such obstruction.
3. The area of the fenestration is not less than 24 square feet (2.23 m²).
4. The distance from the fenestration to any building or geological formation that would block *access to daylight* is greater than the height from the bottom of the fenestration to the top of the building or geologic formation.
5. The visible transmittance of the fenestration is not less than 0.20.

Delete and substitute as follows:



**FIGURE C405.2.3.2
SIDELIT ZONE**

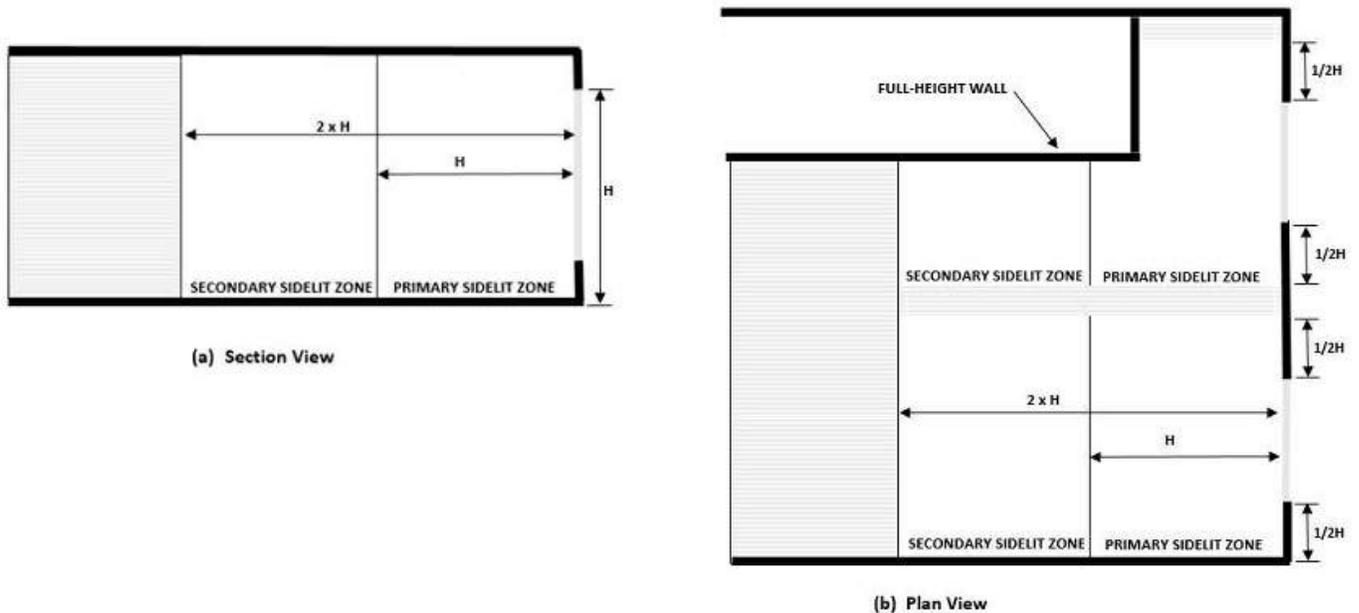


FIGURE C405.2.3.2
SIDELIT ZONE

Reason: Revising this language will:

1. Reduce inconsistency and application confusion with daylight responsive controls
2. Reduce energy use
3. Increase code interpretation
4. Resolve compliance in application, approval and inspection
5. Simplify design and compliance by aligning with other energy efficiency codes.

The contribution of daylight through vertical fenestration (windows) into a space, extends laterally much further into the space than the current code's defined area for a single sidelight daylight zone. In many applications, the change in the 2015 IECC definition of daylighting zones reduced the daylighting area, yet daylight can still project much further into the side lighting space. A secondary sidelit daylighting zone can further reduce the electric lighting level in response to daylighting contribution to this area, saving added energy.

Evaluation studies performed by the Pacific Northwest National Laboratory extensively reviewed the viability of a secondary daylighting zone across six climate zones, four common window to wall ratios, with and without blinds, and with nine visual lighting transmission ratios. A secondary daylighting zone was determined to be cost effective down to 120 watts of controlled power.

See: Daylighting Analysis for ASHRAE 90.1 Code Development – Final Results, March 29, 2012, PNNL: Athalye, Xie, Rosenberg, Liu and Hescong Mahone Group: Saxena, Perry, Chappell.

For simplicity of the code and compliance, this secondary sidelit zone is the same dimension, and sits adjacent to the primary sidelit zone, and parallel to the wall fenestration. The primary and secondary daylighting controls operate independently to adjust electric lighting given the differing daylight level contributions in each zone. The controls maintain space occupant visual acuity and comfort by maintaining the design foot candle levels.

By requiring the toplit and sidelit daylight zones to be shown on the construction documents, it simplifies inspection and enforcement of this provision.

Cost Impact: The code change proposal will increase the cost of construction

This proposed change increases energy efficiency by reducing additional space lighting power with the offset of daylight further into the building space than the primary sidelit zone.

Feasibility and cost studies were conducted in the cited research “Daylighting Analysis for ASHRAE 90.1 Code Development”. In the cost feasibility, the research incorporated the added cost of photocontrols, installation and commissioning. This cost analysis comprehensively included both the fixed control costs and variable costs of wiring and installation, with the number of fixtures, at standard Union Electrician Labor Rates. Averaging across climate zones, typical window to wall ratios, and average building orientations, the study showed adding a secondary daylight area increases cost effectiveness over just a primary sidelight daylight area. Using the typical nine-year scaler, the benefit to cost ratio for a building with 0.2 visible light transmittance (fairly low transmittance) demonstrated a breakeven point at 120W of lighting controlled with only a primary daylighting area. When the secondary daylighting area was included, the breakeven point dropped to 100W of lighting controlled. The current code threshold is at 150W controlled lighting, well above the cited breakeven points, thus putting the Benefit Cost Ratio at 1.2 for adding the secondary daylighting area at 150W of lighting controlled.

Proposal # 4391

CE189-19

CE190-19

IECC: C405.2.3.2

Proponent: Jack Bailey, representing International Association of Lighting Designers (jbailey@oneluxstudio.com); Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers (glenn@lampartners.com)

2018 International Energy Conservation Code

Revise as follows:

C405.2.3.2 Sidelit zone. The sidelit zone is the floor area adjacent to vertical *fenestration* that complies with all of the following:

1. Where the fenestration is located in a wall, the sidelit zone shall extend laterally to the nearest full-height wall, or up to 1.0 times the height from the floor to the top of the fenestration, and longitudinally from the edge of the fenestration to the nearest full-height wall, or up to 2 feet (610 mm), whichever is less, as indicated in Figure C405.2.3.2.
2. The area of the fenestration is not less than 24 square feet (2.23 m²).
3. The distance from the fenestration to any building or geological formation that would block *access to daylight* is greater than one half of the height from the bottom of the fenestration to the top of the building or geologic formation.
4. The visible transmittance of the fenestration is not less than 0.20.

Reason: This change would greatly expand the applicability of daylight responsive controls requirements in cities, where there is significant overshadowing from adjacent buildings, and would conform the requirements in the IECC to those in Standard 90.1 and California T24. For buildings in urban areas, daylight responsive controls would be required on lower floors of buildings where they are currently not required.

Cost Impact: The code change proposal will increase the cost of construction. This proposal would increase the cost of construction by expanding the scope daylight responsive controls requirements.

Proposal # 4785

CE190-19

CE191-19

IECC: C405.2.3.2, FIGURE C405.2.3.2

Proponent: Marilyn Williams, representing National Electrical Manufacturers Association
(mar_williams@nema.org)

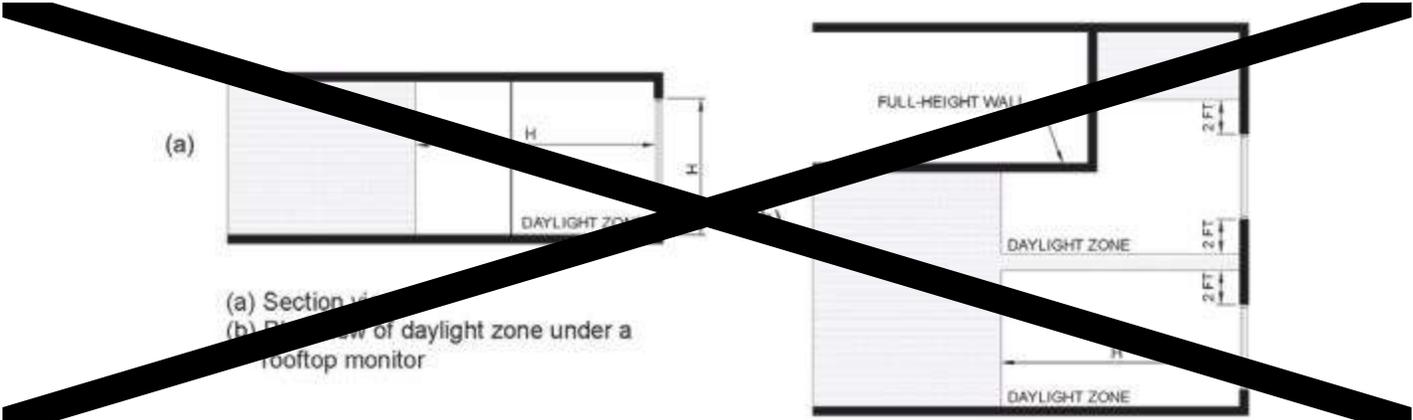
2018 International Energy Conservation Code

Revise as follows:

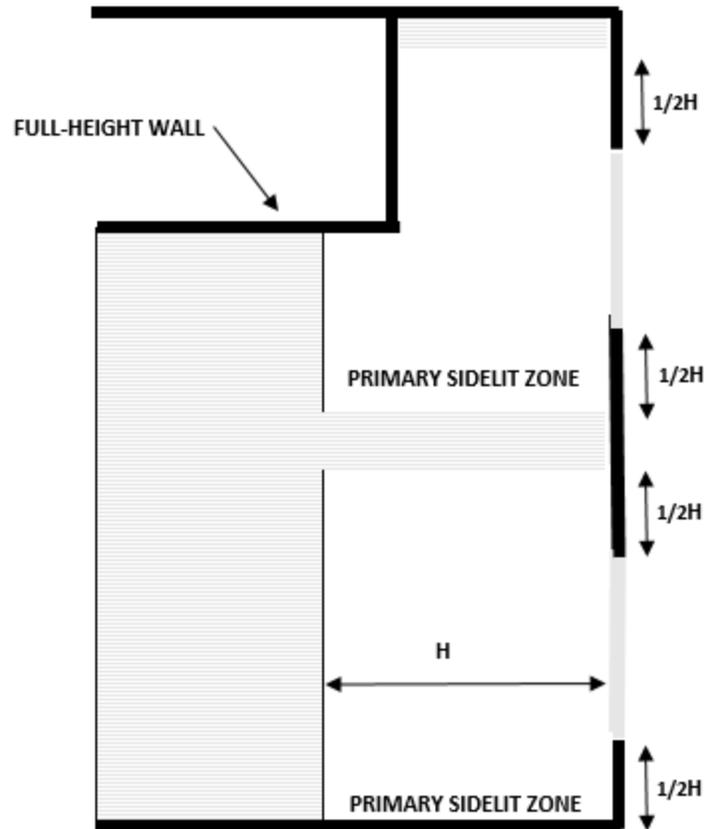
C405.2.3.2 Sidelit zone. The sidelit zone is the floor area adjacent to vertical *fenestration* that complies with all of the following:

1. Where the fenestration is located in a wall, the primary sidelit zone shall extend laterally to the nearest full-height wall, or up to 1.0 times the height from the floor to the top of the fenestration, and longitudinally from the edge of the fenestration to the nearest full-height wall, or up to ~~2 feet (610 mm)~~ 1/2 the height from the floor to the top of the fenestration, whichever is less, as indicated in Figure C405.2.3.2.
2. The area of the fenestration is not less than 24 square feet (2.23 m²).
3. The distance from the fenestration to any building or geological formation that would block *access to daylight* is greater than the height from the bottom of the fenestration to the top of the building or geologic formation.
4. The visible transmittance of the fenestration is not less than 0.20.

Delete and substitute as follows:



**FIGURE C405.2.3.2
SIDELIT ZONE**



(b) Plan View

FIGURE C405.2.3.2
SIDLIT ZONE

Reason: Revising this language will:

1. Reduce inconsistency and application confusion with daylight responsive controls
2. Reduce energy use for taller vertical fenestrations
3. Resolve compliance in application, approval and inspection.
4. Simplify design and compliance by aligning with other energy efficiency codes.

By changing the sidelit daylighting zone horizontal dimension from two feet from the vertical fenestration, to one half times the window head height, the provision aligns with the sidelit zone dimension of other energy codes. The changes will simplify applicaitn and enforcement throught consistent sidelit zone dimensining across energy codes. In many cases, the sidelit daylighting zone area becomes either smaller or larger depending on the head height of the window. The proposed change allows the horizontal dimension beyond the vertical fenestration to dynamically scale based on the amount of daylight entering the space due to vertical fenestration head height instead of being a static two feet which could be too much or not enough distance for daylighting to enter the space.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Changing the definition of the daylighting area to align with other codes will slightly expand the instances when the sidelit daylighting area will reach the 150W lighting power threshold. As a result, some sidelit daylighting

areas which would not have had to apply the cost of daylighting controls before this change, will now require daylighting controls in the building construction. The benefit for energy efficiency increases in these instances, and the cost effectiveness for the controls remains the same as before this code change. As cited in daylighting research study "Daylighting Analysis for ASHRAE 90.1 Code Development" by PNNL and Heschong Mahone Group, a cost to benefit ratio of 1.2 (1.0 or less is breakeven) is achieved in buildings of average window to wall ratio, averaged climate zones and with visual light transmittance of 0.2.

Proposal # 4442

CE191-19

CE192-19

IECC: C405.2.3.2

Proponent: Jack Bailey, representing International Association of Lighting Designers (jbailey@oneluxstudio.com); Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers (glenn@lampartners.com)

2018 International Energy Conservation Code

Revise as follows:

C405.2.3.2 Sidelit zone. The sidelit zone is the floor area adjacent to vertical *fenestration* that complies with all of the following:

1. Where the fenestration is located in a wall, the sidelit zone shall extend laterally to the nearest full-height wall, or up to 1.0 times the height from the floor to the top of the fenestration, and longitudinally from the edge of the fenestration to the nearest full-height wall, or up to 2 feet (610 mm), whichever is less, as indicated in Figure C405.2.3.2.
2. The area of the fenestration is not less than 24 square feet (2.23 m²).
3. The distance from the fenestration to any building or geological formation that would block access to daylight is greater than the height from the bottom of the fenestration to the top of the building or geologic formation.
4. The visible transmittance of the fenestration is not less than 0.20.
5. Where the fenestration is shaded by an overhanging projection and the projection factor determined in accordance with Equation 4-5 is not greater than 1.0 for fenestration oriented 45 degrees or less from true north and not greater than 1.5 for all other orientations.

Reason: Currently there is no exception from daylight responsive controls requirements for windows shaded by deep overhangs. This proposal would create an exception, by stating that a daylight zone is not established if the exterior overhang is too deep.

The exception varies based on façade orientation, with a shallower projection required on the north façade than on the east, south, and west. The language proposed here “oriented 45 degrees or less from true north” is very similar to the language in Table C402.4 “oriented within 45 degrees of true north”. We prefer “45 degrees or less” because it is clear how to treat a building façade oriented exactly 45 degrees from true north.

Cost Impact: The code change proposal will decrease the cost of construction

Where there is a deep overhanging projection, there will no longer be a requirement to install daylight responsive controls.

Proposal # 4988

CE192-19

CE193-19

IECC: C405.2.3.2, C405.2.3.3, FIGURE C405.2.3.3(2), FIGURE C405.2.3.3(3)

Proponent: Jack Bailey, representing International Association of Lighting Designers (jbailey@oneluxstudio.com); Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers (glenn@lampartners.com)

2018 International Energy Conservation Code

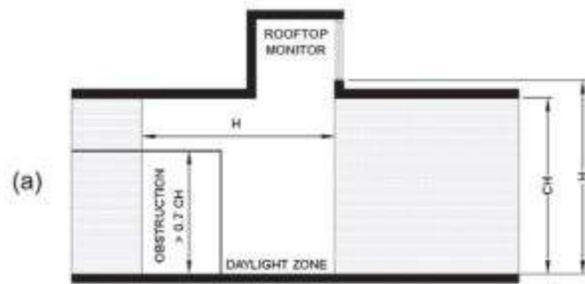
Revise as follows:

C405.2.3.2 Sidelit zone. The sidelit zone is the floor area adjacent to vertical fenestration that complies with all of the following:

1. Where the fenestration is located in a wall, the sidelit zone shall extend laterally to the nearest full-height wall, or up to 1.0 times the height from the floor to the top of the fenestration, and longitudinally from the edge of the fenestration to the nearest full-height wall, or up to 2 feet (610 mm), whichever is less, as indicated in Figure C405.2.3.2.
2. Where the fenestration is located in a rooftop monitor, the sidelit daylight zone shall extend laterally to the nearest obstruction that is taller than 0.7 times the ceiling height, or up to 1.0 times the height from the floor to the bottom of the fenestration, whichever is less, and longitudinally from the edge of the fenestration to the nearest obstruction that is taller than 0.7 times the ceiling height, or up to 0.25 times the height from the floor to the bottom of the fenestration, whichever is less, as indicated in Figures C405.2.3.2 (1) and C405.2.3.2(2).
3. The area of the fenestration is not less than 24 square feet (2.23 m²).
4. The distance from the fenestration to any building or geological formation that would block access to daylight is greater than the height from the bottom of the fenestration to the top of the building or geologic formation.
5. The visible transmittance of the fenestration is not less than 0.20.

C405.2.3.3 Toplit zone. The toplit zone is the floor area underneath a roof fenestration assembly that complies with all of the following:

1. The toplit zone shall extend laterally and longitudinally beyond the edge of the roof fenestration assembly to the nearest obstruction that is taller than 0.7 times the ceiling height, or up to 0.7 times the ceiling height, whichever is less, as indicated in Figure C405.2.3.3(1).
2. ~~Where the fenestration is located in a rooftop monitor, the toplit zone shall extend laterally to the nearest obstruction that is taller than 0.7 times the ceiling height, or up to 1.0 times the height from the floor to the bottom of the fenestration, whichever is less, and longitudinally from the edge of the fenestration to the nearest obstruction that is taller than 0.7 times the ceiling height, or up to 0.25 times the height from the floor to the bottom of the fenestration, whichever is less, as indicated in Figures C405.2.3.3(2) and C405.2.3.3(3).~~
3. Direct sunlight is not blocked from hitting the roof fenestration assembly at the peak solar angle on the summer solstice by buildings or geological formations.
4. The product of the visible transmittance of the roof fenestration assembly and the area of the rough opening of the roof fenestration assembly divided by the area of the toplit zone is not less than 0.008.



(a) Section view
 (b) Plan view of daylight zone under a rooftop monitor

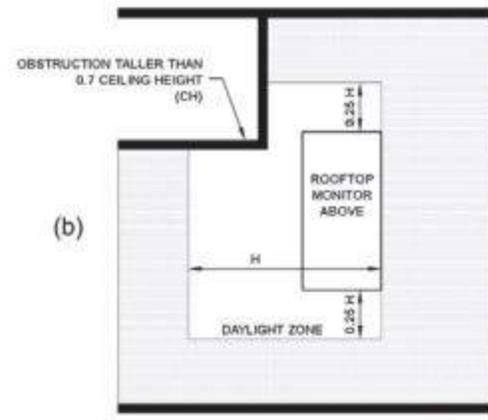


FIGURE C405.2.3.3 C405.2.3.2(2 1)
DAYLIGHT ZONE UNDER A ROOFTOP MONITOR

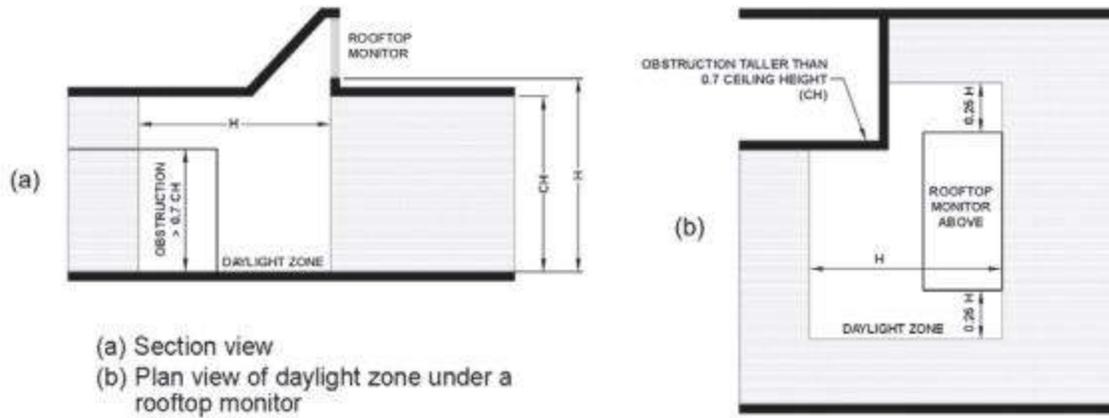


FIGURE C405.2.3.3 C405.2.3.2(3 2)
DAYLIGHT ZONE UNDER A SLOPED ROOFTOP MONITOR

Reason: The language describing daylight zones under rooftop monitors was relocated from the “sidelit” to the “toplit” section in the 2018 IECC. This was a mistake. The requirements for overshadowing, VT, and fenestration area in the toplit section cannot be sensibly applied to rooftop monitors, and were never intended to be applied to rooftop monitors. By contrast, the requirements for overshadowing, VT, and fenestration area in the sidelit section are applicable.

This proposal also clarifies that “vertical fenestration” is a defined term, by adding italics. For rooftop monitors with sloped glazing, this definition is beneficial because it creates a clear distinction between a “rooftop monitor” and a skylight (i.e. a “rooftop monitor” has vertical fenestration which, by definition, is “installed at a slope of not less than 60 degrees from the horizontal”).

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposed change is a clarification of code intent.

Proposal # 4786

CE193-19

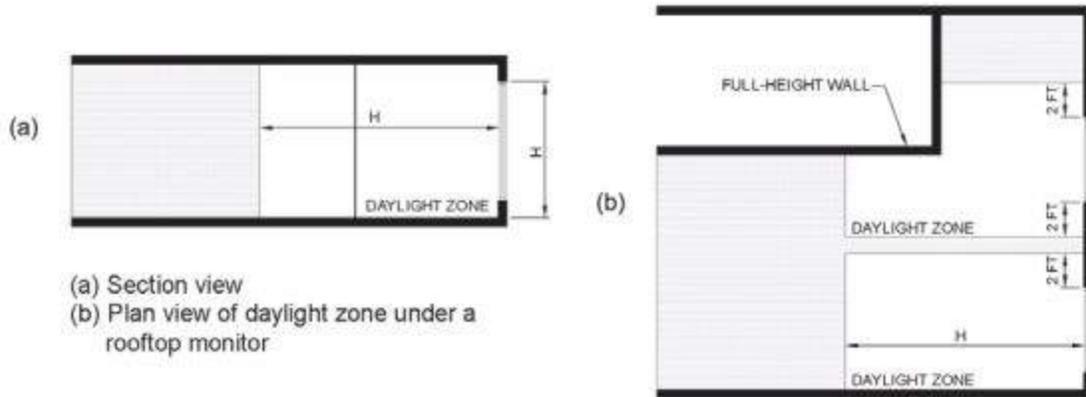
CE194-19

IECC: FIGURE C405.2.3.2

Proponent: Marilyn Williams, representing National Electrical Manufacturers Association
(mar_williams@nema.org)

2018 International Energy Conservation Code

Revise as follows:



(b) Plan view of daylight zone under a rooftop monitor

(b) Plan view

**FIGURE C405.2.3.2
 SIDELIT ZONE**

Reason: Editorial change to correct mis-label of daylighting sidelit zone figure.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
 There is no cost impact. This change is editorial.

Proposal # 4396

CE194-19

CE195-19

IECC: C405.2.3.2

Proponent: Marilyn Williams, representing National Electrical Manufacturers Association
(mar_williams@nema.org)

2018 International Energy Conservation Code

Revise as follows:

C405.2.3.2 Sidelit zone. The sidelit zone is the floor area adjacent to vertical *fenestration* that complies with all of the following:

1. Where the fenestration is located in a wall, the sidelit zone shall extend laterally to the nearest full-height wall, or up to 1.0 times the height from the floor to the top of the fenestration, and longitudinally from the edge of the fenestration to the nearest full-height wall, or up to 2 feet (610 mm), whichever is less, as indicated in Figure C405.2.3.2.
2. The area of the fenestration is not less than 24 square feet (2.23 m²).
3. The distance from the fenestration to any building or geological formation that would block *access to daylight* is greater than the height from the bottom of the fenestration to the top of the building or geologic formation.
4. The visible transmittance of the fenestration is not less than 0.20.
5. For fenestration shaded by an overhang projection with vertical fenestration above the projection, the projection factor, as determined in accordance with Equation 4-5 in Section C402.4.3, is not greater than 1.0 for fenestration oriented less than 45 degrees from North and not greater than 1.5 for all other orientations.

Reason: Revising this language will:

1. Clarify how a daylighting sidelit zone is determined when there is an overhang or shading projection associated with the sidelit zone vertical fenestrations.
2. Eliminate daylighting sidelit zones where adequate daylight is not available to justify daylight responsive controls installation.
3. Increase code interpretation simplicity for sidelit daylight zones.

Cost Impact: The code change proposal will decrease the cost of construction

Where there is an overhang of adequate projection factor (PF), it will not be required to install daylight responsive controls.

Proposal # 4389

CE195-19

CE196-19

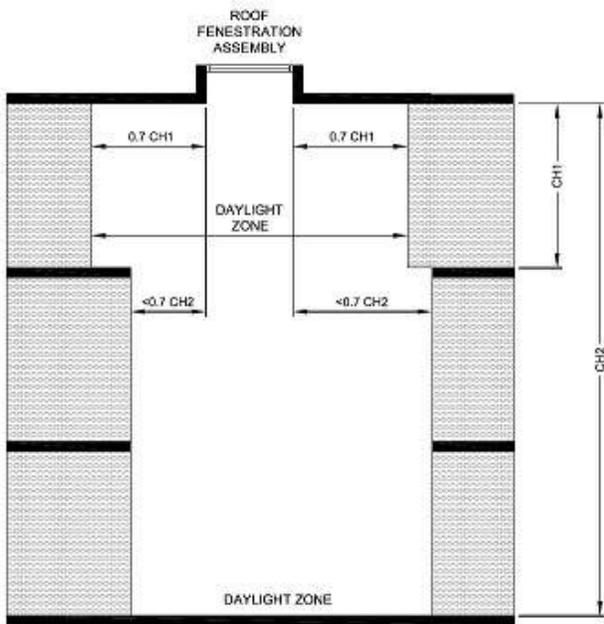
IECC: C405.2.3.4(New) Figure C405.2.3.4(New)

Proponent: Jack Bailey, representing International Association of Lighting Designers (jbailey@oneluxstudio.com); Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers (glenn@lampartners.com)

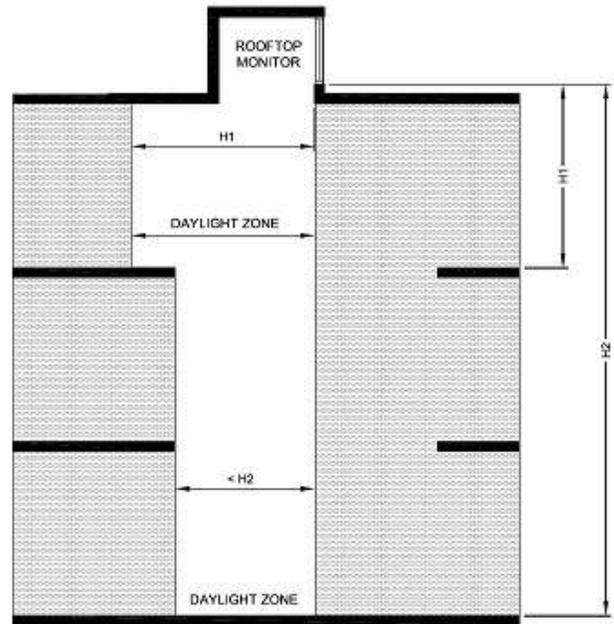
2018 International Energy Conservation Code

Add new text as follows:

C405.2.3.4 Atriums Daylight zones at atrium spaces shall be established at the top floor surrounding the atrium and at the floor of the atrium space, and not on intermediate floors, as indicated in Figure C405.2.3.4.



(a) Section view of roof fenestration assembly at atrium



(b) Section view of rooftop monitor at atrium

FIGURE C405.2.3.4
DAYLIGHT ZONES AT A MULTISTORY ATRIUM

Reason: Currently the code provides no guidance as to how daylight zones would be established in multistory atrium spaces. This proposal provides clarity. It seems reasonable that roof-mounted fenestration would not establish daylight zones on intermediate floors of an atrium, because of shadowing from each floor slab onto the floor below.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposed change is a clarification.

Proposal # 4787

CE196-19

CE197-19

IECC: C405.2.6, C405.2.6.2

Proponent: Jack Bailey, representing International Association of Lighting Designers (jbailey@oneluxstudio.com); Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers (glenn@lampartners.com)

2018 International Energy Conservation Code

Revise as follows:

C405.2.6 Exterior lighting controls. Exterior lighting systems shall be provided with controls that comply with Sections C405.2.6.1 through C405.2.6.4. ~~Decorative lighting systems shall comply with Sections C405.2.6.1, C405.2.6.2 and C405.2.6.4.~~

Exceptions:

1. Lighting for covered vehicle entrances and exits from buildings and parking structures where required for eye adaptation.
2. Lighting controlled from within dwelling units.

C405.2.6.2 ~~Decorative lighting shutoff.~~ Building facade and landscape lighting. Building facade and landscape lighting shall automatically shut off from not later than 1 hour after business closing to not earlier than 1 hour before business opening.

Reason: The use of the term “decorative” lighting for exterior applications is confusing. We have interior “decorative” lighting described in CC405.3.2.2.1, but no exterior “decorative” lighting. The requirements of Section C405.2.6.2 refer specifically to building façade and landscape lighting, and these are the terms we should use.

The second sentence in C405.2.6 is not necessary, as it has no effect.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is an editorial clarification.

Proposal # 4789

CE197-19

CE198-19

IECC: C405.2.6.3

Proponent: Connor Barbaree, representing ASHRAE (cbarbaree@ashrae.org)

2018 International Energy Conservation Code

Revise as follows:

C405.2.6.3 Lighting setback. Lighting that is not controlled in accordance with Section C405.2.6.2 shall ~~be~~ comply with the following:

1. Be controlled so that the total wattage of such lighting is automatically reduced by not less than 50 percent by selectively switching off or dimming luminaires at one of the following times:
 - ~~1.~~ 1.1. From not later than midnight to not earlier than 6 a.m.
 - ~~2.~~ 1.2. From not later than one hour after business closing to not earlier than one hour before business opening.
 - ~~3.~~ 1.3. During any time where activity has not been detected for 15 minutes or more.
2. Luminaires serving outdoor parking areas and having a rated input wattage of greater than 78 W and a mounting height of 24 feet or less above the ground shall be controlled so that the total wattage of such lighting is automatically reduced by not less than 50 percent during any time where activity has not been detected for 15 minutes or more. No more than 1500 W of lighting power shall be controlled together.

Reason: Parking lot lighting offers more controllability and energy efficiency through the prolific use of solid state light sources. In prior versions of the IECC, the lighting setback control to reduce lighting wattage was limited to just 30% due to legacy lighting source limitations. Solid state lighting sources now allow a greater control range and dimmability of exterior luminaires than in the past. Changing the wattage reduction from 30 to 50% maintains sufficient exterior illumination after business operating hours when occupancy is reduced, yet is able to save an additional 20% in lighting wattage over the prior IECC versions. A 50% lighting setback wattage reduction has been part of other energy codes for a number of years. This change allows the IECC to remain consistent with the practice and efficiency of other codes.

Providing lighting when it is needed, through activity detection, has been long proven as one of the most efficient and effective ways to control lighting. In outdoor environments, as parking lots, detection technology is widely available. Many outdoor luminaires come with options to include detection technology directly integrated in the luminaire. These controls add some cost to the parking lot luminaires, but offer good payback. The amount of occupancy in parking lots ranges by exterior use type. Office building exteriors show 29% occupancy (using the proposed 15 minute time delay) during normally scheduled occupancy of 6pm to midnight. This allows lighting that might normally be at 100% to be reduced to 50% for 71% of the time, when controlled by activity detection. By comparison, an outdoor shopping center experiences a 79% occupancy. Even with this broad range of exterior occupancy rates, there still remains consider opportunity to reduce the lighting level with minimal impact to use.

Bibliography: Nonresidential Outdoor Lighting Controls, Codes and Standards Enhancement Initiative, Measure Number: 2019-NR-LIGHT3F, September 2017

Use of Occupancy Sensors in LED Parking Lot and Garage Applications: Early Experiences, Gateway Demonstrations, U.S. Department of Energy, Prepared by: Pacific Northwest National Laboratories, October 2012

Outdoor Lighting and Controls, Codes and Standards Enhancement Initiative, California Utilities Statewide Codes and Standards Team, October 2011

Cost Impact: The code change proposal will increase the cost of construction. This proposal increases the cost of construction due to the lighting controls needed for this requirement. This proposed change increases energy efficiency by an additional 20% during after hour periods and when there is no occupancy in the occupancy sensor-controlled area and provides payback for the increased cost of construction.

Proposal # 4855

CE198-19

CE199-19

IECC: C405.2.7 (New)

Proponent: Marilyn Williams, representing National Electrical Manufacturers Association
(mar_williams@nema.org)

2018 International Energy Conservation Code

Add new text as follows:

C405.2.7 Parking Garage Lighting Control. Lighting for parking garage shall comply with the following:

1. Parking garage lighting shall have automatic time-switch shutoff in accordance with Section C405.2.2.1.
2. Lighting power of each luminaire shall be automatically reduced by not less than 30% when there is no activity detected within a lighting zone for 20 minutes. Lighting zones for this requirement shall be no larger than 3600 ft².
3. Where lighting for eye adaptation is provided at covered vehicle entrances and exits from buildings and parking structures, such lighting shall be separately controlled by a device that automatically reduces lighting power by at least 50% from sunset to sunrise.
4. The power to luminaires within 30 ft of perimeter wall openings or fenestration shall automatically reduce in response to daylight by at least 50%.

Exceptions:

1. Where the opening or fenestration-to-wall-ratio is less than 40% as viewed from the interior and encompassing the vertical distance from the driving surface to the lowest structural element.
2. Where the distance from the opening or fenestration to any exterior daylight blocking obstruction is less than one-half the height from the bottom of the opening or fenestration to the top of the obstruction.
3. Where openings are obstructed by permanent screens or architectural elements restricting daylight entering the interior space.

Reason: Adding this language will:

1. Reduce inconsistency and confusion with the application of lighting controls in parking garages.
2. Align code language and implementation with other energy efficiency codes.
3. Reduce energy use.
4. Resolve compliance in application and inspection.

Currently there is confusion on how to apply the requirements of the 2018 IECC to parking garage applications. Is it to be treated as a interior space, and if so, how are the control requirements applied that has different use needs that building interior spaces? The Daylight Responsive Controls of section C405.2.3 do not provide proper guidance for how to control lighting in a parking garage setting. This proposal provides proper daylight responsive control and exceptions that meet the design needs and operation of parking garages.

There is some relative increase in cost due to adding occupancy sensing control to reduce the lighting level when there is no activity in controlled lighting zones.

Adding a parking garage specific control section, there is improved clarity in parking garage application, increased energy efficiency in lighting operation and better compliance through requirements that meetg the application needs of parking garages.

Cost Impact: The code change proposal will increase the cost of construction
The code change proposal will increase the cost of construction. Proposed language is mostly a clarification and editorial in nature. There is a small increase in construction cost with the added controls for partial automatic off that provide a payback during the long operating hours of a parking garage structure.

Proposal # 4400

CE199-19

CE200-19

IECC: C405.3, C405.4

Proponent: Jack Bailey, representing International Association of Lighting Designers (jbailey@oneluxstudio.com); Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers (glenn@lampartners.com)

2018 International Energy Conservation Code

Revise as follows:

C405.3 Interior lighting power requirements (Prescriptive). A building complies with this section where its total connected interior lighting power calculated under Section C405.3.1 is not greater than the interior lighting power allowance calculated under Section C405.3.2. For the purposes of this determination, all building floor area which is under the horizontal projection of the roof or floor above shall be considered interior, and all lighting serving that floor area shall be considered interior lighting.

C405.4 Exterior lighting power requirements (Mandatory). The total connected exterior lighting power calculated in accordance with Section C405.4.1 shall be not greater than the exterior lighting power allowance calculated in accordance with Section C405.4.2. For the purposes of this determination, all building floor area which is not under the horizontal projection of the roof or floor above shall be considered exterior, and all lighting serving that floor area shall be considered exterior lighting.

Reason: Under the current code how do we know whether lighting is “interior” or “exterior”? This is not discussed anywhere in the code, so users are currently free to make their own assumptions. Consider these examples:

1. Unenclosed lobbies, corridors, and retail and airport concourses in milder climates are most often considered “interior” spaces if they are under a roof, even though they are not conditioned.
2. Lower floors of open air parking garages are considered “interior” spaces (and the allowance for these is located in the interior lighting power tables C405.3.2(1) and C405.3.2(2).
3. The roof of a parking garage is considered “exterior” space, and the allowance for this is located in the exterior lighting power table C405.4.2(2).
4. Rooftop terraces are most often considered “exterior” even though this is occupiable building floor area.
5. Spaces under trellises and canopies on building sites are most often considered exterior.
6. Rooftop terraces and open air courtyards are most often considered exterior.

The proper classification of lighting is important for both lighting power and controls determinations under the code.

Any proposal on this subject matter is bound to challenge some people’s assumptions about how lighting should be classified, and this is inevitable when we try to bring everyone to a common understanding of this topic. It is also inevitable that some of the determinations will seem arbitrary.

The proposed language “under the horizontal projection of the roof or floor above” is borrowed from the IBC definition of “gross floor area” which uses similar language:

From the 2018 IBC:

[BE] FLOOR AREA, GROSS. The floor area within the inside perimeter of the exterior walls of the building under consideration, exclusive of vent shafts and courts, without deduction for corridors, stairways, ramps, closets, the thickness of interior walls, columns or other features. The floor area of a building, or portion thereof,

not provided with surrounding exterior walls shall be the usable area under the horizontal projection of the roof or floor above. The gross floor area shall not include shafts with no openings or interior courts.

This proposal is clear, and should align the language of the code with the way it is most often interpreted for the most common applications.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This aligns the text of the code with the way it is most often applied.

Proposal # 4791

CE200-19

CE201-19

IECC: C405.3.1

Proponent: Marilyn Williams, representing National Electrical Manufacturers Association
(mar_williams@nema.org)

2018 International Energy Conservation Code

Revise as follows:

C405.3.1 Total connected interior lighting power. The total connected interior lighting power shall be determined in accordance with Equation 4-10.

$$TCLP = [LVL + BLL + LED + TRK + Other]$$

(Equation 4-10)

where:

TCLP = Total connected lighting power (watts).

LVL = For luminaires with lamps connected directly to building power, such as line voltage lamps, the rated wattage of the lamp.

BLL = For luminaires incorporating a ballast or transformer, the rated input wattage of the ballast or transformer when operating that lamp.

LED = For light-emitting diode luminaires with either integral or remote drivers, the rated wattage of the luminaire.

TRK = For lighting track, cable conductor, rail conductor, and plug-in busway systems that allow the addition and relocation of luminaires without rewiring, the wattage shall be one of the following:

1. The specified wattage of the luminaires, but not less than 8 W per linear foot (25 W/lin m).
2. The wattage limit of the permanent current-limiting devices protecting the system.
3. The wattage limit of the transformer supplying the system.

Other = The wattage of all other luminaires and lighting sources not covered previously and associated with interior lighting verified by data supplied by the manufacturer or other *approved* sources.

The connected power associated with the following lighting equipment and applications is not included in calculating total connected lighting power.

1. Television broadcast lighting for playing areas in sports arenas.
2. Emergency lighting automatically off during normal building operation.
3. Lighting in spaces specifically designed for use by occupants with special lighting needs, including those with visual impairment and other medical and age-related issues.
4. Casino gaming areas.
5. Mirror lighting in dressing rooms.
6. Task lighting for medical and dental purposes that is in addition to general lighting and controlled by an independent control device.
7. Display lighting for exhibits in galleries, museums and monuments that is in addition to general lighting and controlled by an independent control device.

8. Lighting for theatrical purposes, including performance, stage, film production and video production.
9. Lighting for photographic processes.
10. Lighting integral to equipment or instrumentation and installed by the manufacturer.
11. Task lighting for plant growth or maintenance.
12. Advertising signage or directional signage.
13. Lighting for food warming.
14. Lighting equipment that is for sale.
15. Lighting demonstration equipment in lighting education facilities.
16. Lighting approved because of safety considerations.
17. Lighting in retail display windows, provided that the display area is enclosed by ceiling-height partitions.
18. Furniture-mounted supplemental task lighting that is controlled by automatic shutoff.
19. Exit signs.
20. Antimicrobial lighting used for the sole purpose of disinfecting a space.

Reason: One traditional type of indoor connected power exemptions has been the use of lighting for non-human, non-visual applications as exemplified by food warming or plant growth. New technology is emerging for another non-human, non-visual application using narrow-wavelength high density violet light just above 400 nm to disinfect a space by eliminating a range of common pathogens susceptible to this band. Lighting developed specifically for this purpose is on during times of vacancy and off during occupancy. This type of application is not only important in medical facilities but can also be used in locker rooms, restrooms, and kitchen areas to improve the general health and well being of those in a space.

Without a directly defined exemption, this new technology for improving the general health could come into conflict with today's energy codes, depending on interpretation.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code change proposal will neither increase or decrease the cost of construction. No cost impact to the normally specified architectural lighting installation with a space. Customers looking for this type of implementation would buy separate of specified architectural lighting.

Proposal # 4549

CE201-19

CE202-19

IECC: C405.3.2, C405.3.2.2

Proponent: Glenn Heinmiller, Lam Partners, representing Self (glenn@lampartners.com); Jack Bailey, representing International Association of Lighting Designers (jbailey@oneluxstudio.com)

2018 International Energy Conservation Code

Revise as follows:

C405.3.2 Interior lighting power allowance. The total interior lighting power allowance (watts) is determined according to Table C405.3.2(1) using the Building Area Method, or Table C405.3.2(2) using the Space-by-Space Method, for all areas of the building covered in this permit. Buildings with unfinished spaces shall use the Space-by-Space Method.

C405.3.2.2 Space-by-Space Method. For the Space-by-Space Method, the interior lighting power allowance is determined by multiplying the floor area of each space times the value for the space type in Table C405.3.2(2) that most closely represents the proposed use of the space, and then summing the lighting power allowances for all spaces. Where a building has unfinished spaces, the lighting power allowance for the unfinished spaces shall be the total connected lighting power for those spaces, or 0.2 watts per square foot, whichever is less. Tradeoffs among spaces are permitted.

Reason: This proposal clarifies how the lighting power allowance is to be determined for Core and Shell buildings. This is the source of much legitimate confusion. While there are a variety of strategies for permitting and obtaining certificate of occupancy in core and shell buildings with unfinished spaces, we are concerned about one scenario in particular: where tenant spaces are provided with minimal lighting to meet the egress requirements of the IBC so that a permit can be "closed out", with the intention that this lighting will be replaced when a tenant leases the space and does their own fitout with permanent lighting. In these situations it is quite easy to "game" the code by taking an allowance for the intended use of the space (i.e. retail, office, etc.) while only counting the minimal lighting that is installed to obtain a certificate of occupancy. This is a major loophole.

This change requires that the space-by-space method be used for buildings with unfinished spaces. The Building Area Method cannot be used in this case because the power allowances for each Building Area Type are based on the allocation of space types in a typical building of that building type (Office, Retail, etc.) and it is assumed that all spaces are finished. The space-by-space method is the only way to break out the unfinished spaces and assign a power allowance for those spaces.

The proposed language will be clear in all instances, and will prevent people from claiming credit for fictitious savings in lighting power in unfinished spaces.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal provides clarity on the application of the code and closes a potential loophole.

Proposal # 4790

CE202-19

CE203-19

IECC: C405.3.2, C405.3.2.1, C405.3.2.2

Proponent: Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers (glenn@lampartners.com); Jack Bailey (jbailey@oneluxstudio.com)

2018 International Energy Conservation Code

Revise as follows:

C405.3.2 Interior lighting power allowance. The total interior lighting power allowance (watts) ~~is for an entire building shall be determined according to Table C405.3.2(1) using the C405.3.2.1 Building Area Method, or Table C405.3.2(2) using the Space-by-Space Method, for all areas of the building covered in this permit.~~ C405.3.2.2 Space-by-Space method. The interior lighting power allowance for projects that only involve portions of a building shall be determined according C405.3.2.2 Space-by-Space Method.

Delete and substitute as follows:

~~**C405.3.2.1 Building Area Method.** For the Building Area Method, the interior lighting power allowance is the floor area for each building area type listed in Table C405.3.2(1) times the value from Table C405.3.2(1) for that area. For the purposes of this method, an "area" shall be defined as all contiguous spaces that accommodate or are associated with a single building area type, as listed in Table C405.3.2(1). Where this method is used to calculate the total interior lighting power for an entire building, each building area type shall be treated as a separate area.~~

C405.3.2.1 Building Area Method. For the Building Area Method, the interior lighting power allowance is calculated as follows:

1. For each building area type inside the building, determine the applicable building area type and the allowed lighting power density for that type from Table C405.3.2(1). For building area types not listed, select the building area type that most closely represents the use of that area. For the purposes of this method, an "area" shall be defined as all contiguous spaces that accommodate or are associated with a single building area type.
2. Determine the floor area for each building area type listed in Table C405.3.2(1) and multiply this area by the applicable value from Table C405.3.2(1) to determine the lighting power (watts) for each building area type.
3. The total interior lighting power allowance (watts) for the entire *building* is the sum of the lighting power from each building area type.

~~**C405.3.2.2 Space-by-Space Method.** For the Space-by-Space Method, the interior lighting power allowance is determined by multiplying the floor area of each space times the value for the space type in Table C405.3.2(2) that most closely represents the proposed use of the space, and then summing the lighting power allowances for all spaces. Tradeoffs among spaces are permitted.~~

C405.3.2.2 Space-by-Space Method. For the Space-by-Space Method, the interior lighting power allowance is calculated as follows:

1. For each space enclosed by partitions that are not less than 80 percent of the ceiling height, determine the applicable space type from Table C405.3.2(2). For space types not listed, select the space type that most closely represents the proposed use of the space. Where a space has multiple functions, that space may be divided into separate spaces.
2. Determine the total floor area of all the spaces of each space type and multiply by the value for the space type in Table C405.3.2(2) to determine the lighting power (watts) for each space type.

3. The total interior lighting power allowance (watts) shall be the sum of the lighting power allowances for all space types.

Reason: This proposal clarifies the application and calculation procedures for the Building Area Method and the Space-by-Space Method. Currently the code does not provide clear or complete direction. There is no change in stringency.

This proposal specifically clarifies these items which have been a source of confusion and misunderstanding:

- The Building Area Method may only be used to determine compliance for an entire building. This is because the Building Area method power allowances are based on the typical mix of space types within an entire building of that building type.
- The Space-by-Space Method does not require the determination of the area and power of each individual space, but rather the total area and total power for all of the spaces of each space type.

This proposal makes this calculation procedure easier to understand and will increase the usability of the code. Codes which are usable are more likely to be complied with and are easier to enforce.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal is a re-write to clarify code requirements.

Proposal # 4616

CE203-19

CE204-19

IECC: TABLE C405.3.2(1), TABLE C405.3.2(2)

Proponent: Eric Makela, New Buildings Institute, representing New Buildings Institute
(ericM@newbuildings.org)

2018 International Energy Conservation Code

Revise as follows:

TABLE C405.3.2(1)
INTERIOR LIGHTING POWER ALLOWANCES: BUILDING AREA METHOD

BUILDING AREA TYPE	LPD (w/ft ²)
Automotive facility	0.74 <u>64</u>
Convention center	0.76 <u>70</u>
Courthouse	0.90 <u>74</u>
Dining: bar lounge/leisure	0.90 <u>69</u>
Dining: cafeteria/fast food	0.79 <u>66</u>
Dining: family	0.78 <u>61</u>
Dormitory ^{a, b}	0.64 <u>52</u>
Exercise center	0.65
Fire station ^a	0.53 <u>50</u>
Gymnasium	0.68 <u>67</u>
Health care clinic	0.82 <u>68</u>
Hospital ^a	1.05 <u>0.86</u>
Hotel/Motel ^{a, b}	0.75 <u>70</u>
Library	0.78
Manufacturing facility	0.90 <u>60</u>
Motion picture theater	0.83 <u>62</u>
Multifamily ^c	0.68 <u>49</u>
Museum	1.06 <u>0.68</u>
Office	0.79 <u>69</u>
Parking garage	0.15 <u>12</u>
Penitentiary	0.75 <u>67</u>
Performing arts theater	1.18 <u>0.85</u>
Police station	0.80 <u>68</u>
Post office	0.67 <u>62</u>
Religious building	0.94 <u>72</u>
Retail	1.06 <u>0.91</u>
School/university	0.84 <u>67</u>
Sports arena	0.87 <u>76</u>
Town hall	0.80 <u>72</u>

Transportation	0. 61 <u>51</u>
Warehouse	0. 48 <u>41</u>
Workshop	0. 90 <u>83</u>

- a. Where sleeping units are excluded from lighting power calculations by application of Section R405.1, neither the area of the sleeping units nor the wattage of lighting in the sleeping units is counted.
- b. Where dwelling units are excluded from lighting power calculations by application of Section R405.1, neither the area of the dwelling units nor the wattage of lighting in the dwelling units is counted.
- c. Dwelling units are excluded. Neither the area of the dwelling units nor the wattage of lighting in the dwelling units is counted.

TABLE C405.3.2(2)
INTERIOR LIGHTING POWER ALLOWANCES: SPACE-BY-SPACE METHOD

COMMON SPACE TYPES ^a	LPD (watts/sq.ft)
Atrium	
Less than 40 feet in height	0. 03 <u>23</u> per foot in total height
Greater than 40 feet in height	0.40 + 0.02 per foot in total height
Audience seating area	
In an auditorium	0.63
In a convention center	0. 82 <u>65</u>
In a gymnasium	0. 65 <u>43</u>
In a motion picture theater	1.14 <u>0.64</u>
In a penitentiary	0.28
In a performing arts theater	2.03 <u>1.34</u>
In a religious building	1.53 <u>0.98</u>
In a sports arena	0. 43 <u>42</u>
Otherwise	0. 43 <u>40</u>
Banking activity area	0. 86 <u>79</u>
Breakroom (See Lounge/breakroom)	
Classroom/lecture hall/training room	
In a penitentiary	1. 34 <u>06</u>
Otherwise	0. 96 <u>74</u>
Computer room	1. 33 <u>16</u>
Conference/meeting/multipurpose room	1.07 <u>0.93</u>
<u>Confinement cells</u>	<u>0.52</u>
Copy/print room	0. 56 <u>50</u>
Corridor	
In a facility for the visually impaired (and not used primarily by the staff) ^b	0. 92 <u>81</u>
In a hospital	0. 92 <u>81</u>
In a manufacturing facility	0. 29 <u>28</u>

In a primary or secondary school (and not used by staff)	0.74
Otherwise	0.66 <u>58</u>
Courtroom	1.39 <u>06</u>
Dining area	
In bar/lounge or leisure dining	0.93 <u>62</u>
In cafeteria or fast food dining	0.63 <u>53</u>
In a facility for the visually impaired (and not used primarily by the staff) ^b	2.00 <u>1.48</u>
In family dining	0.71 <u>54</u>
In a penitentiary	0.96 <u>72</u>
Otherwise	0.63 <u>53</u>
Electrical/mechanical room	0.43 <u>39</u>
Emergency vehicle garage	0.41
Food preparation area	1.06 <u>0.92</u>
Guestroom ^{c, d}	0.77 <u>75</u>
Laboratory	
In or as a classroom	1.20 <u>04</u>
Otherwise	1.45 <u>32</u>
Laundry/washing area	0.43
Loading dock, interior	0.58 <u>51</u>
Lobby	
For an elevator	0.68 <u>52</u>
In a facility for the visually impaired (and not used primarily by the staff) ^b	2.03
In a hotel	1.06 <u>0.68</u>
In a motion picture theater	0.45 <u>38</u>
In a performing arts theater	1.70 <u>0.82</u>
Otherwise	1.0 <u>0.90</u>
Locker room	0.48 <u>45</u>
Lounge/breakroom	
In a healthcare facility	0.78 <u>53</u>
Otherwise	0.62 <u>44</u>
Office	
Enclosed	0.93 <u>85</u>
Open plan	0.81 <u>78</u>
Parking area, interior	0.14 <u>11</u>
Pharmacy area	1.34 <u>23</u>
Restroom	
In a facility for the visually impaired (and not used primarily by the staff) ^b	0.96 <u>81</u>
Otherwise	0.85 <u>75</u>
Sales area	1.22 <u>06</u>
Seating area, general	0.42 <u>38</u>

Stairway (see Space containing stairway)	
Stairwell	0.58 <u>50</u>
Storage room	0.46 <u>43</u>
Vehicular maintenance area	0.56 <u>53</u>
Workshop	1.14 <u>09</u>
BUILDING TYPE SPECIFIC SPACE TYPES ^a	LPD (watts/sq.ft)
Automotive (see Vehicular maintenance area)	
Convention Center—exhibit space	0.88 <u>69</u>
Dormitory—living quarters ^{c, d}	0.54 <u>46</u>
Facility for the visually impaired ^b	
In a chapel (and not used primarily by the staff)	1.06 <u>0.89</u>
In a recreation room (and not used primarily by the staff)	1.80 <u>53</u>
Fire Station—sleeping quarters ^c	0.20 <u>19</u>
Gymnasium/fitness center	
In an exercise area	0.50
In a playing area	0.82 <u>75</u>
Healthcare facility	
In an exam/treatment room	1.68 <u>16</u>
In an imaging room	1.06 <u>0.98</u>
In a medical supply room	0.54
In a nursery	1.00 <u>0.94</u>
In a nurse's station	0.81 <u>75</u>
In an operating room	2.17 <u>1.87</u>
In a patient room ^c	0.62 <u>45</u>
In a physical therapy room	0.84
In a recovery room	1.03 <u>0.89</u>
Library	
In a reading area	0.82 <u>77</u>
In the stacks	1.20
Manufacturing facility	
In a detailed manufacturing area	0.93 <u>86</u>
In an equipment room	0.65 <u>61</u>
In an extra-high-bay area (greater than 50' floor-to-ceiling height)	1.05 <u>0.73</u>
In a high-bay area (25-50' floor-to-ceiling height)	0.75 <u>58</u>
In a low-bay area (less than 25' floor-to-ceiling height)	0.96 <u>61</u>
Museum	
In a general exhibition area	1.05 <u>0.61</u>
In a restoration room	0.85 <u>77</u>
Performing arts theater—dressing room	0.36 <u>35</u>
Post office—sorting area	0.68 <u>66</u>

Religious buildings	
In a fellowship hall	0.55_54
In a worship/pulpit/choir area	1.53 0.98
Retail facilities	
In a dressing/fitting room	0.50_49
In a mall concourse	0.90_79
Sports arena—playing area	
For a Class I facility ^e	2.47_26
For a Class II facility ^f	1.96_45
For a Class III facility ^g	1.70_08
For a Class IV facility ^h	1.13 0.72
Transportation facility	
In a baggage/carousel area	0.45_40
In an airport concourse	0.31
At a terminal ticket counter	0.62_48
Warehouse—storage area	
For medium to bulky, palletized items	0.35_27
For smaller, hand-carried items	0.69_65

- a. In cases where both a common space type and a building area specific space type are listed, the building area specific space type shall apply
- b. A 'Facility for the Visually Impaired' is a facility that is licensed or will be licensed by local or state authorities for senior long-term care, adult daycare, senior support or people with special visual needs.
- c. Where sleeping units are excluded from lighting power calculations by application of Section R405.1, neither the area of the sleeping units nor the wattage of lighting in the sleeping units is counted.
- d. Where dwelling units are excluded from lighting power calculations by application of Section R405.1, neither the area of the dwelling units nor the wattage of lighting in the dwelling units is counted.
- e. Class I facilities consist of professional facilities; and semiprofessional, collegiate, or club facilities with seating for 5,000 or more spectators.
- f. Class II facilities consist of collegiate and semiprofessional facilities with seating for fewer than 5,000 spectators; club facilities with seating for between 2,000 and 5,000 spectators; and amateur league and high-school facilities with seating for more than 2,000 spectators.
- g. Class III facilities consist of club, amateur league and high-school facilities with seating for 2,000 or fewer spectators.
- h. Class IV facilities consist of elementary school and recreational facilities; and amateur league and high-school facilities without provision for spectators.
- i. The wattage of lighting in daylight transition zones and ramps without parking is excluded
- j. Pool surfaces are excluded. Neither the area of the swimming or spa pool nor the wattage of the lighting serving them is counted.

Reason: This proposal updates the LPD tables in the IECC to reflect advancements in lighting technology and lighting design practices. A majority of these values are from ASHRAE 189.1-2018 but some values were modified based on discussions with lighting designers and other stakeholders as part of the New York Stretch

Code development process. A majority of these changes are driven by how IALD space type definitions have not kept pace with how spaces and lighting needs are evolving. Airport concourses is one such notable examples.

Cost Impact: The code change proposal will increase the cost of construction. This proposal may represent an increase in cost for affected space and building types depending on current practice of the lighting designer and lighting suppliers. Higher efficacy light sources will be required to meet the proposed lighting power densities which may cost more than what is currently used in particular market.

Proposal # 5191

CE204-19

CE205-19

IECC: TABLE C405.3.2(1)

Proponent: Jonathan McHugh, representing McHugh Energy Consultants Inc. (jon@mchughenergy.com)

2018 International Energy Conservation Code

Revise as follows:

TABLE C405.3.2(1)
INTERIOR LIGHTING POWER ALLOWANCES: BUILDING AREA METHOD

BUILDING AREA TYPE	LPD (w/ft ²)
Automotive facility	0.71 <u>0.64</u>
Convention center	0.76 <u>0.64</u>
Courthouse	0.90 <u>0.74</u>
Dining: bar lounge/leisure	0.90 <u>0.69</u>
Dining: cafeteria/fast food	0.79 <u>0.66</u>
Dining: family	0.78 <u>0.61</u>
Dormitory ^{a, b}	0.61 <u>0.52</u>
Exercise center	0.65
Fire station ^a	0.53 <u>0.50</u>
Gymnasium	0.68 <u>0.65</u>
Health care clinic	0.82 <u>0.68</u>
Hospital ^a	1.05 <u>0.86</u>
Hotel/Motel ^{a, b}	0.75 <u>0.56</u>
Library	0.78 <u>0.70</u>
Manufacturing facility	0.90 <u>0.60</u>
Motion picture theater	0.83 <u>0.44</u>
Multifamily ^c	0.68 <u>0.45</u>
Museum	1.06 <u>0.55</u>
Office	0.79 <u>0.64</u>
Parking garage	0.15 <u>0.12</u>
Penitentiary	0.75 <u>0.67</u>
Performing arts theater	1.18 <u>0.85</u>
Police station	0.80 <u>0.66</u>
Post office	0.67 <u>0.62</u>
Religious building	0.94 <u>0.67</u>
Retail	1.06 <u>0.84</u>
School/university	0.81 <u>0.65</u>
Sports arena	0.87 <u>0.75</u>
Town hall	0.80 <u>0.69</u>
Transportation	0.61 <u>0.51</u>

Warehouse	0.48 <u>0.41</u>
Workshop	0.90 <u>0.83</u>

- a. Where sleeping units are excluded from lighting power calculations by application of Section R405.1, neither the area of the sleeping units nor the wattage of lighting in the sleeping units is counted.
- b. Where dwelling units are excluded from lighting power calculations by application of Section R405.1, neither the area of the dwelling units nor the wattage of lighting in the dwelling units is counted.
- c. Dwelling units are excluded. Neither the area of the dwelling units nor the wattage of lighting in the dwelling units is counted.

Reason: The results here reflect advances in lighting technology from a number of sources including the New York stretch code, California's Title 24 and ASHRAE 90.1 and 189.1.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The LPDs here reflect LED technology. Almost all new lighting projects are using LEDs. The costs of LEDs have dropped significantly and the market share of competing technologies has declined. Since some lighting designers "design to code" in some cases this may result in less products being installed for a cost savings.

Proposal # 5650

CE205-19

CE206-19

IECC: TABLE C405.3.2(1)

Proponent: Connor Barbaree, representing ASHRAE (cbarbaree@ashrae.org)

2018 International Energy Conservation Code

Revise as follows:

TABLE C405.3.2(1)
INTERIOR LIGHTING POWER ALLOWANCES: BUILDING AREA METHOD

BUILDING AREA TYPE	LPD (w/ft ²)
Automotive facility	0.71 <u>0.75</u>
Convention center	0.76 <u>0.64</u>
Courthouse	0.90 <u>0.79</u>
Dining: bar lounge/leisure	0.90 <u>0.80</u>
Dining: cafeteria/fast food	0.79 <u>0.76</u>
Dining: family	0.78 <u>0.71</u>
Dormitory ^{a, b}	0.61 <u>0.53</u>
Exercise center	0.65 <u>0.72</u>
Fire station ^a	0.53 <u>0.56</u>
Gymnasium	0.68 <u>0.76</u>
Health care clinic	0.82 <u>0.81</u>
Hospital ^a	1.05 <u>0.96</u>
Hotel/Motel ^{a, b}	0.75 <u>0.56</u>
Library	0.78 <u>0.83</u>
Manufacturing facility	0.90 <u>0.82</u>
Motion picture theater	0.83 <u>0.44</u>
Multifamily ^c	0.68 <u>0.45</u>
Museum	1.06 <u>0.55</u>
Office	0.79 <u>0.64</u>
Parking garage	0.15 <u>0.18</u>
Penitentiary	0.75 <u>0.69</u>
Performing arts theater	1.18 <u>0.84</u>
Police station	0.80 <u>0.66</u>
Post office	0.67 <u>0.65</u>
Religious building	0.94 <u>0.67</u>
Retail	1.06 <u>0.84</u>
School/university	0.81 <u>0.72</u>
Sports arena	0.87 <u>0.76</u>
Town hall	0.80 <u>0.69</u>
Transportation	0.61 <u>0.50</u>

Warehouse	0.48 0.45
Workshop	0.90 0.91

- a. Where sleeping units are excluded from lighting power calculations by application of Section R405.1, neither the area of the sleeping units nor the wattage of lighting in the sleeping units is counted.
- b. Where dwelling units are excluded from lighting power calculations by application of Section R405.1, neither the area of the dwelling units nor the wattage of lighting in the dwelling units is counted.
- c. Dwelling units are excluded. Neither the area of the dwelling units nor the wattage of lighting in the dwelling units is counted.

Reason: Building Area Method Lighting Power Densities (LPDs) are based on the Space-by-Space LPDs assigned proportionally for the building type. The LPD values proposed here are a continuation of the extensive work done on the Space-by-Space LPD values. The Space-by-space LPD values are not just an update to existing models, but instead, include an extensive review and upgrade of those models. The work included:

- Evaluation of current Illuminating Engineering Society (IES) guidelines for lighting of commercial interiors (recommended footcandles, or illuminance, at the work plane) for all spaces. The ANSI/IES Recommended Practice (RP28-2016 for Seniors and the Low Vision Population) was used to inform both illuminance levels and fixture selection for space types in Facilities for the Visually Impaired.
- Expansion of categories used to assign room surface reflectance for each space type, based on actual usage, not just design “rules of thumb.” Previously, most spaces were assumed to have ceiling surfaces of 70% reflectance, wall surfaces of 50% reflectance and floor surfaces of 20% reflectance (70/50/20). Through a consensus process, the developers of this proposal agreed to select the wall surface reflectance as the primary surface. Many spaces were reassigned to the category of 50/30/20 reflectance and some were reassigned to the 30/10/20 category.
- Update and expansion of the lighting fixture database. 100% of the fixtures are solid state (LED), using current off-the-shelf technology (fixture efficacy)
- o Improvement of the high color quality data set for LED fixtures used in spaces that previously had incandescent, halogen or premium HID
- Standardization on a Light Loss Factor for LED of 0.85, not the End of Useful Life metric of 0.70
- Improvement of the wallwashing methodology for spaces where vertical surface illumination was deemed important

Additionally, the building data set, developed using Dodge Data & Analytics and the National Construction Database, was reviewed to assure that the actual buildings assigned to each Building type better reflected that Building type. It was agreed by the developers of this proposal that a filter should be applied (where possible) based on the criteria that at least 33% of the underlying space-by-space data must represent spaces that are the larger Building Area category. Previously, if the space-by-space mixture contained a large portion of spaces that differed from the larger Building Area category, it could result in a Building Area LPD value that was significantly different from the appropriate Space-by-Space LPDs. The values proposed here are a better composite of the spaces. The overall reduction across all building types will result in energy savings of approximately 5% over IECC 2018.

Bibliography: Addendum CG to ASHRAE Standard 90.1-2016

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code change proposal will not increase or decrease the cost of construction. The Lighting Power Density values proposed in this code change proposal utilize off-the-shelf current LED technology and do not require additional or more expensive luminaires. The efficacy chosen for the models was based on the average of a fixture data set using luminaires from multiple manufacturers. Specifiers and users can find light fixtures that will allow the project to meet code at reasonable price points. Data gathered from industry partners indicates that product development is all directed at solid-state (LED) lighting with many traditional fixtures and lamp sources being discontinued.

CE207-19

IECC: TABLE C405.3.2(2)

Proponent: Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers (glenn@lampartners.com); Jack Bailey, representing International Association of Lighting Designers (jbailey@oneluxstudio.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE C405.3.2(2)
INTERIOR LIGHTING POWER ALLOWANCES: SPACE-BY-SPACE METHOD**

COMMON SPACE TYPES ^a	LPD (watts/sq.ft)
Atrium	
Less than 40 feet in height	0.03 per foot in total height <u>0.48</u>
Greater than 40 feet in height	0.40 + 0.02 per foot in total height <u>0.60</u>
Audience seating area	
In an auditorium	0.63 <u>0.61</u>
In a convention center	0.82
In a gymnasium	0.65 <u>0.23</u>
In a motion picture theater	1.14 <u>0.27</u>
In a penitentiary	0.28 <u>0.67</u>
In a performing arts theater	2.03 <u>1.16</u>
In a religious building	1.53 <u>0.72</u>
In a sports arena	0.43 <u>0.33</u>
Otherwise	0.43 <u>0.23</u>
Banking activity area	0.86 <u>0.61</u>
Breakroom (See Lounge/breakroom)	
Classroom/lecture hall/training room	
In a penitentiary	1.34 <u>0.89</u>
Otherwise	0.96 <u>0.71</u>
Computer room	1.33 <u>0.94</u>
Conference/meeting/multipurpose room	1.07 <u>0.97</u>
Copy/print room	0.56
Corridor	
In a facility for the visually impaired (and not used primarily by the staff) ^b	0.92 <u>0.71</u>
In a hospital	0.92 <u>0.71</u>
In a manufacturing facility	0.29
Otherwise	0.66 <u>0.41</u>
Courtroom	1.39 <u>1.20</u>

Dining area	
In bar/lounge or leisure dining	0.93 <u>0.86</u>
In cafeteria or fast food dining	0.63 <u>0.40</u>
In a facility for the visually impaired (and not used primarily by the staff) ^b	2.00 <u>1.27</u>
In family dining	0.71 <u>0.60</u>
In a penitentiary	0.96 <u>0.42</u>
Otherwise	0.63 <u>0.43</u>
Electrical/mechanical room	0.43
Emergency vehicle garage	0.41 <u>0.52</u>
Food preparation area	1.06 <u>1.09</u>
Guestroom ^{c, d}	0.77 <u>0.41</u>
Laboratory	
In or as a classroom	1.20 <u>1.11</u>
Otherwise	1.45 <u>1.33</u>
Laundry/washing area	0.43 <u>0.53</u>
Loading dock, interior	0.58 <u>0.88</u>
Lobby	
For an elevator	0.68
In a facility for the visually impaired (and not used primarily by the staff) ^b	2.03 <u>1.69</u>
In a hotel	1.06 <u>0.51</u>
In a motion picture theater	0.45 <u>0.23</u>
In a performing arts theater	1.70 <u>1.25</u>
Otherwise	1.0
Locker room	0.48 <u>0.52</u>
Lounge/breakroom	
In a healthcare facility	0.78 <u>0.42</u>
Otherwise	0.62 <u>0.59</u>
Office	
Enclosed	0.93 <u>0.74</u>
Open plan	0.81 <u>0.61</u>
Parking area, interior	0.14 <u>0.15</u>
Pharmacy area	1.34 <u>1.66</u>
Restroom	
In a facility for the visually impaired (and not used primarily by the staff) ^b	0.96 <u>1.26</u>
Otherwise	0.85 <u>0.63</u>
Sales area	1.22 <u>1.05</u>
Seating area, general	0.42 <u>0.23</u>
Stairway (see Space containing stairway)	

Stairwell	0.58 <u>0.49</u>
Storage room	0.46 <u>0.51</u>
Storage room - small materials	0.62
Vehicular maintenance area	0.56 <u>0.60</u>
Workshop	1.14 <u>1.26</u>
BUILDING TYPE SPECIFIC SPACE TYPES ^a	LPD (watts/sq.ft)
Automotive (see Vehicular maintenance area)	
Convention Center—exhibit space	0.88 <u>0.61</u>
Dormitory—living quarters ^{c, d}	0.54 <u>0.50</u>
Facility for the visually impaired ^b	
In a chapel (and not used primarily by the staff)	1.06 <u>0.70</u>
In a recreation room (and not used primarily by the staff)	1.80 <u>1.77</u>
Fire Station—sleeping quarters ^c	0.20 <u>0.23</u>
Gymnasium/fitness center	
In an exercise area	0.50 <u>0.90</u>
In a playing area	0.82 <u>0.85</u>
Healthcare facility	
In an exam/treatment room	1.68 <u>1.40</u>
In an imaging room	1.06 <u>0.94</u>
In a medical supply room	0.54 <u>0.62</u>
In a nursery	1.00 <u>0.92</u>
In a nurse's station	0.81 <u>1.17</u>
In an operating room	2.17 <u>2.26</u>
In a patient room ^c	0.62 <u>0.68</u>
In a physical therapy room	0.84 <u>0.91</u>
In a recovery room	1.03 <u>1.25</u>
Library	
In a reading area	0.82 <u>0.96</u>
In the stacks	1.20 <u>1.18</u>
Manufacturing facility	
In a detailed manufacturing area	0.93 <u>0.80</u>
In an equipment room	0.65 <u>0.76</u>
In an extra-high-bay area (greater than 50' floor-to-ceiling height)	1.05 <u>1.42</u>
In a high-bay area (25-50' floor-to-ceiling height)	0.75 <u>1.24</u>
In a low-bay area (less than 25' floor-to-ceiling height)	0.96 <u>0.86</u>
Museum	
In a general exhibition area	1.05 <u>0.31</u>
In a restoration room	0.85 <u>1.10</u>
Performing arts theater—dressing room	0.36 <u>0.41</u>
Post office—sorting area	0.68 <u>0.76</u>

Religious buildings	
In a fellowship hall	0.55 <u>0.54</u>
In a worship/pulpit/choir area	1.53 <u>0.85</u>
Retail facilities	
In a dressing/fitting room	0.50 <u>0.51</u>
In a mall concourse	0.90 <u>0.82</u>
Sports arena—playing area	
For a Class I facility ^e	2.47 <u>2.94</u>
For a Class II facility ^f	1.96 <u>2.01</u>
For a Class III facility ^g	1.70 <u>1.30</u>
For a Class IV facility ^h	1.13 <u>0.86</u>
Transportation facility	
In a baggage/carousel area	0.45 <u>0.39</u>
In an airport concourse	0.31 <u>0.25</u>
At a terminal ticket counter	0.62 <u>0.51</u>
Warehouse—storage area	
For medium to bulky, palletized items	0.35 <u>0.33</u>
For smaller, hand-carried items	0.69 <u>0.69</u>

- a. In cases where both a common space type and a building area specific space type are listed, the building area specific space type shall apply
- b. A 'Facility for the Visually Impaired' is a facility that is licensed or will be licensed by local or state authorities for senior long-term care, adult daycare, senior support or people with special visual needs.
- c. Where sleeping units are excluded from lighting power calculations by application of Section R405.1, neither the area of the sleeping units nor the wattage of lighting in the sleeping units is counted.
- d. Where dwelling units are excluded from lighting power calculations by application of Section R405.1, neither the area of the dwelling units nor the wattage of lighting in the dwelling units is counted.
- e. Class I facilities consist of professional facilities; and semiprofessional, collegiate, or club facilities with seating for 5,000 or more spectators.
- f. Class II facilities consist of collegiate and semiprofessional facilities with seating for fewer than 5,000 spectators; club facilities with seating for between 2,000 and 5,000 spectators; and amateur league and high-school facilities with seating for more than 2,000 spectators.
- g. Class III facilities consist of club, amateur league and high-school facilities with seating for 2,000 or fewer spectators.
- h. Class IV facilities consist of elementary school and recreational facilities; and amateur league and high-school facilities without provision for spectators.

Reason: This proposal revises the lighting power density allowances to the best available values. "Best" means values that will lead to high energy-efficiency while still allowing high-quality lighting and sufficient light levels. We believe that the best source for these values is the process of the ASHRAE/IES 90.1 Lighting Subcommittee supported by PNNL/DOE. The IALD participates in the development of these values through our representation on the 90.1 Lighting Subcommittee and through the ANSI/ASHRAE/IES public review commenting process.

During this code cycle a detailed review and upgrade of the Space-by-space LPD models was performed by the 90.1 Lighting Subcommittee, rather than a simple update as in past code cycles. Because of this, we have even more confidence in these numbers.

The basis of the values in our proposal is Addendum BB to ASHRAE/IES Standard 90.1 Second Public Review Draft (November 2018). Addendum BB to Standard 90.1 is still a work-in-progress at the time of the submission of this code change proposal for IECC. We know that some of the LPD values will be revised before the publication of 90.1-2019. These values in our proposal are based on our involvement in the ongoing public comment process for Addendum BB and our understanding of the work of the 90.1 Lighting Subcommittee since the Addendum BB Second Public Review Draft was published last November. This proposal contains values that will more closely match the final values that we expect will be 90.1-2019, and are appropriate for inclusion in IECC-2021.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Complying with these new lighting power allowances will require more careful design but will not require the use of more expensive lighting fixtures than would be used otherwise.

Proposal # 4595

CE207-19

CE208-19

IECC: TABLE C405.3.2(2)

Proponent: Connor Barbaree, representing ASHRAE (cbarbaree@ashrae.org)

2018 International Energy Conservation Code

Revise as follows:

TABLE C405.3.2(2)
INTERIOR LIGHTING POWER ALLOWANCES: SPACE-BY-SPACE METHOD

COMMON SPACE TYPES ^a	LPD (watts/sq.ft ft ²)
Atrium	
Less than 40 feet in height	0.03 per foot in total height <u>0.48</u>
Greater than 40 feet in height	0.40 + 0.02 per foot in total height <u>0.60</u>
Audience seating area	
In an auditorium	0.63 <u>0.61</u>
In a convention center	0.82
In a gymnasium	0.65 <u>0.23</u>
In a motion picture theater	1.14 <u>0.27</u>
In a penitentiary	0.28 <u>0.67</u>
In a performing arts theater	2.03 <u>1.16</u>
In a religious building	1.53 <u>0.72</u>
In a sports arena	0.43 <u>0.33</u>
Otherwise	0.43 <u>0.23</u>
Banking activity area	
Breakroom (See Lounge/breakroom)	
Classroom/lecture hall/training room	
In a penitentiary	1.34 <u>0.89</u>
Otherwise	0.96 <u>0.71</u>
Computer room	
Conference/meeting/multipurpose room	1.07 <u>0.97</u>
Copy/print room	0.56 <u>0.31</u>
Corridor	
In a facility for the visually impaired (and not used primarily by the staff) ^b	0.92 <u>0.71</u>
In a hospital	0.92 <u>0.71</u>
In a manufacturing facility	0.29
Otherwise	0.66 <u>0.41</u>
Courtroom	
Dining area	1.39 <u>1.20</u>

In bar/lounge or leisure dining	0.93 <u>0.86</u>
In cafeteria or fast food dining	0.63 <u>0.40</u>
In a facility for the visually impaired (and not used primarily by the staff) ^b	2.00 <u>1.27</u>
In family dining	0.71 <u>0.60</u>
In a penitentiary	0.96 <u>0.42</u>
Otherwise	0.63 <u>0.43</u>
Electrical/mechanical room	0.43
Emergency vehicle garage	0.41 <u>0.52</u>
Food preparation area	1.06 <u>1.09</u>
Guestroom ^{c, d}	0.77 <u>0.41</u>
Laboratory	
In or as a classroom	1.20 <u>1.11</u>
Otherwise	1.45 <u>1.33</u>
Laundry/washing area	0.43 <u>0.53</u>
Loading dock, interior	0.58 <u>0.88</u>
Lobby	
For an elevator	0.68 <u>0.65</u>
In a facility for the visually impaired (and not used primarily by the staff) ^b	2.03 <u>1.69</u>
In a hotel	1.06 <u>0.51</u>
In a motion picture theater	0.45 <u>0.23</u>
In a performing arts theater	1.70 <u>1.25</u>
Otherwise	1.0 <u>0.84</u>
Locker room	0.48 <u>0.52</u>
Lounge/breakroom	
In a healthcare facility	0.78 <u>0.42</u>
Otherwise	0.62 <u>0.59</u>
Office	
Enclosed	0.93 <u>0.74</u>
Open plan	0.81 <u>0.61</u>
Parking area, interior	0.14 <u>0.15</u>
Pharmacy area	1.34 <u>1.66</u>
Restroom	
In a facility for the visually impaired (and not used primarily by the staff) ^b	0.96 <u>1.26</u>
Otherwise	0.85 <u>0.63</u>
Sales area	1.22 <u>1.05</u>
Seating area, general	0.42 <u>0.23</u>
Stairway (see Space containing stairway)	
Stairwell	0.58 <u>0.49</u>

Storage room	0.46 <u>0.38</u>
Vehicular maintenance area	0.56 <u>0.60</u>
Workshop	1.14 <u>1.26</u>
BUILDING TYPE SPECIFIC SPACE TYPES ^a	LPD (watts/sq-ft ft ²)
Automotive (see Vehicular maintenance area)	
Convention Center—exhibit space	0.88 <u>0.61</u>
Dormitory—living quarters ^{c, d}	0.54 <u>0.50</u>
Facility for the visually impaired ^b	
In a chapel (and not used primarily by the staff)	1.06 <u>0.70</u>
In a recreation room (and not used primarily by the staff)	1.80 <u>1.77</u>
Fire Station—sleeping quarters ^c	0.20 <u>0.23</u>
Gymnasium/fitness center	
In an exercise area	0.50 <u>0.90</u>
In a playing area	0.82 <u>0.85</u>
Healthcare facility	
In an exam/treatment room	1.68 <u>1.40</u>
In an imaging room	1.06 <u>0.94</u>
In a medical supply room	0.54 <u>0.62</u>
In a nursery	1.00 <u>0.92</u>
In a nurse's station	0.81 <u>1.17</u>
In an operating room	2.17 <u>2.26</u>
In a patient room ^c	0.62 <u>0.68</u>
In a physical therapy room	0.84 <u>0.91</u>
In a recovery room	1.03 <u>1.25</u>
Library	
In a reading area	0.82 <u>0.96</u>
In the stacks	1.20 <u>1.18</u>
Manufacturing facility	
In a detailed manufacturing area	0.93 <u>0.80</u>
In an equipment room	0.65 <u>0.76</u>
In an extra-high-bay area (greater than 50' floor-to-ceiling height)	1.05 <u>1.42</u>
In a high-bay area (25-50' floor-to-ceiling height)	0.75 <u>1.24</u>
In a low-bay area (less than 25' floor-to-ceiling height)	0.96 <u>0.86</u>
Museum	
In a general exhibition area	1.05 <u>0.31</u>
In a restoration room	0.85 <u>1.10</u>
Performing arts theater—dressing room	0.36 <u>0.41</u>
Post office—sorting area	0.68 <u>0.76</u>
Religious buildings	
In a fellowship hall	0.55 <u>0.54</u>

In a worship/pulpit/choir area	1.53 <u>0.85</u>
Retail facilities	
In a dressing/fitting room	0.50 <u>0.51</u>
In a mall concourse	0.90 <u>0.82</u>
Sports arena—playing area	
For a Class I facility ^e	2.47 <u>2.94</u>
For a Class II facility ^f	1.96 <u>2.01</u>
For a Class III facility ^g	1.70 <u>1.30</u>
For a Class IV facility ^h	1.13 <u>0.86</u>
Transportation facility	
In a baggage/carousel area	0.45 <u>0.39</u>
In an airport concourse	0.31 <u>0.25</u>
At a terminal ticket counter	0.62 <u>0.51</u>
Warehouse—storage area	
For medium to bulky, palletized items	0.35 <u>0.33</u>
For smaller, hand-carried items	0.69

- a. In cases where both a common space type and a building area specific space type are listed, the building area specific space type shall apply
- b. A 'Facility for the Visually Impaired' is a facility that is licensed or will be licensed by local or state authorities for senior long-term care, adult daycare, senior support or people with special visual needs.
- c. Where sleeping units are excluded from lighting power calculations by application of Section R405.1, neither the area of the sleeping units nor the wattage of lighting in the sleeping units is counted.
- d. Where dwelling units are excluded from lighting power calculations by application of Section R405.1, neither the area of the dwelling units nor the wattage of lighting in the dwelling units is counted.
- e. Class I facilities consist of professional facilities; and semiprofessional, collegiate, or club facilities with seating for 5,000 or more spectators.
- f. Class II facilities consist of collegiate and semiprofessional facilities with seating for fewer than 5,000 spectators; club facilities with seating for between 2,000 and 5,000 spectators; and amateur league and high-school facilities with seating for more than 2,000 spectators.
- g. Class III facilities consist of club, amateur league and high-school facilities with seating for 2,000 or fewer spectators.
- h. Class IV facilities consist of elementary school and recreational facilities; and amateur league and high-school facilities without provision for spectators.

Reason: Based on data gathered from industry partners and design professionals, practical LPD values have been determined. These LPD values are not just an update to existing models, but instead, include an extensive review and upgrade of those models. The work included:

- Evaluation of current Illuminating Engineering Society (IES) guidelines for lighting of commercial interiors (recommended footcandles, or illuminance, at the work plane) for all spaces. The ANSI/IES Recommended Practice (RP28-2016 for Seniors and the Low Vision Population) was used to inform both illuminance levels and fixture selection for space types in Facilities for the Visually Impaired.

- Expansion of categories used to assign room surface reflectance for each space type, based on actual usage,

not just design “rules of thumb.” Previously, most spaces were assumed to have ceiling surfaces of 70% reflectance, wall surfaces of 50% reflectance and floor surfaces of 20% reflectance (70/50/20). Through a consensus process, the developers of this proposal agreed to select the wall surface reflectance as the primary surface. Many spaces were reassigned to the category of 50/30/20 reflectance and some were reassigned to the 30/10/20 category.

- Update and expansion of the lighting fixture database. 100% of the fixtures are solid state (LED), using current off-the-shelf technology (fixture efficacy)

- o Improvement of the high color quality data set for LED fixtures used in spaces that previously had incandescent, halogen or premium HID

- Standardization on a Light Loss Factor for LED of 0.85, not the End of Useful Life metric of 0.70

- Improvement of the wallwashing methodology for spaces where vertical surface illumination was deemed important

This methodology resulted in reductions in many LPDs, and increases in some. The overall reduction across all space types will result in energy savings of approximately 5% over IECC 2018.

Two space types were eliminated based on input from industry professionals: Audience Seating in a Convention Center and Corridor in a Manufacturing Facility. They were eliminated for similar reasons; the lighting specifier has to design for the entire space in a Convention Center or Manufacturing Facility. The seating area in a convention center is completely flexible based on user preference for each event. Similarly, corridors in Manufacturing Facilities are most often the circulation created between pieces of equipment or workbenches. Specifiers and users have allowances to use for Convention Centers and Manufacturing Facilities.

Bibliography: Addendum BB to ANSI/ASHRAE/IES Standard 90.1-2016, Energy Standard for Buildings Except Low-Rise Residential Buildings

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The Lighting Power Density values proposed in this code change proposal utilize off-the-shelf current LED technology and do not require additional or more expensive luminaires. The efficacy chosen for the models was based on the average of a fixture data set using luminaires from multiple manufacturers. Specifiers and users can find light fixtures that will allow the project to meet code at reasonable price points. Data gathered from industry partners indicates that product development is all directed at solid-state (LED) lighting with many traditional fixtures and lamp sources being discontinued.

Proposal # 5522

CE208-19

CE209-19

IECC: C405.4 (New), ASABE Chapter 6

Proponent: Eric Makela, New Buildings Institute, representing New Buildings Institute
(ericM@newbuildings.org)

2018 International Energy Conservation Code

Add new text as follows:

C405.4 Lighting for plant growth and maintenance. Not less than 95 percent of the permanently installed luminaires used for plant growth and maintenance shall have a photon efficiency of not less than 1.6 $\mu\text{mol}/\text{J}$ rated in accordance with ANSI/ASABE S640.

ASABE

ASABE
2950 Niles Road
St. Joseph MI 49085
US

Add new standard(s) as follows:

ASABE

ASABE
2950 Niles Road
St. Joseph MI 49085
US

S640-2017: Quantities and Units of Electromagnetic Radiation for Plants (Photosynthetic Organisms)

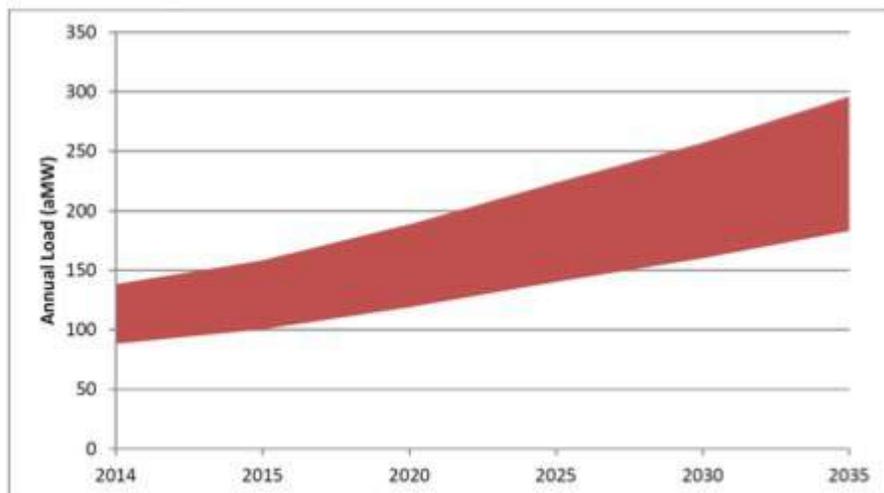
Reason: Indoor agriculture energy usage is projected to grow substantially over the next several years, driven in large part (but not entirely) by the legalization of medical and recreational marijuana. As more and more states legalize medical and recreational marijuana, this will become an increasing national issue. If the ICC does not take action on this, industry is likely to see a patchwork of different and even conflicting local solutions.



The Northwest Power and Conservation Council projects that indoor marijuana growing operations alone will add as much as 300 average megawatts by 2030. That is equivalent to 1.5% of total regional electricity

demand. Indoor agriculture operations not related to marijuana are expanding too. Indoor horticulture facilities can have EUIs that exceed even data centers.

PACIFIC NORTHWEST CANNABIS ENERGY LOAD FORECAST



Source: Northwest Power & Planning Council, Seventh Power Plan, March 2016

ENERGY INTENSITY COMPARISONS

	Typical Site EUI* kBtu/sf	kWh/sf (of flowering canopy)	grams/kWh (of final product in flower form)
Outdoor (Sungrown)**	n/a	0	16
Greenhouse (Light Deprivation)**	84	33	8
Indoor (Efficient)**	-600	234	1+
Indoor (Inefficient)**	-1300	500+	1-
Office Building***	67	n/a	n/a
Hospital***	197	n/a	n/a
Data Center***	-600	n/a	n/a

*Assumes 75% of grow facility floor space is used for flowering canopy

**Data source: Self-Reported producer data from the Resource Innovation Institute Cannabis PowerScore

***Data source: US Energy Star Portfolio Manager

The price of LEDs has fallen dramatically in the past few years and local food movements in cities are driving increased demand for fresh high-quality produce that is grown close to the point of consumption. More restaurants are interested in sourcing ingredients directly from the producer, and in dense urban areas a growing number of new indoor agriculture operations have begun to meet this demand. This potent combination of policy, technology, and market factors is driving a dramatic expansion in indoor agriculture. As written, the 2018 IECC leaves lighting in this growing energy load completely exempt from efficiency requirements.

This proposal removes the loophole by requiring lighting used for plant growth or maintenance to either meet an efficiency metric. The efficiency metric of 1.6 μmol/J (micromoles per Joule) was developed in collaboration with the American Society of Agricultural and Biological Engineers and was developed specifically for lighting used for plant growth. It measures the number of photons emitted from the fixture per Joule of energy consumed. Lighting Power Density was developed as a metric to evaluate the light usable for visual tasks relative to the power consumed. Likewise, this metric was developed specifically to measure the light usable for

plant growth relative to the power consumed. This metric is codified as an ANSI standard (ANSI/ASABE S640 – Quantities and Units of Electromagnetic Radiation for Plants (Photosynthetic Organisms)) and is already seeing wide adoption in the industry with over 84 products available that meet this requirement when surveyed in 2016. More information on the metric can be found in the ANSI Standard: ANSI/ASABE S640.

Using a typical High Pressure Sodium lamps (a common growing light) as the baseline, this requirement will result in 78% savings. That is a substantially lower lighting load and a reduction in the cooling load.

Cost Impact: The code change proposal will increase the cost of construction

The proposal could marginally add to the cost of construction. The cost of horticultural lighting fixtures is actually driven to a large extent by reflectors and ventilation needs (horticultural lighting is positioned very close to the plants and venting the heat is essential) and not just lighting technology. Therefore, fixture cost can vary dramatically, from \$25/fixture to almost \$1000/fixture for High Pressure Sodium fixtures and from \$75/fixture to well over \$1000/fixture for LED. And advancements and expanding market share of LED lighting has narrowed the impact of lighting technology. Therefore, lighting that meets this requirement can be obtained for less than lighting that does not. The only projects that will see an increase in cost are those using the absolute cheapest lighting that does not meet the requirement.

Proposal # 5155

CE209-19

CE210-19

IECC: C405.4.1, C405.4.2

Proponent: Jonathan McHugh, representing McHugh Energy Consultants Inc. (jon@mchughenergy.com)

2018 International Energy Conservation Code

Revise as follows:

C405.4.1 Total connected exterior building exterior lighting power. The total exterior connected lighting power shall be the total maximum rated wattage of all lighting ~~that is powered through the energy service for the building- applications listed in Table C405.4.2(2) and Table C405.4.2(3).~~

Exception: Lighting used for the following applications shall not be included.

1. Lighting *approved* because of safety considerations.
2. Emergency lighting automatically off during normal business operation.
3. Exit signs.
4. Specialized signal, directional and marker lighting associated with transportation.
5. Advertising signage or directional signage.
6. Integral to equipment or instrumentation and installed by its manufacturer.
7. Theatrical purposes, including performance, stage, film production and video production.
8. Athletic playing areas.
9. Temporary lighting.
10. Industrial production, material handling, transportation sites and associated storage areas.
11. Theme elements in theme/amusement parks.
12. Used to highlight features of art, public monuments, and the national flag.
13. Lighting for water features and swimming pools.
14. Lighting controlled from within dwelling units, where the lighting complies with Section R404.1.

C405.4.2 Exterior lighting power allowance. The total exterior lighting power allowance is the sum of the base site allowance plus the individual allowances for areas that are to be illuminated by lighting ~~that is powered through the energy service for the building.~~ Lighting power allowances are as specified in Table C405.4.2(2). The lighting zone for the building exterior is determined in accordance with Table C405.4.2(1) unless otherwise specified by the *code official*.

Reason: This proposal would increase the scope of outdoor lighting requirements to all commercial lighting applications in Table C405.4.2(2) and Table 405.4.2(3) regardless of whether the power to these outdoor lighting applications passes through a building's service. Examples of outdoor lighting energy efficiency that is "falling between the cracks" of effective regulation include:

- parking lot lighting for malls where the service entrance is not associated with any building on the site.
- parking lot lighting not associated with any building, such as might be adjacent to ball fields, fairgrounds etc.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal will increase the scope of the current IECC lighting requirements to more applications but the stringency and cost are not being increased.

Proposal # 5610

CE210-19

CE211-19

IECC: C405.4.2, C405.4.2.1

Proponent: Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers (glenn@lampartners.com); Jack Bailey (jbailey@oneluxstudio.com)

2018 International Energy Conservation Code

Delete and substitute as follows:

~~**C405.4.2 Exterior lighting power allowance.** The total exterior lighting power allowance is the sum of the base site allowance plus the individual allowances for areas that are to be illuminated by lighting that is powered through the energy service for the building. Lighting power allowances are as specified in Table C405.4.2(2). The lighting zone for the building exterior is determined in accordance with Table C405.4.2(1) unless otherwise specified by the code official.~~

C405.4.2 Exterior lighting power allowance. The exterior lighting power allowance (watts) is calculated as follows:

1. Determine the Lighting Zone (LZ) for the building according to Table C405.4.2(1) unless otherwise specified by the code official.
2. For each exterior area that is to be illuminated by lighting that is powered through the energy service for the building, determine the applicable area type from Table C405.4.2(2). For area types not listed, select the area type that most closely represents the proposed use of the area.
3. Determine the total area or length of each area type and multiply by the value for the area type in Table C405.4(2) to determine the lighting power (Watts) allowed for each area type.
4. The total exterior lighting power allowance (Watts) is the sum of the base site allowance determined according to Table C405.4.2(2), plus the Watts from each area type.

Revise as follows:

C405.4.2.1 Additional exterior lighting power. ~~Any increase in the Additional exterior lighting power allowance is limited to allowances are available for the specific lighting applications indicated listed in Table C405.4.2(3). The These additional power allowances shall be used only for the luminaires that are serving these specific applications and shall not be used for to increase any other purpose: lighting power allowance.~~

Reason: This proposal clarifies the calculation procedures for compliance with exterior lighting power requirements. Currently the code does not provide clear or complete direction. There is no change in stringency. This proposal makes this calculation procedure easier to understand and will increase the usability of the code. Codes which are usable are more likely to be complied with and are easier to enforce.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal is a re-write to clarify code requirements.

Proposal # 4617

CE211-19

CE212-19

IECC: C405.8.1, C405.8.2, C405.8.2.1, C405.9, C407.2

Proponent: David Collins, SEHPCAC, representing SEHPCAC (SEHPCAC@iccsafe.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Energy Conservation Code

Revise as follows:

C405.8.1 Elevator cabs (Mandatory). For the luminaires in each elevator cab, not including signals and displays, the sum of the lumens divided by the sum of the watts shall be not less than 35 lumens per watt. Ventilation fans in elevators that do not have their own air-conditioning system shall not consume more than 0.33 watts/cfm at the maximum rated speed of the fan. Controls shall be provided that will de-energize ventilation fans and lighting systems when the elevator is stopped, unoccupied and with its doors closed for over 15 minutes.

C405.8.2 Escalators and moving walks (Mandatory). Escalators and moving walks shall comply with ASME A17.1/CSA B44 and shall have automatic controls configured to reduce speed to the minimum permitted speed in accordance with ASME A17.1/CSA B44 or applicable local code when not conveying passengers.

Exception: A variable voltage drive system that reduces operating voltage in response to light loading conditions is an alternative to the reduced speed function.

C405.8.2.1 Regenerative drive (Mandatory). An escalator designed either for one-way down operation only or for reversible operation shall have a variable frequency regenerative drive that supplies electrical energy to the building electrical system when the escalator is loaded with passengers whose combined weight exceeds 750 pounds (340 kg).

C405.9 Voltage drop in feeders and branch circuits (Mandatory). The total *voltage drop* across the combination of feeders and branch circuits shall not exceed 5 percent.

C407.2 Mandatory requirements. Compliance with this section requires compliance with Sections C402.5, C403.2, C403.3 through C403.3.2, C403.4 through C403.4.2.3, C403.5.5, C403.7, C403.8.1 through C403.8.4, C403.10.1 through C403.10.3, C403.11, C403.12, C404 and ~~C405.1, C405.2, C405.4 through C405.9.~~

Reason: The provisions of C405.8.1, C405.8.2, and C405.9 are a combination of performance requirements and references to standards, with no associated performance metrics or values available to model or trade in the performance path.

For this reason C405.8.1, C405.8.2, and C405.9 are mandatory. This is consistent with the parallel provisions of ASHRAE 90.1 10.4.3, 10.4.4, and 8.4.1, which are identified as 'mandatory.'

Note that the SEHPCAC has a proposal to eliminate the use of the labels "prescriptive" and "mandatory" in favor of a tabular method of identifying non-tradeable requirements. If that proposal is successful ICC staff have stated that sections being individually approved to be labeled as 'mandatory' will instead have their respective section numbers added to the new C407.2 table of requirements that are non-tradeable in the performance path.

This proposal is submitted by the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction

Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at:

<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>

(<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>)

Cost Impact: The code change proposal will increase the cost of construction

As commonly interpreted, these items are already considered mandatory, and therefore should have no impact on cost. However, it may increase the cost of construction for a subset of buildings designed to comply with Section C407 that do not include the specifications for vertical and horizontal transportation systems as included in Section C405.8 and C405.9.

Proposal # 4190

CE212-19

CE213-19

IECC: C405.8.2, C405.8.2.1

Proponent: Kevin Brinkman, representing National Elevator Industry, Inc. (klbrinkman@neii.org)

2018 International Energy Conservation Code

Revise as follows:

C405.8.2 Escalators and moving walks. Escalators and moving walks shall comply with ASME A17.1/CSA B44 and Where a traffic analysis indicates that an escalator or moving walk application will have sufficient periods with no riders while it is operating, it shall have automatic controls configured to that reduce speed to the minimum as permitted speed in accordance with ASME A17.1/CSA B44 or applicable local code when not conveying passengers.

Exception: A variable voltage drive system that reduces operating voltage in response to light loading conditions is an alternative to the reduced speed function.

C405.8.2.1 Regenerative drive. Power Recovery. ~~An escalator designed either for one-way down operation only or for reversible operation shall have a variable frequency regenerative drive that supplies electrical energy to the building electrical system when the escalator is loaded.~~ Where a traffic analysis indicates that an escalator application will have sufficient periods in the down direction with passengers whose combined weight exceeds 750 pounds (340 kg), the escalator shall be designed to recover, on average, more power than is consumed by the power recovery feature of its motor controller system.

Reason: The universal application of technology designed for energy efficiency improvement imposed by the current requirement may actually increase energy consumption in many applications. The proposed revision would require a traffic analysis to determine whether the technology would actually be beneficial or detrimental. The proposal also used more prescriptive language for the power recovery to allow designers and manufacturers to select the most energy efficient technology for the application.

C405.8.2: Depending on the escalator or moving walk application, varying speeds may actually increase energy usage. Each time the escalator or moving walk returns to the normal operating speed from its reduced speed condition, more energy is consumed to create the acceleration needed. In applications where the amount of time that there are no riders is very short, the energy consumed during the acceleration stage may actually exceed what is saved during the reduced speed segments. The traffic analysis can be used to calculate the anticipated savings, if any, to determine whether the technology should be applied and the return on investment.

C405.8.2.1: It should be noted that most, if not all, escalators are designed to be reversible, so the provision in the current edition would be applied to all escalators, including those that always run in the up direction. Depending on the escalator application, there may be only marginal gains in applying one technical solution over another and therefore no single technical solution should be prescribed for all escalators as stated in the current standard. The proposed language uses more prescriptive language for the power recovery to allow designers and manufacturers to select the most energy efficient technology for the application and ensure that if applied it actually recovers more power on average than the added feature would consume. [Note: some examples may include direct induction motor regeneration, variable frequency regeneration motor controller, or various combinations of the two.]

To further illustrate the deficiencies in the current language and support the need for an analysis to determine the best option for energy usage, three hypothetical scenarios are provided below with three configurations of motor controller-motor energy recovery arrangements. In each configuration, power recovery (regen power) back to the supply system can only be realized when the escalator is running in the down direction with a

sufficient load to overcome friction. (See sample motor controller configuration diagrams under Technical Backup).

Electrical DATA

Rise: 18' (approx. 6m)

Power: 15Hp/11kW

Power factor (Pf) 0.75

Voltage: 480VAC

Configuration 1 is an electro-mechanical motor controller with an AC induction motor that can feed direct power back to the power supply system when the escalator is running in the down direction with sufficient load.

Configuration 2 is an electronic motor controller with no regeneration capability but can reduce escalator speed when there are no riders on it, and uses the AC motor to feed direct power back to the power supply system when the escalator is running in the down direction with sufficient load.

Configuration 3 is an electronic motor controller with regeneration capability back to the power supply system when the escalator is running in the down direction with sufficient load driving an AC induction motor.

A) Approximate additional energy consumption (kW/hr.) by the controller for the four types of motor controls considered (electro-mechanical is baseline):

1. Electro-mechanical motor controller with AC induction motor ~ 0 kW
2. Electronic motor controller (VVVF) without regen and with AC induction motor ~ 0.285 kW
3. Electronic motor controller (VVVF Pf1 regen type) with AC induction motor ~ 0.430 kW

B) Approximate energy saved (kW/hr.) at reduced speed for the three types of motor controls considered:

1. Electro-mechanical motor controller with AC induction motor ~ 0 kW (reduced speed not possible)
2. Electronic motor controller (VVVF) without regen and with AC induction motor ~ 1.5 kW
3. Electronic motor controller (VVVF Pf1 regen type) with AC induction motor ~ 1,5 kW

C) Approximate energy recovered (kW/hr) by the escalator for the three types of motor controls considered:

1. Electro-mechanical motor controller with AC induction motor ~ 3 kW
2. Electronic motor controller (VVVF) without regen and with AC induction motor ~ 3 kW
3. Electronic motor controller (VVVF Pf1 regen type) with AC induction motor ~ 4 kW

Summary: From the three application scenarios below, it will be seen that the energy savings from each configuration very much depends upon the application and use of the escalator:

- The single dedicated down airport escalator in Scenario 1 with the VVVF Pf1 regenerative motor controller of Configuration 3 provides the best energy efficiency. This configuration is specified by the current standard.
- The single up escalator with a peak hour down direction in scenario 2 is better suited with the VVVF motor controller in Configuration 2 that can reduce the speed of the escalator when no riders are present but uses the AC motor to feed direct power back to the power supply system when the escalator is moving in the down direction with sufficient load.
- The heavily used bi-directional shopping mall escalators in Scenario 3 will consume more energy with the added speed reduction and power recovery features of Configuration 2 and 3 than they would by simply allowing the AC induction motor of Configuration 1 to recover direct energy from the induction motor whenever possible.

The NEII proposed code modifications address the application sensitivity in achieving energy recovery and savings by making the application of the conveyance a factor in selecting the best suited energy saving configuration.

Application Scenario 1

An airport is open 18 hours per day with a dedicated down escalator to baggage claim. When flights arrive, it is loaded with more than 75% capacity for 5 minutes for each flight and zero load the remainder of the time. One hundred and twenty arriving flights per day use this baggage claim escalator.

Escalators load during the 18 operating hours:

1. 0% load for 8 hours (=Total time where reduced speed can be applied)
2. > 0%, < 75% load for 0 hours
3. 75% load or more for 10 hours

Motor Controller (Operating 18 hours/day)	A) Controller power ~kW consumption		B) Reduced speed ~kW saved		C) Regen ~kW recovered		Energy saved Power ~kW
	Up	Down	Up	Down	Up	Down	Total
1. Electro-mechanical with AC induction motor that provides regen	0	0	0	0	0	30	30
2. Electronic controller with AC induction motor that provides power recuperation capability	0	5.1	0	12	0	30	38.90
3. Electronic controller (Pf1 regen type) with AC induction motor	0	7.74	0	12	0	40	44.26

Application Scenario 2

A subway station open 22 hour per day has one escalator for each platform. Typically, the escalator runs in the up direction most of the time and in the down direction during peak rush hour. Scenario for reduced power consumption and regen power is as follows:

Escalators load during the 22 operating hours (20hrs up and 2hrs down):

1. 0% load for 10 hours up direction (Total time where reduced speed can be applied)
2. > 0%, < 75% load for 10 hours up direction
3. 75% load or more for 2 hours down direction

Motor Controller (Operating 22 hours/day)	A) Controller power ~kW consumption		B) Reduced speed ~kW saved		C) Regen ~kW recovered		Energy saved Power ~kW
	Up	Down	Up	Down	Up	Down	Total
1. Electro-mechanical with AC induction motor that provides regen	0	0	0	0	0	6	6
2. Electronic controller with AC induction motor that provides power recuperation capability	5.7	0.57	15	0	0	6	14.73
3. Electronic controller (Pf1 regen type) with AC induction motor	8.6	0.86	15	0	0	8	13.5

Application Scenario 3

A busy outdoor mall is open 12 hours per day has two escalators. Typically, one of the escalators will be running up and the other in the down direction. Both escalators can run down and each may be used for that direction from time to time. Scenario for reduced power consumption and regen power is as follows:

Escalators load during the 12 operating hours:

1. 0% load for 0 hours (Total time where reduced speed can be applied)
2. > 0%, < 75% load for 12 hours
3. 75% load or more for 0 hours

Motor Controller (Operating 12 hours/day)	A) Controller power (~kW) consumption		2) Reduced speed (0hrs) ~kW saved		3) Regen (0hr) ~kW recovered		Energy saved Power ~kW
	Up	Down	Up	Down	Up	Down	Total
1. Electro-mechanical with AC induction motor	0	0	0	0	0	0	0

2. Electronic controller with AC induction motor that provides power recuperation capability	3.4	3.4	0	0	0	0	(6.8)
3. Electronic controller (Pf1 regen type) with AC induction motor	5.16	5.16	0	0	0	0	(10.32)

Technical backup.

Energy is utilized by escalators for the following:

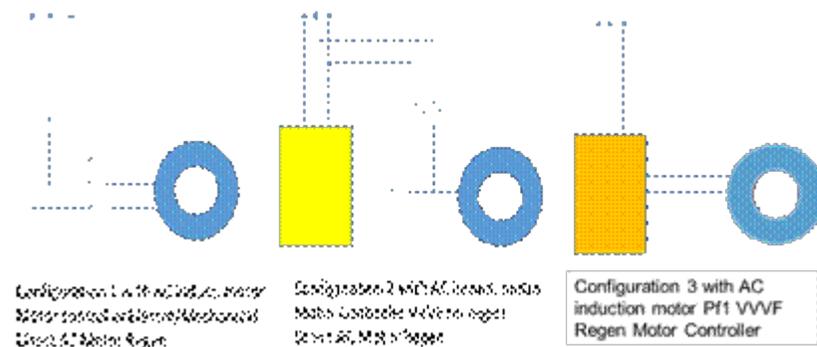
1. to overcome friction,
2. transport the load, and
3. inertia (starting) (insignificant for configuration 1 minimum for the others)

Because of the angle of inclination, transport of the escalator load is the dominate energy consumption area of the system to move a load up the inclination. However, the converse is true that when the load is being transported in the down direction, energy can be produced by the overhauling of the drive motor from the downward moving load and returned to the power system.

In general, an AC induction motor used to drive an escalator will produce power when it is in overhauling in the down direction with sufficient passenger loading to overcome the friction in the system. AC induction motors may be applied with simple electro-mechanical or fully electronic motor controllers and still provide this capability. Other variations of motor types, such as permanent magnet motors and variable voltage variable frequency motor control are also possible, and may also provide an energy saving reduced speed feature in the application. However, the electronics required for the various technologies to provide these motor control functions also consumes energy and must be weighed against the possible energy saving under the application and use of the escalator.

It should also be pointed out that in certain applications, escalators and moving walks with a speed reduction feature are confronted with flows of traffic that can cause the escalator or moving walk to continually switch between full to reduced speed and back to full speed. With a high enough frequency, this switching between slow to full speed will consume more energy than saved by the feature because of the need to accelerate the mass to full speed each time.

Example configurations (basic diagrams)



Cost Impact: The code change proposal will decrease the cost of construction

The code change proposal will decrease the cost of construction because it would allow alternate designs to achieve energy conservation.

CE214-19

IECC: C405.9

Proponent: Marilyn Williams, representing National Electrical Manufacturers Association
(mar_williams@nema.org)

2018 International Energy Conservation Code

Revise as follows:

C405.9 Voltage drop in feeders and branch circuits. The total *voltage drop* across the combination of ~~feeders~~ customer-owned service conductors, feeder conductors and branch circuits conductors shall not exceed 5 percent.

Reason: Revising this language will:

1. Increase energy efficiency
2. Reduce inconsistency and application confusion in compliance

The current requirement for voltage drop in feeder conductors does not include customer-owned service conductors. These are runs, owned by customers, from the utility service to the building main disconnect. These runs can be quite long which result in significant voltage drop and efficiency losses.

An editorial change adding the word "conductors" to feeder and branch circuits, provides greater clarity.

Cost Impact: The code change proposal will increase the cost of construction

The increased cost in construction would only apply when the service feeder conductors are customer-owned and only if they would not have been designed to the 5% voltage drop allowance of the present code. This should represent a small subset of building construction projects. Additionally, the cost effectiveness of this code change remains the same as for all other service conductors under the present provision. This is not adding to stringency of this requirement. It only expands the conditions where the requirement is applied and maintains the cost effectiveness, as has been the case for the current voltage drop requirement.

Proposal # 4445

CE214-19

CE215-19

IECC: C405.10 (New), C405.10.1 (New), C405.10.2 (New),
TABLE C405.10.2 (New), C405.10.2 (New), C405.10.4 (New), C405.10.5(New)

Proponent: Marilyn Williams, representing National Electrical Manufacturers Association
(mar_williams@nema.org)

2018 International Energy Conservation Code

Add new text as follows:

C405.10 Energy Monitoring (Mandatory) New buildings with a gross conditioned floor area of 25,000 square feet or larger shall be equipped to measure, monitor, record and report energy consumption data in compliance with Section C406.10.1 through C406.10.5.

Exception: Individual tenant spaces are not required to comply with this section provided the space has its own utility services and meters and has less than 5,000 square feet of conditioned floor area.

C405.10.1 Electrical energy metering. For electrical energy, including all electrical energy supplied to the building and its associated site, including but limited to site lighting, parking, recreational facilities, and other areas that serve the building and its occupants, meters or other measurement devices shall be provided to collect energy consumption data for each end-use category required by Section C405.10.2.

C405.10.2 End-use metering categories. Meters or other approved measurement devices shall be provided to collect energy use data for each end-use category indicated in Table 405.10.2. Where multiple meters are used to measure any end-use category, the data acquisition system shall total all of the energy used by that category. Not more than 5 percent of the measured load for each of the end-use categories indicated in Table 405.10.2 shall be permitted to be from a load that is not within that category.

Exceptions:

1. HVAC and water heating equipment serving only an individual dwelling unit shall not require end-use metering.
2. End-use metering shall not be required for fire pumps, stairwell pressurization fans or any system that operates only during testing or emergency.
3. End-use metering shall not be required for an individual tenant space having a floor area not greater than 2,500 square feet where a dedicated source meter complying with Section C405.10.3 is provided.

TABLE C405.10.2
ENERGY USE CATEGORIES

<u>LOAD CATEGORY</u>	<u>DESCRIPTION OF ENERGY USE</u>
<u>Total HVAC System</u>	<u>Heating, cooling and ventilation including, but not limited to fans, pumps, boilers, chillers, and water heating. Energy used by 120 volt equipment, or by 208/120 volt equipment that is located in a building where the main service is 480/277 volt power, is permitted to be excluded from Total HVAC system energy use.</u>
<u>Interior Lighting</u>	<u>Lighting systems located within the building.</u>

<u>Exterior Lighting</u>	<u>Lighting systems located on the building site but not within the building.</u>
<u>Plug Loads</u>	<u>Devices, appliances and equipment connected to convenience receptacle outlets.</u>
<u>Process Loads</u>	<u>Any single load that is not included in a HVAC, lighting or plug load category and that exceeds 5 percent of the peak connected load of the whole building including, but not limited to data centers, manufacturing equipment and commercial kitchens.</u>
<u>Building Operations and other miscellaneous loads</u>	<u>The remaining loads not included elsewhere in this table including, but not limited to, vertical transportation systems, automatic doors, motorized shading systems, ornamental fountains, ornamental fireplaces, swimming pools, in-ground spas, and snow-melt systems.</u>

C405.10.3 Meters. Meters or other measurement devices required by this section shall be configured to automatically communicate energy consumption data to the data acquisition system required by Section C405.10.4. Source meters shall be allowed to be any digital-type meter. Lighting, HVAC, or other building systems that can monitor their energy consumption shall be permitted instead of meters. Current sensors shall be permitted, provided that they have a tested accuracy of plus or minus 2 percent. Required metering systems and equipment shall have the capability to provide at least hourly data that is fully integrated into the data acquisition system and graphical energy report in accordance with Sections C405.10.4 and C405.10.5.

C405.10.4 Data acquisition system A data acquisition system shall have the capability to store the data from the required meters and other sensing devices for minimum of 36 months. The data acquisition system shall have the capability to store real-time energy consumption data and provide hourly, daily, monthly, and yearly logged data for each end-use category required by Section C405.10.2.

C405.10.5 Graphical energy report A permanent and readily accessible reporting mechanism shall be provided in the building that is accessible by building operation and management personnel. The reporting mechanism shall have the capability to graphically provide the energy consumption for each end-use category required by Section C405.10.2 at least every hour, day, month, and year for the previous 36 months.

Reason: The investment made for the infrastructure of a building to comply with the IECC is significant. The assumption that is currently made upon commissioning a facility is that energy efficiency measures will not degrade, or go out of calibration, over time and their energy consumption will not increase as time passes from the time they were commissioned. Such as assumption is completely inaccurate and any payback assumed for energy efficient infrastructure investments will be lengthened, thereby reducing the ROI and increasing the payback period. The only means to retain the energy performance of a building is to continuously monitor energy consumption levels of various energy consuming systems and compare them to previous levels. Monitoring sub-systems provides key indications when changes have been made or systems are not operating to specification, which increases energy consumption. Examples include, but are not limited to:

1. Increase energy consumption in HVAC system loads will point to failures in motors, drive systems, bearings, etc.
2. Degrading building envelope.
3. Configuration changes to the building that may drive increased energy consumption.
4. Increase of energy consumption from lighting loads may indicate changes in arrangement of the office space that resulted in reduced lighting driving the installation of more lighting above permitted energy code levels, failure of occupant sensors, inappropriate lighting schedules, lamps that need to be replaced or cleaned, etc.

5. Monitoring plug loads will indicate when computer equipment is left on during non-working hours and use of space heaters that compromise the efficiency of the facility due to set points on the HVAC system.

The requirements in this proposal save energy by continually monitoring and reporting actionable energy consumption data to building owners and operators. For large buildings, this data is further broken out by the major sub-systems (HVAC, lighting, process loads, and plus loads). There are well documented studies that demonstrates the energy savings from metering and monitoring systems. The 2013 version of ASHRAE Std. 90.1 and several state energy codes have recognized the benefits and require energy monitoring to support a continual high level of performance from the energy efficient investment.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code change proposal “will” increase the cost of construction because it will require additional hardware, software and labor during installation. Providing specific cost would violate antitrust laws, however the following link to a report provided by the GSA demonstrates an example of cost and savings:

https://www.gsa.gov/cdnstatic/Energy_Submetering_Finance_Paper_Knetwork_2012_11_269%28508%29.pdf

Proposal # 4406

CE215-19

CE216-19

IECC: C405.10 (New)

Proponent: Marilyn Williams, representing National Electrical Manufacturers Association

2018 International Building Code

Add new text as follows:

C405.10 Automatic Receptacle Control The following shall be automatically controlled:

1. At least 50% of all 125 V, 15 and 20-amp receptacles installed in enclosed offices, conference rooms, rooms used primarily for copy or print functions, breakrooms, classrooms, and individual workstations, including those installed in modular partitions and module office workstation systems.
2. At least 25% of branch circuit feeders installed for modular furniture not shown on the construction documents.
3. Either split controlled receptacles shall be provided, with the top receptacle controlled, or a controlled receptacle shall be located within 12 inches of each uncontrolled receptacle.

This control shall function on:

1. A scheduled basis using a time-of-day operated control device that turns receptacle power off at specific programmed times and can be programmed separately for each day of the week. The control device shall be configured to provide an independent schedule for each portion of the building of not more than 5000 ft² and not more than one floor. The occupant shall be able to manually override an area for not more than two hours. Any individual override switch shall control the receptacles of not more than 5000 ft.
2. An occupant sensor control that shall turn receptacles off within 20 minutes of all occupants leaving a space; or
3. An automated signal from another control or alarm system that shall turn receptacles off within 20 minutes after determining that the area is unoccupied.

All controlled receptacles shall be permanently marked in accordance with NFPA 70 and be uniformly distributed throughout the space. Plug-in devices shall not comply.

Exceptions: Receptacles for the following shall not require an automatic control device:

1. Receptacles specifically designated for equipment requiring continuous operation (24/day, 365 days/year).
2. Spaces where an automatic control would endanger the safety or security of the room or building occupants.
3. Within a single modular office workstation, non-controlled receptacles are permitted to be located more than 12 inches, but not more than 72 inches from the controlled receptacles serving that workstation.

Reason: This proposal will:

1. Increase building energy efficiency
2. Offer a well-studied, cost effective efficiency measure

3. Maintain building occupant's safe usability
4. Keep enforceability simple
5. Align with other energy efficiency codes, increasing design compliance.

Cost Impact: The code change proposal will increase the cost of construction. Costs estimated to be \$0.26/ft² for small office implementation and \$0.19/ft² for large office. Payback estimated at 4.2 years for small office buildings (10,000sqft) and 2.4 years for large office buildings (100,000sqft). Source: 2013 California Building Energy Efficiency Standards CASE report.

Proposal # 4316

CE216-19

CE217-19 Part I

PART I — IECC: C202, C405.10 (New), C405.10.1 (New), TABLE C405.10.1 (New), C405.10.2 (New)

PART II — IECC: R202 (IRC N1101.6), R404.2 (IRC N1104.2) (New), R404.2.1 (IRC N1104.2.1) (New), R404.2.2 (IRC N1104.2.2) (New), Table R404.2.2 (IRC N1104.2.2) (New), R404.2.3 (IRC N1104.2.3) (New)

Proponent: Matt Frommer, Southwest Energy Efficiency Project, representing Southwest Energy Efficiency Project (mfrommer@swenergy.org); Eric Makela, New Buildings Institute, representing New Buildings Institute (ericM@newbuildings.org); jim edelson, representing New Buildings Institute (jim@newbuildings.org); Steven Rosenstock, representing Edison Electric Institute (rosenstock@eei.org); Francesca Wahl (fwahl@tesla.com); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

Add new definition as follows:

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE). The conductors, including the ungrounded, grounded, and equipment grounding conductors, and the Electric Vehicle connectors, attachment plugs, and all other fittings, devices, power outlets, or apparatus installed specifically for the purpose of transferring energy between the premises wiring and the Electric Vehicle.

EV CAPABLE SPACE. Electrical panel capacity and space to support a minimum 40-ampere, 208/240-volt branch circuit for each EV parking space, and the installation of raceways, both underground and surface mounted, to support the EVSE.

EV READY SPACE. A designated parking space which is provided with one 40-ampere, 208/240-volt dedicated branch circuit for EVSE servicing *Electric Vehicles*. The circuit shall terminate in a suitable termination point such as a receptacle, junction box, or an *EVSE*, and be located in close proximity to the proposed location of the EV parking spaces.

Add new text as follows:

C405.10. Electric Vehicle (EV) charging for new construction. New construction shall facilitate future installation and use of *Electric Vehicle Supply Equipment (EVSE)* in accordance with the NFPA 70.

C405.10.1. New commercial buildings. *EV Ready Spaces* and *EV Capable Spaces* shall be provided in accordance with Table C405.10.1. Where the calculation of percent served results in a fractional parking space, it shall be shall rounded up to the next whole number. The service panel or sub panel circuit directory shall identify the spaces reserved to support EV charging as “EV Capable” or “EV Ready”. The raceway location shall be permanently and visibly marked as “EV Capable”.

TABLE C405.10.1.
EV READY SPACE AND EV CAPABLE SPACE REQUIREMENTS

<u>Total Number of Parking Spaces</u>	<u>Minimum number of <i>EV Ready Spaces</i></u>	<u>Minimum number of <i>EV Capable Spaces</i></u>
<u>1</u>	<u>1</u>	<u>=</u>

<u>2 – 10</u>	<u>2</u>	<u>=</u>
<u>11 – 15</u>	<u>2</u>	<u>3</u>
<u>16 – 19</u>	<u>2</u>	<u>4</u>
<u>21 - 25</u>	<u>2</u>	<u>5</u>
<u>26+</u>	<u>2</u>	<u>20% of total parking spaces</u>

C405.10.2. Identification. Construction documents shall indicate the raceway termination point and proposed location of future EV spaces and EV chargers. Construction documents shall also provide information on amperage of future *EVSE*, raceway methods, wiring schematics and electrical load calculations to verify that the electrical panel service capacity and electrical system, including any on-site distribution transformers, have sufficient capacity to simultaneously charge all EVs at all required EV spaces at the full rated amperage of the *EVSE*.

Proposal # 4968

CE217-19 Part I

CE217-19 Part II

IECC: R202 (IRC N1101.6), R404.2 (IRC N1104.2) (New), R404.2.1 (IRC N1104.2.1) (New), R404.2.2 (IRC N1104.2.2) (New), Table R404.2.2 (IRC N1104.2.2) (New), R404.2.3 (IRC N1104.2.3) (New)

Proponent: Matt Frommer, Southwest Energy Efficiency Project, representing Southwest Energy Efficiency Project (mfrommer@swenergy.org); Eric Makela, New Buildings Institute, representing New Buildings Institute (ericM@newbuildings.org); jim edelson, representing New Buildings Institute (jim@newbuildings.org); Steven Rosenstock, representing Edison Electric Institute (srosenstock@eei.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Francesca Wahl (fwahl@tesla.com)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Add new definition as follows:

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE). The conductors, including the ungrounded, grounded, and equipment grounding conductors, and the Electric Vehicle connectors, attachment plugs, and all other fittings, devices, power outlets, or apparatus installed specifically for the purpose of transferring energy between the premises wiring and the Electric Vehicle.

EV CAPABLE SPACE. Electrical panel capacity and space to support a minimum 40-ampere, 208/240-volt branch circuit for each EV parking space, and the installation of raceways, both underground and surface mounted, to support the *EVSE*.

EV READY SPACE. A designated parking space which is provided with one 40-ampere, 208/240-volt dedicated branch circuit for *EVSE* servicing Electric Vehicles. The circuit shall terminate in a suitable termination point such as a receptacle, junction box, or an *EVSE*, and be located in close proximity to the proposed location of the EV parking spaces.

Add new text as follows:

R404.2 (IRC N1104.2) Electric Vehicle (EV) charging for new construction. New construction shall facilitate future installation and use of *Electric Vehicle Supply Equipment (EVSE)* in accordance with the *National Electrical Code (NFPA 70)*.

R404.2.1 (IRC N1104.2.1) One- to two-family dwellings and townhouses. For each dwelling unit, provide at least one *EV Ready Space*. The branch circuit shall be identified as “EV Ready” in the service panel or subpanel directory, and the termination location shall be marked as “EV Ready”.

Exception: *EV Ready Spaces* are not required where no parking spaces are provided.

R404.2.2 (IRC N1104.2.2) Multifamily dwellings (three or more units). *EV Ready Spaces* and *EV Capable Spaces* shall be provided in accordance with Table R404.2.2. Where the calculation of percent served results in a fractional parking space, it shall round up to the next whole number. The service panel or subpanel circuit directory shall identify the spaces reserved to support EV charging as “EV Capable” or “EV Ready”. The raceway location shall be permanently and visibly marked as “EV Capable”.

Table R404.2.2 (IRC N1104.2.2) ***EV Ready Space and EV Capable Space requirements.***

<u>Total Number of Parking Spaces</u>	<u>Minimum number of EV Ready Spaces</u>	<u>Minimum number of EV Capable Spaces</u>
<u>1</u>	<u>1</u>	<u>1</u>
<u>2 – 10</u>	<u>2</u>	<u>1</u>
<u>11 – 15</u>	<u>2</u>	<u>3</u>
<u>16 – 19</u>	<u>2</u>	<u>4</u>
<u>21 - 25</u>	<u>2</u>	<u>5</u>
<u>26+</u>	<u>2</u>	<u>20% of total parking spaces</u>

R404.2.3 (IRC N1104.2.3) Identification. Construction documents shall indicate the raceway termination point and proposed location of future EV spaces and EV chargers. Construction documents shall also provide information on amperage of future EVSE, raceway methods, wiring schematics and electrical load calculations to verify that the electrical panel service capacity and electrical system, including any on-site distribution transformers, have sufficient capacity to simultaneously charge all EVs at all required EV spaces at the full rated amperage of the EVSE.

Reason: In the United States, electric vehicle (EV) sales increased by 80 percent from 2017 to 2018 (1). According to a November 2018 forecast from the Edison Electric Institute, the number of EVs on U.S. roads is projected to grow from 1 million vehicles at the end of 2018, to 18.7 million by 2030. To recharge these new EVs, the U.S. will need 9.6 million charge ports, a substantial portion of which will be installed in single and multi-family residential buildings (2).

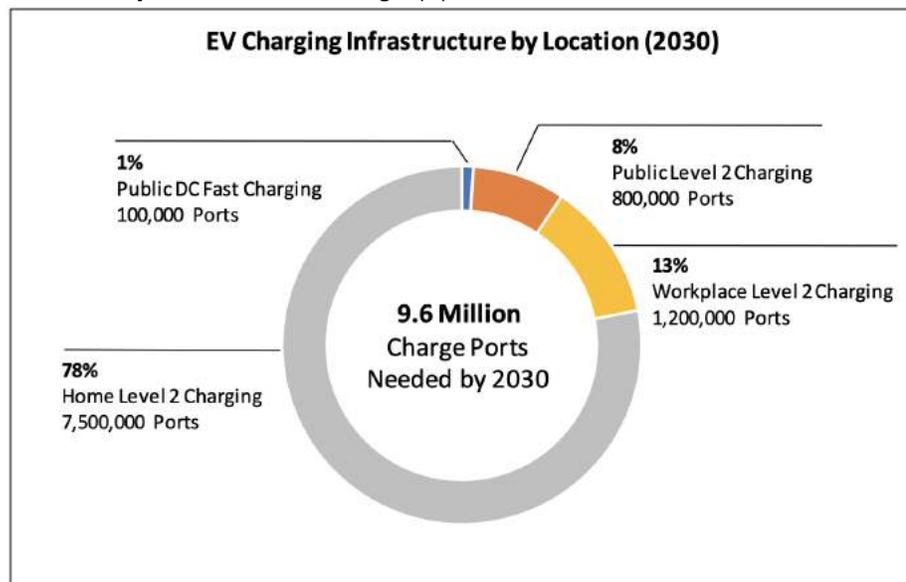


Figure 1. EV Charging Infrastructure in 2030 Based on EEI/IEI Forecast.

EVs provide significant economic benefits for consumers through fuel and maintenance cost savings, and have been identified as a key climate strategy to reduce GHG emissions from the U.S. transportation sector. The interest in EVs has grown alongside greater EV model availability and increased vehicle range. Every major auto manufacturer in the world has announced a plan to electrify a significant portion of their vehicle fleets over the next 3-5 years. Ford recently announced an \$11 billion investment to reach their goal of 40 EV models by 2022 (3). The goal for GM: 20 EV models by 2023 (4); for VW: 27 EV models by 2022 (5); for Toyota: 10 BEVs by the early 2020's (6); and similar goals for Volvo, Daimler, Nissan, BMW, and Fiat-Chrysler.

However, the lack of access to EV charging stations continues to be a critical barrier to EV adoption. In particular, there are significant logistical barriers for residents of multi-family dwellings to upgrade existing electrical infrastructure and install new EV charging stations.

A lack of pre-existing EV charging infrastructure, such as electrical panel capacity, raceways, and pre-wiring, can make the installation of a new charging station cost-prohibitive for a potential EV-owner. The installation of an EV charging station is made three to four times less expensive when the infrastructure is installed during the initial construction phase as opposed to retrofitting existing buildings to accommodate the new electrical equipment.

New residential buildings are constructed to last for decades, and so it is critical that EV charging infrastructure is incorporated at the pre-construction stage to ensure that new buildings can accommodate the charging needs of future EV-owners.

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Cost Impact: The code change proposal will increase the cost of construction. The code change proposal will increase the cost of initial construction, but provide long-term savings for EV owners through the avoided retrofit costs of installing EV charging infrastructure.

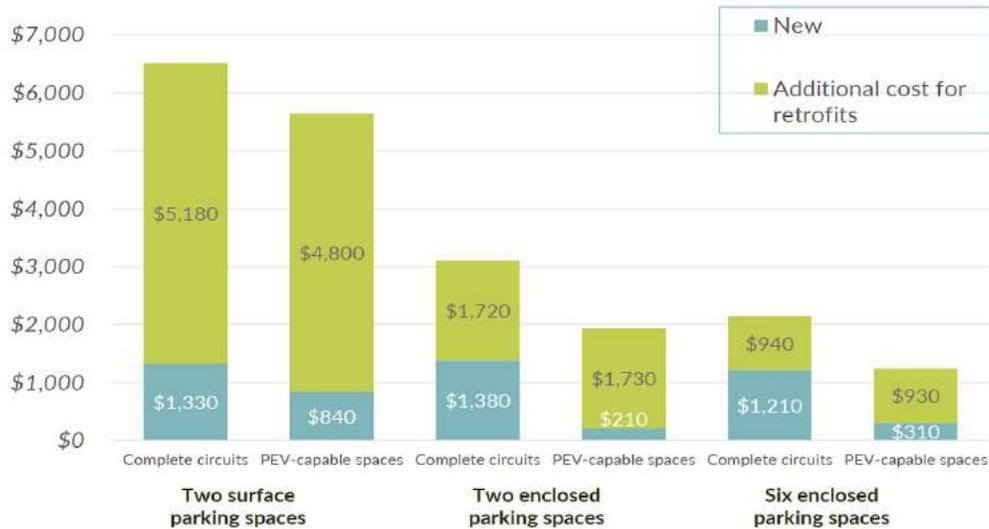
One- and two- family dwellings: additional costs include the price and labor associated with the installation of one 40-ampere, 208/240-volt dedicated branch circuit and a circuit terminating in a receptacle, junction box, or EVSE. The proposed code will allow current and future EV-owners to avoid the cost of electrical equipment upgrades, demolition, and permitting for future retrofits.

Multi-family residential (3 or more units): The chart below compares the cost of installing the necessary electrical infrastructure to support EV-Ready spaces (complete circuit) and an EV-Capable spaces (PEV-capable) at the time of new construction versus a building retrofit. In one example, the cost estimate to retrofit

an existing building with two EV-Capable spaces is \$5,640, and \$4,800 or 85 percent of that cost would be avoided if EV-Capable infrastructure was included during the initial construction of the parking lot. These additional retrofit costs typically include labor expenses for demolition, trenching and boring, balancing the circuits, and new permitting costs.

Why Adopt EV Infrastructure Building Codes?

Cost Savings Modeled for the City of Oakland



In April, 2018, the California Air Resources Board published a cost analysis for a proposed code change to increase the required percentage of EV-Capable spaces. (8)

“Avoided Retrofit Costs: Significant retrofit costs can be avoided by installing EV charging infrastructure in new construction. CARB staff reviewed multiple sources to obtain average retrofit costs of installing infrastructure to support Level 2 charging stations in existing buildings. An estimated \$7,000 per parking space can be avoided with multiple installations of Level 2 charging stations. An estimated \$8,000 per parking space can be avoided when an individual Level 2 charging station is installed. These retrofit costs do not include the cost of the electrical vehicle supply equipment (EVSE). Retrofit costs are focused on parking lot trenching, adding electrical service and/or panel upgrades. The 10 percent requirement would result in the installation of an additional 38,000 to 47,000 parking spaces with EV charging infrastructure beyond the current 3 percent requirement. If the proposed 10% requirement is not adopted, CARB staff assumed that every one of these parking spaces would need the basic EV charging infrastructure (raceway and panel capacity) to become EV Capable and support future installation of Level 2 charging stations. CARB staff estimates that the avoided retrofit costs range from \$272 million to \$386 million between 2020 and 2025.”

Proposal # 4701

CE217-19 Part II

CE218-19

IECC: SECTION C406 (New), C406.1 (New), C406.1 (New), C406.1.1 (New), C406.2 (New), C406.2.1 (New), C406.2.2 (New), C406.2.3 (New), C406.2.4 (New), C406.3, C406.3.2 (New), C406.5, C406.5.2 (New), C406.7, C406.7.1, C406.7.3 (New), C406.7.4 (New)

Proponent: Eric Makela, New Buildings Institute, representing Northwest Energy Codes Group (ericM@newbuildings.org)

2018 International Energy Conservation Code

Revise as follows:

SECTION C406 ADDITIONAL EFFICIENCY PACKAGE OPTIONS REQUIREMENTS

~~C406.1 Requirements. Additional energy efficiency credit requirements. Buildings shall comply with one or more of the following:~~

- ~~1. More efficient HVAC performance in accordance with Section C406.2.~~
- ~~2. Reduced lighting power in accordance with Section C406.3.~~
- ~~3. Enhanced lighting controls in accordance with Section C406.4.~~
- ~~4. On-site supply of renewable energy in accordance with Section C406.5.~~
- ~~5. Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with Section C406.6.~~
- ~~6. High efficiency service water heating in accordance with Section C406.7.~~
- ~~7. Enhanced envelope performance in accordance with Section C406.8.~~
- ~~8. Reduced air infiltration in accordance with Section C406.9~~

New buildings shall achieve a total of 10 credits from Tables C406.1(1) through C406.1(5). Where a building contains multiple use groups, credits from each use group shall be weighted by floor area of each group to determine the weighted average building credit.

Add new text as follows:

C406.1

Table C406.1(1) Additional Energy Efficiency Credits for Group B Occupants

Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
C406.2.1: 5% Heating	NA	1	NA	NA	1	1	NA	1									
C406.2.2: 5% Cooling	6	6	5	5	4	4	3	3	3	2	2	2	1	2	2	2	1
C406.2.3: 10% Heating	NA	1	NA	NA	2	1	1	2	2	NA	1						
C406.2.4: 10% Cooling	11	12	10	9	7	7	6	5	6	4	4	5	3	4	3	3	3
C406.3.1: 10% LPA	9	8	9	9	9	9	10	8	9	9	7	8	8	6	7	7	6
C406.4: Digital Lt Ctrl	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	1	1
C406.5: Renewable	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
C406.6: DOAS	4	4	4	4	4	3	2	5	3	2	5	3	2	7	4	5	3
C406.7.1: SWH HR	NA																
C406.7.2: SWH NG eff	NA																
C406.7.3: SWH HP	NA																
C406.8: 85% UA	1	4	2	4	4	3	NA	7	4	5	10	7	6	11	10	14	16

C406.9: Low Leak	2	1	1	2	4	1	NA	8	2	3	11	4	1	15	8	11	6
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C406.1

Table C406.1(2) Additional Energy Efficiency Credits for Group R and I Occupancies

Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
C406.2.1: 5% Heating	NA	NA	NA	NA	1	NA	NA	1	NA	1	1	1	1	2	1	2	2
C406.2.2: 5% Cooling	3	3	2	2	1	1	1	1	1	NA	1	1	NA	1	1	1	NA
C406.2.3: 10% Heating	NA	NA	NA	NA	1	NA	NA	1	1	1	2	2	1	3	2	3	4
C406.2.4: 10% Cooling	5	5	4	3	2	3	1	2	2	1	1	1	1	1	1	1	1
C406.3.1: 10% LPA	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2
C406.4: Digital Lt Ctrl	NA																
C406.5: Renewable	8	8	8	8	7	8	8	7	7	7	7	7	7	7	7	7	7
C406.6: DOAS	3	4	3	3	4	2	NA	6	3	4	8	5	5	10	7	11	12
C406.7.1: SWH HR	10	9	11	10	13	12	15	14	14	15	14	14	16	14	15	15	15
C406.7.2: SWH NG eff	5	5	6	6	8	7	8	8	8	9	9	9	10	10	9	10	11
C406.7.3: SWH HP	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
C406.8: 85% UA	3	6	3	5	4	4	1	4	3	3	4	5	3	5	4	6	6
C406.9: Low Leak	6	5	3	11	6	4	NA	7	3	3	9	5	1	13	6	8	3

C406.1

Table C406.1(3) Additional Energy Efficiency Credits for Group E Occupancies

Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
C406.2.1: 5% Heating	NA	NA	NA	NA	1	1	1	1	1	2	1	2	1	2	2	3	4
C406.2.2: 5% Cooling	4	4	3	3	2	2	2	2	1	1	1	1	NA	1	1	1	NA
C406.2.3: 10% Heating	NA	NA	NA	1	1	1	1	2	3	4	3	4	3	4	3	5	7
C406.2.4: 10% Cooling	7	8	7	6	5	4	3	4	3	1	2	2	1	2	2	2	1
C406.3.1: 10% LPA	8	8	8	9	8	9	9	8	9	9	8	9	8	7	8	7	7
C406.4: Digital Lt Ctrl	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	1
C406.5: Renewable	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	5
C406.6: DOAS	NA																
C406.7.1: SWH HR*	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
C406.7.2: SWH NG eff*	NA	1	1	1	1	1	1	2	2	3	2	3	2	3	3	3	5
C406.7.3: SWH HPWH*	NA	1	NA	NA	1	1	NA	1	1	1	1						
C406.8: 85% UA	3	7	3	4	2	4	1	1	3	1	2	3	NA	4	3	6	9
C406.9: Low Leak	1	1	1	2	NA	NA	NA	NA	NA	NA	1	NA	NA	4	1	4	3

* for schools with full service kitchens or showers

C406.1

Table C406.1(4) Additional Energy Efficiency Credits for Group M Occupancies

Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
C406.2.1: 5% Heating	NA	NA	NA	NA	1	1	NA	1	1	2	2	2	2	3	2	3	4
C406.2.2: 5% Cooling	5	6	4	4	3	3	1	2	2	1	1	2	NA	1	1	1	NA
C406.2.3: 10% Heating	NA	NA	NA	1	1	1	1	2	2	4	3	4	5	5	3	6	8
C406.2.4: 10% Cooling	9	12	9	8	6	6	3	4	4	1	2	3	NA	2	2	2	1
C406.3.1: 10% LPA	13	13	15	14	16	14	17	15	15	14	12	14	14	16	16	14	12
C406.4: Digital Lt Ctrl	NA																
C406.5: Renewable	8	8	8	8	8	8	8	8	8	7	7	7	7	7	7	7	6
C406.6: DOAS	3	4	3	3	3	3	1	3	2	2	2	3	2	4	3	4	4
C406.7.1: SWH HR	NA																
C406.7.2: SWH NG eff	NA																
C406.7.3: SWH HP	NA																
C406.8: 85% UA	4	6	3	4	3	3	1	6	4	4	4	5	4	6	5	8	9
C406.9: Low Leak Env	1	1	1	2	1	1	NA	3	1	1	3	2	1	7	3	6	3

C406.1

Table C406.1(5) Additional Energy Efficiency Credits for Other* Occupancies

Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
C406.2.1: 5% Heating	NA	NA	NA	NA	1	1	1	1	1	2	1	2	1	2	2	3	3
C406.2.2: 5% Cooling	5	5	4	4	3	3	2	2	2	1	1	2	1	1	1	1	1
C406.2.3: 10% Heating	NA	NA	NA	1	1	1	1	2	2	3	3	3	3	4	3	5	5
C406.2.4: 10% Cooling	8	9	8	7	5	5	3	4	4	2	2	3	2	2	2	2	2
C406.3.1: 10% LPA	8	8	9	9	9	9	10	8	9	9	7	8	8	8	8	8	7
C406.4: Digital Lt Ctrl	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	1
C406.5: Renewable	8	8	8	8	8	8	8	8	8	7	7	7	7	7	7	7	7
C406.6: DOAS	3	4	3	3	4	3	2	5	3	3	5	4	3	7	5	7	6
C406.7.1: SWH HR**	10	9	11	10	13	12	15	14	14	15	14	14	16	14	15	15	15
C406.7.2: SWH FF eff**	5	5	6	6	8	7	8	8	8	9	9	9	10	10	9	10	11
C406.7.3: SWH HPWH**	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
C406.8: 85% UA	3	6	3	4	3	4	1	5	4	3	5	5	4	7	6	9	10
C406.9: Low Leak Env	3	2	2	4	4	2	NA	6	2	2	6	4	1	10	5	7	4

* Other occupancy groups include all Groups except for Groups B, R, I, E, and M.

** for occupancy groups listed in C406.7.1

Revise as follows:

C406.1.1 Tenant spaces. Tenant spaces shall comply with sufficient options from Tables C406.1(1) through C406.1(5) to achieve a minimum number of 5 credits, where credits are selected from Section C406.2, C406.3, C406.4, C406.6 or C406.7. Alternatively Where the entire building complies using credits from Section C406.5, C406.8 or C406.9, tenant spaces within the building shall be deemed to comply with Section C406.5 where the

~~entire building is in compliance, this section.~~

Exception: Previously occupied tenant spaces that comply with this code in accordance with Section C501.

C406.2 More efficient HVAC equipment performance. ~~Equipment shall exceed the minimum efficiency requirements listed in Tables C403.3.2(1) through C403.3.2(7) by 10 percent, in addition to the requirements of Section C403. Where multiple performance requirements are provided, the equipment shall exceed all requirements by 10 percent.~~ 9) and Variable refrigerant flow systems shall exceed listed in the energy efficiency provisions of ANSI/ASHRAE/IESNA 90.1 by 10 percent, in accordance with Sections C406.2.1, C406.2, C406.2.3 or C406.4. Equipment shall also meet applicable requirements of Section C403. Energy efficiency credits for heating shall be selected from C406.2.1 or C406.2.3 and energy efficiency credits for cooling shall be selected from C406.2.2 or C406.2.4. Selected credits shall include a heating or cooling energy efficiency credit or both. Equipment not listed in Tables C403.3.2(1) through C403.3.2(7) 9) and Variable refrigerant flow systems not listed in the energy efficiency provisions of ANSI/ASHRAE/IES 90.1 shall be limited to 10 percent of the total building system capacity, capacity for heating equipment where selecting C406.2.1 or C406.2.3 and cooling equipment where selecting C406.2.2 or C406.2.4.

Add new text as follows:

C406.2.1 More efficient HVAC heating performance. Equipment shall exceed the minimum heating efficiency requirements by 5 percent.

C406.2.2 More efficient HVAC cooling performance. Equipment shall exceed the minimum cooling and heat rejection efficiency requirements by 5 percent. Where multiple cooling performance requirements are provided, the equipment shall exceed the annual energy requirement, including IEER, SEER, and IPLV.

C406.2.3 High efficiency HVAC heating performance. Equipment shall exceed the minimum heating efficiency requirements by 10 percent.

C406.2.4 High efficiency HVAC cooling performance. Equipment shall exceed the minimum cooling and heat rejection efficiency requirements by 10 percent. Where multiple cooling performance requirements are provided, the equipment shall exceed the annual energy requirement, including IEER, SEER, and IPLV.

Revise as follows:

C406.3 Reduced lighting power. Buildings shall comply with Section C406.3.1 or C406.3.2.

C406.3.1 Reduced lighting power 10 percent . The total connected interior lighting power calculated in accordance with Section C405.3.1 shall be less than 90 percent of the total lighting power allowance calculated in accordance with Section C405.3.2.

Add new text as follows:

C406.3.2 Reduced lighting power more than 15 percent. Where the total connected interior lighting power calculated in accordance with Section C405.3.1 is less than 85 percent of the total lighting power allowance calculated in accordance with Section C405.3.2, additional energy efficiency credits shall be determined based on Equation 4-12, rounded to the nearest whole number.

$AEEC_{LPA} = AEEC_{10} \times 10 \times (LPA - LPD) / LPA$ (Equation 4-12)

Where:

$AEEC_{LPA}$ = C406.3.2 additional energy efficiency credits

LPD = total connected interior lighting power calculated in accordance with Section C405.3.1

LPA = total lighting power allowance calculated in accordance with Section C405.3.2

AEEC₁₀ = C406.3.1 credits from Tables C406.1(1) through C406.1(5)

Revise as follows:

C406.5 On-site renewable energy. Buildings shall comply with Section C406.5.1 or C406.5.2.

C406.5.1 Basic Renewable Credits. The total minimum ratings of on-site renewable energy systems shall be one of the following:

1. Not less than ~~1.71-0.86~~ Btu/h per square foot (~~5.4-2.7~~ W/m²) or ~~0.50-0.25~~ watts per square foot (~~5.4-2.7~~ W/m²) of conditioned floor area.
2. Not less than 3 percent of the annual energy used within the building for building mechanical and service water heating equipment and lighting regulated in Chapter 4.

Add new text as follows:

C406.5.2 Enhanced Renewable Credits. Where the total minimum ratings of on-site renewable energy systems exceeds the rating in C406.5.1(1), additional energy efficiency credits shall be determined based on Equation 4-13, rounded to the nearest whole number.

AEEC_{RRa} = AEEC_{2.5} × RRa / RR₁ (Equation 4-13)

Where:

AEEC_{RRa} = C406.5.2 additional energy efficiency credits

RRa = actual total minimum ratings of on-site renewable energy systems in Btu/h, watts per square foot or W/m²

RR₁ = minimum ratings of on-site renewable energy systems required by C406.5.1(1) in Btu/h, watts per square foot or W/m² AEEC_{2.5} = C406.5.1 credits from Tables C406.1(1) through C406.1(5)

Revise as follows:

C406.7 Reduced energy use in service water heating. Buildings shall comply with Sections C406.7.1 and either C406.7.2, C406.7.3 or C406.7.4.

C406.7.1 Building type. To qualify for this credit, the building shall contain one of shall be of the following use groups and the additional energy efficiency credit shall be prorated by conditioned floor area of the portion of the building comprised of the following use groups.

~~types to use this compliance method:~~

1. *Group R-1:* Boarding houses, hotels or motels.
2. *Group I-2:* Hospitals, psychiatric hospitals and nursing homes.
3. *Group A-2:* Restaurants and banquet halls or buildings containing food preparation areas.
4. *Group F:* Laundries.
5. *Group R-2.*
6. *Group A-3:* Health clubs and spas.
7. Group E: Schools with full-service kitchens or locker rooms with showers
8. Buildings showing a service hot water load of 10 percent or more of total building energy loads, as shown with an energy analysis as described in Section C407.

~~C406.7.1~~ **C406.7.2 Load fraction-Recovered or renewable water heating** The building service water-heating system shall have one or more of the following that are sized to provide not less than ~~60~~30 percent of the building's annual hot water requirements, or sized to provide ~~100~~70 percent of the building's annual hot water requirements if the building ~~shall otherwise be required to comply with Section C403.9.5:~~

1. Waste heat recovery from service hot water, heat-recovery chillers, building equipment, or process equipment.
2. *On-site renewable energy* water-heating systems.

Add new text as follows:

C406.7.3 Efficient fossil fuel water heater. The combined input-capacity-weighted-average equipment rating of all fossil fuel water heating equipment in the building shall be not less than 95% Et or 0.95 EF. This option shall receive only half the listed credits for buildings required to comply with C404.2.1.

C406.7.4 Heat pump water heater. Where electric resistance water heaters are allowed, all service hot water system heating requirements shall be met using heat pump technology with a combined input-capacity-weighted-average EF of 3.0. Air-source heat pump water heaters shall not draw conditioned air from within the building, except exhaust air that would otherwise be exhausted to the exterior.

Reason: The C406 Option Packages was introduced into the IECC in 2012 as part of the prescriptive method to achieve an additional 4% energy savings over the prescriptive requirements of the code. The original proposal included three additional options (reduced lighting power density, increased HVAC efficiency and renewables). The 2018 IECC now has eight options to select from. In 2018, PNNL performed an analysis to determine the energy savings potential for each of the eight options and found significant savings differences.

How does the proposed measure compare to what's required in current codes?

The current additional efficiency package options are all considered equal in the 2018 IECC, and any one item must be selected to comply with the extra efficiency provision. However, there is a great deal of variation in the energy savings, as shown in Figure 1.

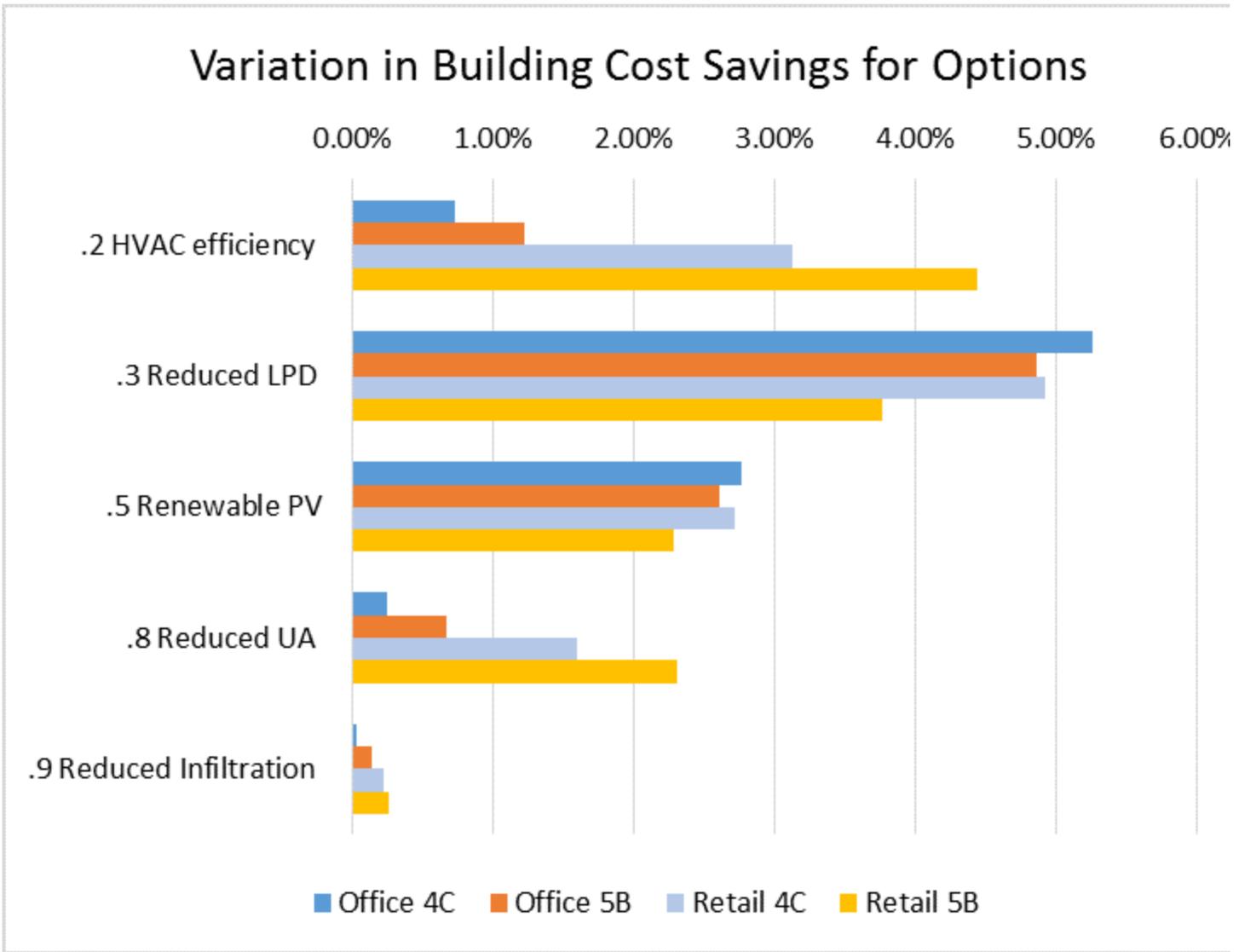


Figure [if supportFields]> SEQ Figure * ARABIC

To address this issue PNNL developed a points based option that provides equity across the efficiency measure options. The analysis is presented in their technical brief “Relative Credits for Extra Efficiency Measures”

C406 – Additional Efficiency Credits

http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-28370.pdf

Technical Analysis

The technical analysis was conducted as follows:

- Prototype models are used in the analysis. Their development, and associated climate locations, are described in detail in the quantitative determination[1] and are available for download.[2] Four building prototypes were used to capture the difference between building types:

- Medium office
- Primary School

– Mid-rise Apartment

– Stand Alone Retail

EnergyPlus™ was used to evaluate each measure in the four prototypes in all U.S. climate zones, except in cases where there is not a strong interaction with building HVAC systems, where standard engineering calculations were used. This applies to service hot water and renewable energy. Dedicated outdoor air systems (DOAS) savings were estimated rather than modeled, as discussed in the “Relative Credits for Extra Efficiency Measures”.

· Using average annual commercial energy prices, cost savings for each measure are calculated as a percentage of building total annual energy cost.

· The cost percentages are converted to credit points, with the goal of not being exactly equivalent, but to provide approximate relative equivalency between measures. One point is assigned for each 0.25% of building energy cost savings.

Extra efficiency measures save energy by reducing energy use directly or reducing the heating or cooling loads in the building, resulting in lower HVAC energy use. The measure would require different items to be added to construction, depending on the combination of credits selected. The requirements for each measure are discussed under the individual items.

Why is an energy efficiency credit assignment method superior to other approaches?

The extra efficiency credit approach allows for designer and builder flexibility. While it is slightly more complicated to select multiple items and add up points, in many cases credit would be given for measures that are often included in buildings. Furthermore, using points rather than “just pick one” puts the options on more of a level consideration and better accounts for the impact of climate.

The climate zone impact is fairly broad, especially for cooling efficiency and building envelope measures. The spread is also broad for lighting reduction and plug load controls, as the reduced heat load must be made up by the heating system in colder climates, while in warmer climates there is added savings in the cooling system. Assigning the points relative to building energy cost savings and climate zone will reward savings measures appropriate to the location of the building, and more fairly across measures.

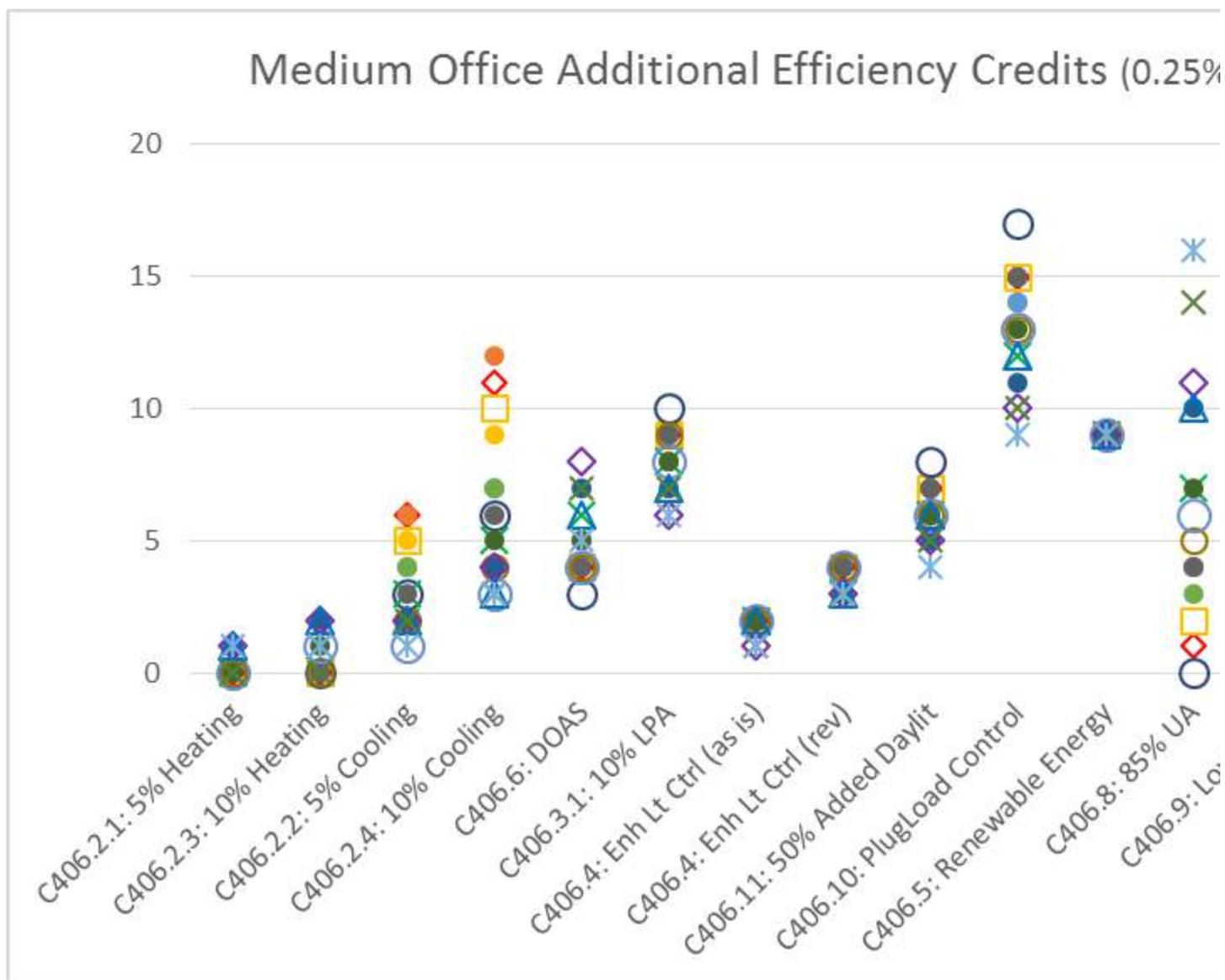


Figure [if supportFields]> SEQ Figure * ARABIC

The points resulting from averaging four typical C406 measures (10% HVAC, 10% LPA, Renewable and 85% UA) are shown as the last item on the right side of Figure 2. These four average around 10 points across climate zones, while lighting power allowance—a popular option selection—averages around 8 points across climate zones. Selecting 10 points or 2.5% savings of building energy cost as the target of a point-based system makes sense as being slightly ahead or roughly equal to the approach followed in the 2018 IECC.

What strategies are considered to minimize compliance burdens?

To achieve savings from a combination of multiple measures under the 2018 IECC, the only recourse is to follow the performance path that requires a building model. Having a simple table of points for measures in different building types and climate zones bypasses the need for full performance modeling, which can be expensive relative to savings for smaller buildings. The end result is a performance-based approach that can be applied with the simplicity of a prescriptive approach.

Are there existing codes and standards that take a similar approach?

The outlined approach is based on the structure currently employed in the IECC for commercial buildings. It just

shifts from a “pick one” approach to one that selects adequate measures from the options to meet a required point level. It is also similar to packages of measures that have been utilized in both residential and commercial energy codes, particularly in the Pacific Northwest. The Washington code has successfully used such a structure to balance energy performance, design flexibility, and evolving technologies.

The existing measures were modified to better fit within the points option and to provide more flexibility.

More efficient HVAC heating performance (C406.2) There has been industry feedback that it is difficult to comply with the 10% increase in efficiency for the More Efficient HVAC Option because both the heating and cooling equipment must comply. The points option allows either heating or cooling or both to comply. This measure would be modified to provide separate credits for the following:

- Medium efficiency HVAC heating performance (C406.2.1) is a 5% improvement in efficiency over the existing minimum requirement.
- Medium efficiency HVAC cooling performance (C406.2.2) is a 5% improvement in efficiency over the existing minimum requirement.
- High Efficiency HVAC heating performance (C406.2.3) is a 10% improvement in efficiency over the existing minimum requirement.
- High Efficiency HVAC cooling performance (C406.2.4) is a 10% improvement in efficiency over the existing minimum requirement

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Note: If equipment efficiency tables for VRF or other items are added by another proposal, then remove the reference to the ASHRAE 90.1 tables and adjust the table number reference range to include all HVAC equipment tables.

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- **C406.3 Reduced lighting power.** The proposal keeps the 10% reduced lighting power allowance threshold and adds a threshold of 15%. Lighting designers that want to design to lower LPD levels can also use the calculation (Equation 4-12) to achieve more points giving them more flexibility.

- **C406.5 On-site renewable energy.** The onsite renewable energy credit has been modified to allow for additional credit from increased system size over the base level requirement for this credit.

- **C406.7.1 Reduced energy use in service water heating.** The water heating option allows for credit for high efficiency gas and electric water heaters in addition to heat recovery.

Bibliography: Hart R and B Liu. 2015. *Methodology for Evaluating Cost-effectiveness of Commercial Energy Code Changes*. PNNL-23923, Rev1, Pacific Northwest National Laboratory for U.S. Department of Energy; Energy Efficiency & Renewable Energy. <https://www.energycodes.gov/development/commercial/methodology>. Hart R and J Zhang. 2018. *Cost-effectiveness Analysis of Hi-rise Residential Building Air Leakage Testing*. <https://www.energycodes.gov/sites/default/files/documents/TBD.pdf>.

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Cost Impact

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The current proposal does not require more investment, but rather expands existing options permitted under the 2018 IECC. The intention is to assess relative savings equity amongst current options, and identify additional options to increase flexibility and more effectively utilize new technologies and construction practices. There is not expected to be an increased cost, as several of the evaluated options are included in current code. In some cases, costs may be reduced, as the outlined approach provides partial credit for selected items as well as credit for items that may have previously been included in the building design without credit. Costs, and cost effectiveness, are not evaluated for individual measures due to the vast number of potential combinations amongst building types, climates, and selected options. Actual costs will vary based on the items selected by the building designer—architects, engineers, and other involved trades—based on the needs and goals of the individual project.

Proposal # 4960

CE218-19

CE219-19

IECC: C406.1

Proponent: Marilyn Williams, representing National Electrical Manufacturers Association
(mar_williams@nema.org)

2018 International Energy Conservation Code

Revise as follows:

C406.1 Requirements. Buildings shall comply with ~~one~~two or more of the following:

1. More efficient HVAC performance in accordance with Section C406.2.
2. Reduced lighting power in accordance with Section C406.3.
3. Enhanced lighting controls in accordance with Section C406.4.
4. On-site supply of renewable energy in accordance with Section C406.5.
5. Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with Section C406.6.
6. High-efficiency service water heating in accordance with Section C406.7.
7. Enhanced envelope performance in accordance with Section C406.8.
8. Reduced air infiltration in accordance with Section C406.9

Reason: Section C406.1 establishes a set of additional efficiency measure options above base code requirements. The present code requires compliance with only one measure, yet the list of efficiency options has continued to grow without adding any efficiency to buildings. This proposal would modify the requirement so buildings would comply with two packages instead of just one to increase the energy efficiency of buildings.

Cost Impact: The code change proposal will increase the cost of construction
The impact would be the cost of the added measure which increases the energy efficiency of the building.

Proposal # 4441

CE219-19

CE220-19

IECC: C406.1

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

C406.1 Requirements. Buildings shall comply with ~~one~~two or more of the following:

1. More efficient HVAC performance in accordance with Section C406.2.
2. Reduced lighting power in accordance with Section C406.3.
3. Enhanced lighting controls in accordance with Section C406.4.
4. On-site supply of renewable energy in accordance with Section C406.5.
5. Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with Section C406.6.
6. High-efficiency service water heating in accordance with Section C406.7.
7. Enhanced envelope performance in accordance with Section C406.8.
8. Reduced air infiltration in accordance with Section C406.9

Reason: The purpose of this code change proposal is to improve the efficiency of the prescriptive compliance path by requiring the selection of two additional efficiency package options instead of only one. Section C406 was adopted in the 2012 IECC not only as an immediate efficiency improvement, but also as a means of facilitating code improvements in the future. As new technologies become available, the package options can be updated or the list of options can be expanded (as it was in the 2018 IECC) to provide more flexibility for code users. As additional efficiency is needed, the number of required options can be increased. Several states have adopted a package- or points-based approach similar to Section C406, and as more efficiency is needed, the number of options (or points) has been increased. We note that this proposal deals only with the prescriptive path, and that a separate proposal will address needed efficiency improvements in the performance path.

Cost Impact: The code change proposal will increase the cost of construction. The proposal requires additional efficiency measures to be installed in the building which will increase costs. However, we expect that design professionals and builders will select the package options that are the most cost-effective and the easiest to implement into specific designs.

Proposal # 4202

CE220-19

CE221-19

IECC: C406.2

Proponent: Steven Rosenstock, Edison Electric Institute, representing Edison Electric Institute (srosenstock@eei.org)

2018 International Energy Conservation Code

Revise as follows:

C406.2 More efficient HVAC equipment performance. Equipment shall exceed the minimum efficiency requirements listed in Tables C403.3.2(1) through C403.3.2(7) by 10 percent, in addition to the requirements of Section C403. Where multiple performance requirements are provided, the equipment shall exceed all requirements by 10 percent. *Variable refrigerant flow systems* shall exceed the energy efficiency provisions of ANSI/ASHRAE/IESNA 90.1 by 10 percent. Equipment-Building designers or owners using equipment not listed in Tables C403.3.2(1) through C403.3.2(7-9) shall be limited to 10 percent of the total building system capacity. provide documentation of equivalent energy efficiency performance to the satisfaction of the code official.

Reason: There are numerous problems with the current language that need to be fixed. This proposal improves the language in this section and provides more high-efficiency options.

1) VRF system limits

Under the current language, high-efficiency VRF systems are allowed to be used, but since they are not listed in Tables C403.2.3(1) through C403.2.3(7), they are limited to 10% of the building system capacity.

2) Cooling Tower limits

Under the current language, cooling towers are shown in Table C403.2.3(8). Since they are not listed in Tables C403.2.3(1) through C403.2.3(7), they are limited to 10% of the building system capacity. So a building could have a 500-ton water chiller system, but would only be allowed to install a 50-ton cooling tower. This is not technically feasible.

3) Computer Room AC limits

Under the current language, computer room AC units are shown in Table C403.2.3(9). Since they are not listed in Tables C403.2.3(1) through C403.2.3(7), they are limited to 10% of the building system capacity. So if a building with a data center has 500 tons of cooling needed, with 250 tons needed for the data center, under the current language, you are only allowed to have 50 tons of computer room AC systems. Again, this is not feasible.

4) Limits on other high-efficiency HVAC equipment that is not listed in tables

Under the current language and tables in the IECC, many types of high-efficiency technologies are limited by the current language. The following is a partial list of technologies that are restricted by the current arbitrary 10% limit:

- Chilled Beam Systems
- Radiant Systems
- DX-DOAS units, without energy recovery
- DX-DOAS units, with energy recovery

- Vapor Compression Based Indoor Pool Dehumidifiers
- Floor-mounted computer room AC units (not listed in current tables)
- Ceiling-mounted computer room AC units (not listed in current tables)
- Combined space heating / water heating systems
- Heat Pump and Heat Reclaim Chiller Packages

Building owners and designers should be allowed to use other high-efficiency equipment to meet the criteria for additional HVAC energy efficiency without having to go to a full performance path option. This proposal allows the use of advanced technologies to improve the efficiency of the HVAC equipment (and the building) with the condition that proof must be provided to show energy savings.

Cost Impact: The code change proposal will increase the cost of construction

As an additional efficiency option allowing more technologies to be used, the impact on construction costs will depend on the technology that is chosen. To be conservative, it is assumed that the newer high-efficiency technologies have higher costs since they may not have achieved economies of scope and/or scale.

Proposal # 4707

CE221-19

CE222-19

IECC: C406.2

Proponent: Steven Rosenstock, Edison Electric Institute, representing Edison Electric Institute (srosenstock@eei.org)

2018 International Energy Conservation Code

Revise as follows:

C406.2 More efficient HVAC equipment performance. Equipment with a rated heating or cooling capacity of less than 300,000 Btu/hour (87.9 kW) shall exceed the minimum efficiency requirements listed in Tables C403.3.2(1) through C403.3.2(7) by 10 percent, in addition to the requirements of Section C403. Where multiple performance requirements are provided, the equipment shall exceed all requirements by 10 percent. Equipment with a rated heating or cooling capacity of 300,000 Btu/hour (87.9 kW) or greater shall exceed the minimum efficiency requirements listed in Tables C403.3.2(1) through C403.3.2(7) by 5 percent, in addition to the requirements of Section C403. Where multiple performance requirements are provided, the equipment shall exceed all requirements by 5 percent.

Variable refrigerant flow systems shall exceed the energy efficiency provisions of ANSI/ASHRAE/IESNA 90.1 by 10 percent. Equipment not listed in Tables C403.3.2(1) through C403.3.2(7) shall be limited to 10 percent of the total building system capacity.

Reason: New federal energy efficiency standards and new provisions in ASHRAE 90.1 continue to increase the minimum

energy efficiency of many HVAC products. For an increasing number of products, especially in the larger sizes, the difference

in energy efficiency between the required baseline models and the higher efficiency models is less than 10%.

To provide options for buildings with larger equipment, this proposal requires smaller commercial equipment to increase efficiency by 10%, while larger equipment has to increase efficiency by 5%. For both heating and cooling systems, 300,000 Btu/hour (or 25 tons of cooling capacity) is a reasonable "break point" for additional efficiency requirements.

Cost Impact: The code change proposal will decrease the cost of construction

For larger buildings with larger HVAC equipment, this proposal makes the requirement more reasonable and achievable. For buildings using smaller HVAC equipment, this proposal will have no impact on the construction costs, as the requirement for smaller equipment is not changed.

Proposal # 4731

CE222-19

CE223-19

IECC: C406.2

Proponent: Charles Foster, Self, representing self (cfoster20187@yahoo.com)

2018 International Energy Conservation Code

Revise as follows:

C406.2 More efficient HVAC equipment performance. Equipment shall exceed the minimum efficiency requirements listed in Tables C403.3.2(1) through C403.3.2(7) by 10 percent, in addition to the requirements of Section C403. Where multiple performance requirements are provided, the equipment shall exceed all requirements by 10 percent. Variable refrigerant flow systems shall exceed the energy efficiency provisions of ANSI/ASHRAE/IESNA 90.1 by 10 percent. ~~Equipment not listed in Tables C403.3.2(1) through C403.3.2(7) shall be limited to 10 percent of the total building system capacity.~~

Reason: Under the current language, high-efficiency VRF systems are allowed to be used, but since they are not listed in Tables C403.2.3(1) through C403.2.3(7), they are limited to 10% of the building system capacity.

2) Cooling Tower limits

Under the current language, cooling towers are shown in Table C403.2.3(8). Since they are not listed in Tables C403.2.3(1) through C403.2.3(7), they are limited to 10% of the building system capacity. So a building could have a 500-ton water chiller system, but would only be allowed to install a 50-ton cooling tower. This is not technically feasible.

3) Computer Room AC limits

Under the current language, computer room AC units are shown in Table C403.2.3(9). Since they are not listed in Tables C403.2.3(1) through C403.2.3(7), they are limited to 10% of the building system capacity. So if a building with a data center has 500 tons of cooling needed, with 250 tons needed for the data center, under the current language, you are only allowed to have 50 tons of computer room AC systems. Again, this is not feasible.

4) Limits on other high-efficiency HVAC equipment that is not listed in tables

Under the current language and tables in the IECC, many types of high-efficiency technologies are limited by the current language. The following is a partial list of technologies that are restricted by the current arbitrary 10% limit:

Chilled Beam Systems

Radiant Systems

DX-DOAS units, without energy recovery

DX-DOAS units, with energy recovery

Vapor Compression Based Indoor Pool Dehumidifiers

Floor-mounted computer room AC units (not listed in current tables)

Ceiling-mounted computer room AC units (not listed in current tables)

Combined space heating / water heating systems

Heat Pump and Heat Reclaim Chiller Packages

Building owners and designers should be allowed to use other high-efficiency equipment to meet the criteria for additional HVAC energy efficiency without having to go to a full performance path option. This proposal allows the use of advanced technologies to improve the efficiency of the HVAC equipment (and the building) with the condition that proof must be provided to show energy savings.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal would add flexibility which typically leads to lower costs. On the other hand, it could also lead to higher costs if owners chose to install higher efficiency equipment.

Proposal # 5156

CE223-19

CE224-19

IECC: C406.2, TABLE C406.2 (New)

Proponent: Mark Lessans, Ingersoll Rand, representing Ingersoll Rand (mark.lessans@irco.com)

2018 International Energy Conservation Code

Revise as follows:

C406.2 More efficient HVAC equipment performance. Equipment shall ~~exceed~~ comply with the minimum efficiency requirements listed in Tables C403.3.2(1) through C403.3.2(7) by 10 percent following requirements, as applicable, in addition to the requirements of Section C403. ~~Where multiple performance requirements are provided, the equipment shall exceed all requirements by 10 percent.~~

1. Package unitary air-cooled systems with cooling capacity greater than 65,000 Btu/h shall meet or exceed the applicable efficiency requirements listed in Table C406.2, or shall exceed the mandatory federal minimum efficiency requirements for IEER by not less than 10 percent, whichever is greater.
2. All other electrically operated unitary air conditioners and heat pumps with cooling capacity less than 760,000 Btu/h shall exceed the mandatory federal minimum efficiency requirements by not less than 10 percent.
3. Variable refrigerant flow systems shall exceed the energy efficiency provisions of ANSI/ASHRAE/IESNA 90.1 by not less than 10 percent.
4. All other systems shall exceed the applicable minimum efficiency requirements listed in Tables C403.3.2(1) through C403.3.2(7) by not less than 10 percent. Equipment not listed in Tables C403.3.2(1) through C403.3.2(7) shall be limited to 10 percent of the total building system capacity.

Add new text as follows:

TABLE C406.2
MINIMUM EFFICIENCY REQUIREMENTS: MORE EFFICIENT HVAC EQUIPMENT PERFORMANCE UNITARY AIR-COOLED SYSTEMS

<u>EQUIPMENT TYPE</u>	<u>SIZE CATEGORY</u>	<u>HEATING SECTION TYPE</u>	<u>SUBCATEGORY OR RATING CONDITION</u>	<u>MINIMUM EFFICIENCY</u>	<u>TEST PROCEDURE</u>
<u>Air conditioners, air cooled</u>	<u>≥ 65,000 Btu/h and < 135,000 Btu/h</u>	<u>Electric Resistance (or None)</u>	<u>Single Package</u>	<u>18.0 IEER</u>	<u>AHRI 340/360</u>
		<u>All other</u>	<u>Single Package</u>	<u>17.8 IEER</u>	
	<u>≥ 135,000 Btu/h and < 240,000 Btu/h</u>	<u>Electric Resistance (or None)</u>	<u>Single Package</u>	<u>17.0 IEER</u>	
		<u>All other</u>	<u>Single Package</u>	<u>16.8 IEER</u>	
	<u>≥ 240,000 Btu/h</u>	<u>Electric Resistance (or None)</u>	<u>Single Package</u>	<u>14.5 IEER</u>	
		<u>All other</u>	<u>Single Package</u>	<u>14.3 IEER</u>	
	<u>≥ 65,000 Btu/h and < 135,000 Btu/h</u>	<u>Electric Resistance (or None)</u>	<u>Single Package</u>	<u>16.0 IEER</u>	
		<u>All other</u>	<u>Single Package</u>	<u>15.8 IEER</u>	

<u>Heat pumps, air cooled (cooling mode)</u>	<u>≥ 135,000 Btu/h and < 240,000 Btu/h</u>	<u>Electric Resistance (or None)</u>	<u>Single Package</u>	<u>15.0 IEER</u>	<u>AHRI 340/360</u>
		<u>All other</u>	<u>Single Package</u>	<u>14.8 IEER</u>	
	<u>≥ 240,000 Btu/h</u>	<u>Electric Resistance (or None)</u>	<u>Single Package</u>	<u>14.5 IEER</u>	
		<u>All other</u>	<u>Single Package</u>	<u>14.3 IEER</u>	
<u>Heat pumps, air cooled (heating mode)</u>	<u>≥ 65,000 Btu/h and < 135,000 Btu/h (cooling capacity)</u>	=	<u>47°F db/43°F wb outdoor air</u>	<u>3.5 COP</u>	<u>AHRI 340/360</u>
	<u>≥ 135,000 Btu/h (cooling capacity)</u>	=	<u>47°F db/43°F wb outdoor air</u>	<u>3.6 COP</u>	

Reason: The purpose of this code change proposal is to ensure that next-generation commercial unitary air conditioners and heat pumps - those which are high-efficiency by future standards - are effectively promoted by Section C406.2 of the IECC. In doing so, this proposal will better align the energy code with DOE appliance and equipment standards, above-code programs, and manufacturer plans to improve their product offerings in response to them.

As written, C406.2 requires that all minimum efficiency requirements listed in the equipment efficiency tables of Section C403 be exceeded 10 percent. This requirement is appropriate new buildings which utilize multiple equipment types for space conditioning, as well as for equipment that has multiple performance compliance paths. However, for package air-cooled unitary systems, conventionally referred to as rooftop units (RTUs), there are typically three different efficiency metrics listed in the equipment efficiency tables, all of which must be met. Exceeding these efficiencies proportionally does not make sense given updated standards and the capabilities of RTUs, and creates conflicting as well as commercially unattainable requirements.

This proposal solves this issue for package RTUs by focusing their requirements in C406.2 predominantly on cooling efficiency as defined by IEER, as this equipment operates primarily in cooling mode, even in cold climates. Additionally, IEER is the metric used by DOE for federal appliance standards covering this equipment. This proposal aligns efficiency requirements for commercial unitary air conditioners with those in the Consortium for Energy Efficiency (CEE) Advanced Tier specification, which took effect on January 1, 2019. CEE does not develop an Advanced Tier specification for commercial package heat pumps, so improvements proportionally similar are used in this proposal.

If approved, this proposal would raise IEER for package air-cooled unitary systems by roughly 25-40% above the requirements of Section C403, as well as roughly 10-20% above the efficiencies required by updated DOE appliance standards that take effect in 2023. Additionally, this proposal creates a “backstop” of 10% above federal appliance standards, so that the intent of Section C406.2 is met if DOE standards for this equipment is updated prior to revisions to Table C406.2. All other efficiency metrics governing RTUs will remain in place, as the equipment still must comply with all requirements of Section C403.

This code change is necessary to avoid conflicting requirements between EER and IEER, as well as commercially unattainable requirements for AFUE. Regarding EER (full-load performance) and IEER (blended part- and full-load performance), optimizing for one performance condition will yield sub-optimal performance at

another. While new products may improve both EER and IEER, one can only be improved incrementally at the expense of the other, and therefore requiring both to improve proportionally is not appropriate. Regarding AFUE, the requirements placed on furnaces and gas heating elements by C406.2 requires moving to a condensing technology, which is not commercially available in RTUs outside of highly niche applications. The product availability gap is related to condensate disposal; in rooftop applications there is no industry-accepted practice to dispose of condensing furnace condensate discharge, and inappropriate applications will lead to roof damage.

This code change proposal makes significant improvements to package air-cooled unitary system cooling efficiencies, and removes conflicting requirements that would prevent premium efficiency, next-generation equipment from being used in new construction. It maintains the intent of Section C406, while also keeping C406.2 relevant given changes to appliance standards and industry innovation since its original inclusion in the 2012 IECC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is an editorial change only.

Proposal # 4500

CE224-19

CE225-19

IECC: C406.2, TABLE C406.2 (New)

Proponent: Mark Lessans, Ingersoll Rand, representing Ingersoll Rand (mark.lessans@irco.com)

2018 International Energy Conservation Code

Revise as follows:

C406.2 More efficient HVAC equipment performance. Equipment shall exceed the minimum efficiency requirements listed in Tables C403.3.2(1) through C403.3.2(7) by 10 percent, in addition to the requirements of Section C403. Where multiple performance requirements are provided, the equipment shall exceed all requirements by 10 percent. *Variable refrigerant flow systems* shall exceed the energy efficiency provisions of ANSI/ASHRAE/IESNA 90.1 by 10 percent. Equipment not listed in Tables C403.3.2(1) through C403.3.2(7) shall be limited to 10 percent of the total building system capacity.

Exception: Electrically operated unitary and applied heat pumps that do not utilize electric resistance heating elements and utilize a gas-fired furnace for supplemental heating shall comply with the minimum efficiency requirements in Table C406.2, in addition to the requirements of Section C403.

Add new text as follows:

TABLE C406.2

MINIMUM EFFICIENCY REQUIREMENTS: MORE EFFICIENT HVAC PERFORMANCEDUAL FUEL UNITARY AND APPLIED HEAT PUMPS

<u>EQUIPMENT TYPE</u>	<u>SIZE CATEGORY</u>	<u>SUBCATEGORY OR RATING CONDITION</u>	<u>MINIMUM EFFICIENCY</u>	<u>TEST PROCEDURE</u>
Air cooled (cooling mode)	< 65,000 Btu/h	Single Package	15.6 SEER 12.8 EER	AHRI 340/360
	≥ 65,000 Btu/h	Single Package	11.5 EER 14.1 IEER	
Air cooled (heating mode, heat pump operation only)	< 65,000 Btu/h (cooling capacity)	47°F db/43°F wb outdoor air	8.8 HSPF	AHRI 340/360
	≥ 65,000 Btu/h (cooling capacity)	47°F db/43°F wb outdoor air	3.4 COP	

Reason: For mechanical equipment to comply with Section C406.2 of the 2018 IECC, it must exceed by 10 percent the efficiencies listed in Tables C403.3.2(1) through C403.3.2(7), which require that gas-fired commercial warm air furnaces have an efficiency rating of at least 88 AFUE. However, in order for a furnace to meet this efficiency level, it must utilize a condensing technology, and in rooftop applications it is difficult to safely and effectively dispose of furnace condensate. By contrast, residential condensing furnaces typically dispose of condensate through a side wall of a home. As a result, condensing furnaces are niche, non-commercialized products in commercial applications, which severely limits the ability to use a furnace when complying with Section C406.2. The only realistic option for small commercial buildings with rooftop units is to use heat pumps which meet the efficiency requirements of Section C406.2, but even at these improved performance ratings, it does not make sense to forego the use of warm air furnaces in cold climates. The proposed code change will remove this barrier for dual fuel commercial rooftop units – packaged units which contain both a heat pump and a furnace for heating. In these systems, the heat pump is the primary source of heating, but when the outdoor ambient temperature is too low for the heat pump to operate

effectively, the compressor disengages, and rather than relying on an electric resistance source, a natural gas furnace provides supplementary heating. This approach allows the rooftop unit to utilize a heat pump when it is efficient to do so, such as during shoulder seasons and mild winter days, and switch to a natural gas furnace at very low outdoor temperatures when the heat pump cannot perform efficiently, if at all. The result is a mechanical system that can be optimized for energy efficiency and lower operating costs, as well as for effective electric demand management without loss of heating utility.

This proposed code change is necessary to fully enable buildings in cold climates to benefit from the optimized utilization of both a heat pump and furnace to provide heating. Dual fuel commercial rooftop units are available from multiple equipment manufacturers in 3-10 ton (36,000-120,000 Btu/h) capacities, and much of the small commercial market segment served by these units uses the prescriptive path to comply with the energy code. This proposed code change increases the heat pump performance requirements beyond 10 percent, as would otherwise be required by C406.2, to make up for the use of a standard efficiency furnace to ensure the intent of this provision is met. As a result, the prescriptive path in the IECC will enable improved HVAC performance while maintaining comfort and cost-effectiveness – the intent of Section C406.2.

Because this change is part of an optional path, designers will be able to select a system that is optimized for a particular building design in order to maximize the energy-savings benefit. The requirement for additional efficiency measures is intended to provide flexibility in design with optimized costs; including the dual fuel heat pump option brings another technology to the table. It does not replace other options, it simply provides greater opportunity for efficient HVAC system selections – and energy efficiency.

The only reasonable alternative to this code change proposal is to maintain the status quo requirements in Section C406.2 of the IECC, which does little to recognize the energy efficiency benefit of dual fuel rooftop units. As written, C406.2 directs the building designer to select either a high efficiency heat pump or high efficiency furnace, both of which have their own technical limitations:

- Heat pump coefficient of performance (COP) declines as outdoor ambient temperatures get colder. At very low ambient temperatures, the heat pump compressor will completely disengage, and instead rely on a resistance heating element, which results in a COP < 1.0.
- Furnaces complying with C406.2 must have an annual fuel utilization efficiency (AFUE) ≥ 88, which requires moving to a condensing technology not commercially available in rooftop units.

Dual fuel RTUs solve these limitations by operating in heat pump heating mode when it is efficient to do so, and furnace heating mode when the heat pump cannot run efficiently. In many buildings, this will yield improved source efficiency, significantly lower energy costs, and lower combined emissions when compared to any other practical alternative.

Cost Impact: The code change proposal will decrease the cost of construction

The proposed code change will decrease construction costs by providing additional options for equipment to comply with Section C406.2 and allowing the designer to select the optimal solution. It will also decrease utility costs for building owners and occupants by utilizing the most efficient heating source for a given outdoor ambient temperature, and has the potential to decrease utility costs further by enabling more effective demand response during peak electricity periods.

CE226-19

IECC: SECTION C406, C406.1, TABLE C406.1(1) (New), TABLE C406.1(2) (New), TABLE C406.1(3) (New), TABLE C406.1(4) (New), TABLE C406.1(5) (New), C406.1.1, C406.2, C406.2.1 (New), C406.2.2 (New), C406.2.3 (New), C406.2.4 (New), C406.3, C406.3.3 (New), C406.5 (New), C406.5, C406.5.2 (New), C406.7, C406.7.1, C406.7.3 (New), C406.7.4 (New)

Proponent: Louis Starr (lstarr@neea.org)

2018 International Energy Conservation Code

SECTION C406 ADDITIONAL EFFICIENCY PACKAGE OPTIONS REQUIREMENTS

C406.1 Requirements- Additional efficiency requirements. Buildings shall comply ~~New buildings shall~~ achieve a total of 10 credits from Tables C406.1(1) through C406.1(5) where the table is selected based on the use group of the building. Where a building contains multiple use groups, credits from each use group shall be weighted by floor area of each group to determine the weighted average building credit. Credits may also be as calculated in accordance the relevant subsection of C406. Credits from the tables or calculation shall be achieved where a building complies with one or more of the following:

1. More efficient HVAC performance in accordance with Section C406.2.
2. Reduced lighting power in accordance with Section C406.3.
3. Enhanced lighting controls in accordance with Section C406.4.
4. On-site supply of renewable energy in accordance with Section C406.5.
5. Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with Section C406.6.
6. High-efficiency service water heating in accordance with Section C406.7.
7. Enhanced envelope performance in accordance with Section C406.8.
8. Reduced air infiltration in accordance with Section C406.9

Add new text as follows:

**TABLE C406.1(1)
ADDITIONAL ENERGY EFFICIENCY CREDITS FOR GROUP B OCCUPANCIES**

Sub-section / Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6 A	6 B	7	8
C406.2.1: 5% Heating Eff Imprv.	NA	1	NA	NA	1	1	NA	1									
C406.2.2: 5% Cooling Eff Imprv.	6	6	5	5	4	4	3	3	3	2	2	2	1	2	2	2	1
C406.2.3: 10 % Heating Eff Imprv.	NA	1	NA	NA	2	1	1	2	2	NA	1						
C406.2.4: 10 % Cooling Eff Imprv.	11	12	10	9	7	7	6	5	6	4	4	5	3	4	3	3	3
C406.3.1: Reduce Light Power 10%	9	8	9	9	9	9	10	8	9	9	7	8	8	6	7	7	6
C406.3.3: Lamp Efficacy	NA	NA	NA	NA													
C406.4: Enh. Digital Light Ctrl	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	1	1
C406.5.1: On-site Renewable Egy.	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
C406.6 : Dedicated OA Sys (DOAS)	4	4	4	4	4	3	2	5	3	2	5	3	2	7	4	5	3
C406.7.2: Recovered/Renew SWH	NA	NA	NA	NA													
C406.7.3: Eff fossil fuel SWH	NA	NA	NA	NA													

C406.7.4: Heat Pump SWH	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C406.8: Enhanced Envelope Perf	<u>1</u>	<u>4</u>	<u>2</u>	<u>4</u>	<u>4</u>	<u>3</u>	NA	<u>7</u>	<u>4</u>	<u>5</u>	<u>10</u>	<u>7</u>	<u>6</u>	<u>11</u>	<u>10</u>	<u>14</u>	<u>16</u>
C406.9: Reduced Air Infiltration	<u>2</u>	<u>1</u>	<u>1</u>	<u>2</u>	<u>4</u>	<u>1</u>	NA	<u>8</u>	<u>2</u>	<u>3</u>	<u>11</u>	<u>4</u>	<u>1</u>	<u>15</u>	<u>8</u>	<u>11</u>	<u>6</u>

TABLE C406.1(2)
ADDITIONAL ENERGY EFFICIENCY CREDITS FOR GROUP R AND I OCCUPANCIES

Sub-section / Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6 A	6 B	7	8
C406 .2.1: 5% Heating Eff Imprv.	NA	NA	NA	NA	<u>1</u>	NA	NA	<u>1</u>	NA	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>2</u>	<u>1</u>	<u>2</u>	<u>2</u>
C406 .2.2: 5% Cooling Eff Imprv.	<u>3</u>	<u>3</u>	<u>2</u>	<u>2</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	NA	<u>1</u>	<u>1</u>	NA	<u>1</u>	<u>1</u>	<u>1</u>	NA
C406 .2.3: 10 % Heating Eff Imprv.	NA	NA	NA	NA	<u>1</u>	NA	NA	<u>1</u>	<u>1</u>	<u>1</u>	<u>2</u>	<u>2</u>	<u>1</u>	<u>3</u>	<u>2</u>	<u>3</u>	<u>4</u>
C406 .2.4: 10 % Cooling Eff Imprv.	<u>5</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>3</u>	<u>1</u>	<u>2</u>	<u>2</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>
C406 .3.1: Reduce Light Power 10%	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>3</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>						
C406 .3.3: Lamp Efficacy	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>1</u>	<u>2</u>	<u>2</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>						
C406 .4: Enh. Digital Light Ctrl	NA	NA	NA	NA													
C406 .5.1: On-site Renewable Egy.	<u>8</u>	<u>8</u>	<u>8</u>	<u>8</u>	<u>7</u>	<u>8</u>	<u>8</u>	<u>7</u>	<u>7</u>	<u>7</u>	<u>7</u>						
C406 .6 : Dedicated OA Sys (DOAS)	<u>3</u>	<u>4</u>	<u>3</u>	<u>3</u>	<u>4</u>	<u>2</u>	NA	<u>6</u>	<u>3</u>	<u>4</u>	<u>8</u>	<u>5</u>	<u>5</u>	<u>10</u>	<u>7</u>	<u>11</u>	<u>12</u>
C406 .7.2: Recovered/Renew SWH	<u>10</u>	<u>9</u>	<u>11</u>	<u>10</u>	<u>13</u>	<u>12</u>	<u>15</u>	<u>14</u>	<u>14</u>	<u>15</u>	<u>14</u>	<u>14</u>	<u>16</u>	<u>14</u>	<u>15</u>	<u>15</u>	<u>15</u>
C406 .7.3: Eff fossil fuel SWH	<u>5</u>	<u>5</u>	<u>6</u>	<u>6</u>	<u>8</u>	<u>7</u>	<u>8</u>	<u>8</u>	<u>8</u>	<u>9</u>	<u>9</u>	<u>9</u>	<u>10</u>	<u>10</u>	<u>9</u>	<u>10</u>	<u>11</u>
C406 .7.4: Heat Pump SWH	<u>6</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>												
C406 .8: Enhanced Envelope Perf	<u>3</u>	<u>6</u>	<u>3</u>	<u>5</u>	<u>4</u>	<u>4</u>	<u>1</u>	<u>4</u>	<u>3</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>3</u>	<u>5</u>	<u>4</u>	<u>6</u>	<u>6</u>
C406 .9: Reduced Air Infiltration	<u>6</u>	<u>5</u>	<u>3</u>	<u>11</u>	<u>6</u>	<u>4</u>	NA	<u>7</u>	<u>3</u>	<u>3</u>	<u>9</u>	<u>5</u>	<u>1</u>	<u>13</u>	<u>6</u>	<u>8</u>	<u>3</u>

TABLE C406.1(3)
ADDITIONAL ENERGY EFFICIENCY CREDITS FOR GROUP E OCCUPANCIES

Sub-section / Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6 A	6 B	7	8
C406 .2.1: 5% Heating Eff Imprv.	NA	NA	NA	NA	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>2</u>	<u>1</u>	<u>2</u>	<u>1</u>	<u>2</u>	<u>2</u>	<u>3</u>	<u>4</u>
C406 .2.2: 5% Cooling Eff Imprv.	<u>4</u>	<u>4</u>	<u>3</u>	<u>3</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	NA	<u>1</u>	<u>1</u>	<u>1</u>	NA
C406 .2.3: 10 % Heating Eff Imprv.	NA	NA	NA	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>3</u>	<u>4</u>	<u>3</u>	<u>4</u>	<u>3</u>	<u>5</u>	<u>7</u>
C406 .2.4: 10 % Cooling Eff Imprv.	<u>7</u>	<u>8</u>	<u>7</u>	<u>6</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>4</u>	<u>3</u>	<u>1</u>	<u>2</u>	<u>2</u>	<u>1</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>1</u>
C406 .3.1: Reduce Light Power 10%	<u>8</u>	<u>8</u>	<u>8</u>	<u>9</u>	<u>8</u>	<u>9</u>	<u>9</u>	<u>8</u>	<u>9</u>	<u>9</u>	<u>8</u>	<u>9</u>	<u>8</u>	<u>7</u>	<u>8</u>	<u>7</u>	<u>7</u>
C406 .3.3: Lamp Efficacy	NA	NA	NA	NA													
C406 .4: Enh. Digital Light Ctrl	<u>2</u>	<u>3</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>1</u>										
C406 .5.1: On-site Renewable Egy.	<u>6</u>	<u>6</u>	<u>5</u>	<u>5</u>													
C406 .6 : Dedicated OA Sys (DOAS)	NA	NA	NA	NA													
C406 .7.2: Recovered/Renew SWH ^a	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>													
C406 .7.3: Eff fossil fuel SWH ^a	NA	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>2</u>	<u>2</u>	<u>3</u>	<u>2</u>	<u>3</u>	<u>2</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>5</u>
C406 .7.4: Heat Pump SWH ^a	NA	<u>1</u>	NA	NA	<u>1</u>	<u>1</u>	NA	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>						
C406 .8: Enhanced Envelope Perf	<u>3</u>	<u>7</u>	<u>3</u>	<u>4</u>	<u>2</u>	<u>4</u>	<u>1</u>	<u>1</u>	<u>3</u>	<u>1</u>	<u>2</u>	<u>3</u>	NA	<u>4</u>	<u>3</u>	<u>6</u>	<u>9</u>
C406 .9: Reduced Air Infiltration	<u>1</u>	<u>1</u>	<u>1</u>	<u>2</u>	NA	NA	NA	NA	NA	NA	<u>1</u>	NA	NA	<u>4</u>	<u>1</u>	<u>4</u>	<u>3</u>

a. For schools with full service kitchens or showers

**TABLE C406.1(4)
ADDITIONAL ENERGY EFFICIENCY CREDITS FOR GROUP M OCCUPANCIES**

Sub-section / Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6 A	6 B	7	8
C406 .2.1: 5% Heating Eff Imprv.	NA	NA	NA	NA	1	1	NA	1	1	2	2	2	2	3	2	3	4
C406 .2.2: 5% Cooling Eff Imprv.	5	6	4	4	3	3	1	2	2	1	1	2	NA	1	1	1	NA
C406 .2.3: 10 % Heating Eff Imprv.	NA	NA	NA	1	1	1	1	2	2	4	3	4	5	5	3	6	8
C406 .2.4: 10 % Cooling Eff Imprv.	9	12	9	8	6	6	3	4	4	1	2	3	NA	2	2	2	1
C406 .3.1: Reduce Light Power 10%	13	13	15	14	16	14	17	15	15	14	12	14	14	16	16	14	12
C406 .3.3: Lamp Efficacy	NA	NA	NA	NA													
C406 .4: Enh. Digital Light Ctrl	NA	NA	NA	NA													
C406 .5.1: On-site Renewable Egy.	8	8	8	8	8	8	8	8	8	7	7	7	7	7	7	7	6
C406 .6 : Dedicated OA Sys (DOAS)	3	4	3	3	3	3	1	3	2	2	2	3	2	4	3	4	4
C406 .7.2: Recovered/Renew SWH	NA	NA	NA	NA													
C406 .7.3: Eff fossil fuel SWH	NA	NA	NA	NA													
C406 .7.4: Heat Pump SWH	NA	NA	NA	NA													
C406 .8: Enhanced Envelope Perf	4	6	3	4	3	3	1	6	4	4	4	5	4	6	5	8	9
C406 .9: Reduced Air Infiltration	1	1	1	2	1	1	NA	3	1	1	3	2	1	7	3	6	3

**TABLE C406.1(5)
ADDITIONAL ENERGY EFFICIENCY CREDITS FOR OTHER OCCUPANCIES**

Sub-section / Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6 A	6 B	7	8
C406 .2.1: 5% Heating Eff Imprv.	NA	NA	NA	NA	1	1	1	1	1	2	1	2	1	2	2	3	3
C406 .2.2: 5% Cooling Eff Imprv.	5	5	4	4	3	3	2	2	2	1	1	2	1	1	1	1	1
C406 .2.3: 10 % Heating Eff Imprv.	NA	NA	NA	1	1	1	1	2	2	3	3	3	3	4	3	5	5
C406 .2.4: 10 % Cooling Eff Imprv.	8	9	8	7	5	5	3	4	4	2	2	3	2	2	2	2	2
C406 .3.1: Reduce Light Power 10%	8	8	9	9	9	9	10	8	9	9	7	8	8	8	8	8	7
C406 .3.3: Lamp Efficacy	NA	NA	NA	NA													
C406 .4: Enh. Digital Light Ctrl	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	1
C406 .5.1: On-site Renewable Egy.	8	8	8	8	8	8	8	8	8	7	7	7	7	7	7	7	7
C406 .6 : Dedicated OA Sys (DOAS)	3	4	3	3	4	3	2	5	3	3	5	4	3	7	5	7	6
C406 .7.2: Recovered/Renew SWH ^b	10	9	11	10	13	12	15	14	14	15	14	14	16	14	15	15	15
C406 .7.3: Eff fossil fuel SWH ^b	5	5	6	6	8	7	8	8	8	9	9	9	10	10	9	10	11
C406 .7.4: Heat Pump SWH ^b	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
C406 .8: Enhanced Envelope Perf	3	6	3	4	3	4	1	5	4	3	5	5	4	7	6	9	10
C406 .9: Reduced Air Infiltration	3	2	2	4	4	2	NA	6	2	2	6	4	1	10	5	7	4

a. Other occupancy groups include all Groups except for Groups B, R, I, E, and M.

b. For occupancy groups listed in C406 .7.1.

C406.1.1 Tenant spaces. Tenant spaces shall comply with sufficient options form Tables C406 .1(1) through C406 .1(5) to achieve a minimum number of 5 credits, where credits are selected from Section C406.2, C406.3, C406.4, C406.6 or C406.7. Alternatively Where the entire building complies using credits from Section C406 .5, C406 .8 or C406 .9, tenant spaces within the building shall be deemed to comply with Section C406.5 where the entire building is in compliance. this section

Exception: Previously occupied tenant spaces that comply with this code in accordance with Section C501.

C406.2 More efficient HVAC equipment performance. Equipment shall exceed the minimum efficiency requirements listed in Tables C403.3.2(1) through C403.3.2(7) ~~by 10 percent, in addition to the requirements of Section C403. Where multiple performance requirements are provided, the equipment shall exceed all requirements by 10 percent.~~ 9) and Variable refrigerant flow systems shall exceed listed in the energy efficiency provisions of ANSI/ASHRAE/IESNA 90.1 by 10 percent, in accordance with Sections C406 .2.1, C406 .2.2, C406 .2.3 or C406 .2.4. Equipment shall also meet applicable requirements of Section C403. Energy efficiency credits for heating shall be selected from C406 .2.1 or C406 .2.3 and energy efficiency credits for cooling shall be selected from C406 .2.2 or C406 .2.4. Selected credits shall include a heating or cooling energy efficiency credit or both. Equipment not listed in Tables C403.3.2(1) through C403.3.2(7_9) shall be limited to 10 percent of the total building system capacity. capacity for heating equipment where selecting C406 .2.1 or C406 .2.3 and cooling equipment where selecting C406 .2.2 or C406 .2.4.

Add new text as follows:

C406.2.1 Five percent heating efficiency improvement Equipment shall exceed the minimum heating efficiency requirements by 5 percent.

C406.2.2 Five percent cooling efficiency improvement Equipment shall exceed the minimum cooling and heat rejection efficiency requirements by 5 percent. Where multiple cooling performance requirements are provided, the equipment shall exceed the annual energy requirement, including IEER, SEER, and IPLV.

C406.2.3 Ten percent heating efficiency improvement Equipment shall exceed the minimum heating efficiency requirements by 10 percent.

C406.2.4 Ten percent cooling efficiency improvement Equipment shall exceed the minimum cooling and heat rejection efficiency requirements by 10 percent. Where multiple cooling performance requirements are provided, the equipment shall exceed the annual energy requirement, including IEER, SEER, and IPLV.

Revise as follows:

C406.3 Reduced lighting power. The total connected interior lighting power calculated in accordance with Section C405.3.1 shall be less than 90 percent of the total lighting power allowance calculated in accordance with Section C405.3.2. Buildings shall comply with Section C406.3.1 or C406.3.2 and dwelling units and sleeping units within the building shall comply with C406.3.3.

C406.3 C406.3.1 Reduced lighting power. power by more than 10 percent. The total connected interior lighting power calculated in accordance with Section C405.3.1 shall be less than 90 percent of the total lighting power allowance calculated in accordance with Section C405.3.2.

Add new text as follows:

C406.2.3 Reduced lighting power by more than 15 percent. Where the total connected interior lighting power calculated in accordance with Section C405.3.1 is less than 85 percent of the total lighting power allowance calculated in accordance with Section C405.3.2, additional energy efficiency credits shall be determined based on Equation 4-12, rounded to the nearest whole number.

$AEEC_{LPA} = AEEC_{10} \times 10 \times (LPA - LPD) / LPA$ (Equation 4-12)

Where:

$AEEC_{LPA} = C406 .3.2$ additional energy efficiency credits

$LPD =$ total connected interior lighting power calculated in accordance with Section C405.3.1

$LPA =$ total lighting power allowance calculated in accordance with Section C405.3.2

$AEEC_{10} =$ C406.3.1 credits from Tables C406.1(1) through C406.1(5)

C406.3.3 Lamp efficacy Not less than 95 percent of the interior lighting power (watts) from lamps in permanently installed light fixtures in dwelling units and sleeping units shall be provided by lamps with a minimum efficacy of 65 lumens per watt.

C406.5 On-site renewable energy. Buildings shall comply with Section C406.5.1 or C406.5.2

C406.5 C406.5.1 On-site renewable energy- Basic Renewable Credits The total minimum ratings of on-site renewable energy systems not including systems used for credits under Section C406.7.2 shall be one of the following:

1. Not less than ~~1.71~~0.86 Btu/h per square foot (~~5.4~~2.7 W/m²) or ~~0.50~~0.25 watts per square foot (~~5.4~~2.7 W/m²) of conditioned floor area.
2. Not less than ~~3~~2 percent of the energy used within the building for building mechanical and service water heating equipment and lighting regulated in Chapter 4.

Add new text as follows:

C406.5.2 Enhanced Renewable Credit Where the total minimum ratings of on-site renewable energy systems exceeds the rating in C406.5.1(1), additional energy efficiency credits shall be determined based on Equation 4-13, rounded to the nearest whole number.

$AEEC_{RRa} = AEEC_{2.5} \times RR_a / RR_1$ (Equation 4-13)

Where:

$AEEC_{RRa} =$ C406 .5.2 additional energy efficiency credits

$RR_a =$ actual total minimum ratings of *on-site renewable energy* systems (in Btu/h, watts per square foot or W/m²).

$RR_1 =$ minimum ratings of *on-site renewable energy* systems required by C406 .5.1(1) (in Btu/h, watts per square foot or W/m²).

$AEEC_{2.5} =$ C406.5.1 credits from Tables C406 .1(1) through C406.1(5)

C406.7 Reduced energy use in service water heating. Buildings shall comply with Sections C406.7.1 and either C406 .7.2, C406 .7.3 or C406 .7.4. be of the following types to use this compliance method:

1. Group R-1: Boarding houses, hotels or motels.
2. Group I-2: Hospitals, psychiatric hospitals and nursing homes.
3. Group A-2: Restaurants and banquet halls or buildings containing food preparation areas.
4. Group F: Laundries.
5. Group R-2.

6. ~~Group A-3: Health clubs and spas.~~
7. ~~Buildings showing a service hot water load of 10 percent or more of total building energy loads, as shown with an energy analysis as described in Section C407.~~

~~**C406.7 C406.7.1 Reduced energy use in service water heating. Building Type** Buildings shall be To qualify for this credit, the building shall contain one be of the following use groups and the additional energy efficiency credit shall be prorated by conditioned floor area of the portion of the building comprised of the following types to use this compliance method groups:~~

1. ~~Group R-1: Boarding houses, hotels or motels.~~
2. ~~Group I-2: Hospitals, psychiatric hospitals and nursing homes.~~
3. ~~Group A-2: Restaurants and banquet halls or buildings containing food preparation areas.~~
4. ~~Group F: Laundries.~~
5. ~~Group R-2.~~
6. ~~Group A-3: Health clubs and spas.~~
7. Group E: Schools with full-service kitchens or locker rooms with showers
8. ~~Buildings showing a service hot water load of 10 percent or more of total building energy loads, as shown with an energy analysis as described in Section C407.~~

~~**C406.7.1 C406.7.2 Load fraction. Recovered or renewable water heating** The building service water-heating system shall have one or more of the following that are sized to provide not less than ~~60~~30 percent of the building's annual hot water requirements, or sized to provide ~~100~~70 percent of the building's annual hot water requirements if the building ~~shall otherwise is required to comply with Section C403.9.5:~~~~

1. ~~Waste heat recovery from service hot water, heat-recovery chillers, building equipment, or process equipment.~~
2. ~~On-site renewable energy water-heating systems.~~

Add new text as follows:

C406.7.3 Efficient fossil fuel water heater The combined input-capacity-weighted-average equipment rating of all fossil fuel water heating equipment in the building shall be not less than 95% Et or 0.95 EF. This option shall receive only half the listed credits for buildings required to comply with C404.2.1.

C406.7.4 Heat pump water heater Where electric resistance water heaters are allowed, all service hot water system heating requirements shall be met using heat pump technology with a combined input-capacity-weighted-average EF of 3.0. Air-source heat pump water heaters shall not draw conditioned air from within the building, except exhaust air that would otherwise be exhausted to the exterior.

Reason: C406 Credits for Dwelling Lighting Efficacy

This proposal builds on top of a proposal that assigns energy efficiency credits to each option in Section C406 (CE218-19). For clarity, that entire base proposal is included here with additional provisions and table row additions that provide additional energy efficiency credits when:

- The lighting power density is reduced by more than 15% below the required lighting power allowance. For this option the 10% reduction credits in Section C406.3.1 are multiplied by the ratio of actual lighting power density reduction to lighting power allowance
- The efficacy of lamps installed in sleeping and dwelling units is higher than required in the residential section of the code and appropriate credits for that improvement are added as new lines in the credit tables.

The provision expands the available credits for more than 10% lighting power reduction where the lighting

power density is reduced by more than 15%.

Currently, a 10% lighting reduction in lighting power allowance is required for this extra efficiency option; however dwelling units and sleeping units can follow the residential lighting efficacy requirements. As a result, the applicability of option C406.3 is unclear for multi-family buildings. This measure would make clear the 10% lighting reduction applies to areas in a multi-family building that are not dwelling units and sleeping units and would apply a higher efficacy rating in the dwelling and sleeping units than is required in the residential lighting requirements.

To achieve this extra efficiency credit, this measure would increase the efficacy requirement for lamps in permanently installed fixtures and make them more in line with lamps available today.

This measure provides more clarity for multi-family buildings for the extra efficiency credit. Lamps meeting the higher efficacy requirement are readily available and appropriate for an optional credit.

Bibliography:

Hart, R., R. Nambiar, M. Tyler, M., Y. Xie, and J. Zhang. "Relative Credits for Extra Efficiency Measures: Technical Brief." Pacific Northwest National Laboratory (PNNL), Richland, WA (US), January 2019.

https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-28370Rev.1.pdf.

www.1000bulbs.com for lamp prices

Cost Impact: The code change proposal will not increase or decrease the cost of construction. To achieve the lighting credit in multi-family buildings, this proposal will require higher efficacy lamps in dwelling units and sleeping units. However, these lamps are readily available in the market place, and checking internet sources has found them to actually be less costly than the slightly lower efficacy alternative required under the residential code. LED lamps were found to be about 85% the cost of similar output compact fluorescent lamps. If compared to incandescent lamps, there may be a cost increase, but the life of either the CFL or LED lamps is 10 or 15 times as long, resulting in a much lower cost per year of service.

Further, the current proposal does not require more investment, but rather expands existing options permitted under the 2018 IECC. In fact, credit is now given to lighting reductions greater than 10%. The intention is to assess relative savings equity amongst current options, and identify additional options to increase flexibility and more effectively utilize new technologies and construction practices.

There is not expected to be an increased cost, as several of the evaluated options are included in current code. In some cases, costs may be reduced, as the outlined approach provides partial credit for selected items as well as credit for items that may have previously been included in the building design without credit. Costs, and cost effectiveness, are not evaluated for individual measures due to the vast number of potential combinations amongst building types, climates, and selected options. Actual costs will vary based on the items selected by the building designer—architects, engineers, and other involved trades—based on the needs and goals of the individual project.

Proposal # 4981

CE226-19

CE227-19

IECC: C406.3

Proponent: Steven Rosenstock, Edison Electric Institute, representing Edison Electric Institute (srosenstock@eei.org)

2018 International Energy Conservation Code

Revise as follows:

C406.3 Reduced lighting power. The total connected interior lighting power calculated in accordance with Section C405.3.1 shall be less than ~~90-95~~ percent of the total lighting power allowance calculated in accordance with Section C405.3.2.

Reason: In another proposal, the LPD values being proposed for ASHRAE 90.1-2019 (Addendum bb) are proposed for the IECC. This addendum significantly lowers the LPD values in many spaces, due to the following:

-Going from 77% LED / 23% non-LED fixtures in 90.1-2016 modeling to 100% LED fixtures for 90.1-2019.

-Significantly increasing the average baseline efficacy to 110 Lumens / Watt.

-Reducing the target footcandles in common space types for 90.1-2019 compared to 90.1-2016.

(source: ASHRAE Lighting Subcommittee Presentation, August 2018)

Assuming that the other proposal passes, the "floor" of lighting efficiency will have increased significantly, leaving much less "head room" for higher efficiency options.

This proposal make this efficiency option more achievable and more realistic, based on the updated LPD values that are likely to be adopted in the next version of the IECC.

Bibliography: ASHRAE, "ANSI/ASHRAE/IES Standard 90.1 Lighting Model" Presentation, August 2, 2018.

Cost Impact: The code change proposal will decrease the cost of construction

This proposal makes this efficiency option more realistic and achievable with available technologies, and will reduce the cost of this option.

Proposal # 4861

CE227-19

CE228-19

IECC: C406, C406.1, C406.3, C406.3.1 (New), C406.3.2 (New)

Proponent: Mark Lyles, representing Northwest Energy Codes Group (markl@newbuildings.org)

2018 International Energy Conservation Code

SECTION C406 ADDITIONAL EFFICIENCY PACKAGE OPTIONS REQUIREMENTS

C406.1 Requirements- Additional energy efficiency requirements. ~~Buildings~~ New buildings shall comply with one or more of the following:

1. More efficient HVAC performance in accordance with Section C406.2.
2. Reduced lighting power in accordance with Section C406.3.
3. Enhanced lighting controls in accordance with Section C406.4.
4. On-site supply of renewable energy in accordance with Section C406.5.
5. Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with Section C406.6.
6. High-efficiency service water heating in accordance with Section C406.7.
7. Enhanced envelope performance in accordance with Section C406.8.
8. Reduced air infiltration in accordance with Section C406.9

Revise as follows:

C406.3 Reduced lighting power. ~~The total connected interior lighting power calculated in accordance with Section C405.3.1 shall be less than 90 percent of the total lighting power allowance calculated in accordance with Section C405.3.2. Buildings shall comply with Section C406.3.1 and dwelling units and sleeping units within the building shall comply with C406.3.2.~~

Add new text as follows:

C406.3.1 Reduce lighting power by more than 10 percent. The total connected interior lighting power calculated in accordance with Section C405.3.1 shall be less than 90 percent of the total lighting power allowance calculated in accordance with Section C405.3.2.

C406.3.2 Lamp Efficacy Not less than 95 percent of the interior lighting power (watts) from lamps in permanently installed light fixtures in dwelling units and sleeping units shall be provided by lamps with a minimum efficacy of 65 lumens per watt.

Reason: C406 add Dwelling Lighting Efficacy

Currently, a 10% lighting reduction in lighting power allowance is required for this extra efficiency option; however the lighting power concept does not apply to dwelling units and sleeping units, which can follow the residential lighting efficacy requirements. As a result, the applicability of option C406.3 is unclear for multi-family buildings. This measure would make clear the 10% lighting reduction applies to areas in a multi-family building that are not dwelling units and sleeping units and would apply a higher efficacy rating in the dwelling and sleeping units than is required in the residential lighting requirements.

For buildings with residential occupancy, this measure would increase the efficacy requirement for lamps in permanently installed fixtures and make them more in line with lamps available today. This measure provides more clarity for multi-family buildings for the lighting power reduction option. Lamps meeting the higher efficacy

requirement are readily available and appropriate for an optional credit.

Bibliography: Hart, R., R. Nambiar, M. Tyler, M., Y. Xie, and J. Zhang. “Relative Credits for Extra Efficiency Measures: Technical Brief.” Pacific Northwest National Laboratory (PNNL), Richland, WA (US), January 2019. https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-28370Rev.1.pdf.

www.1000bulbs.com for lamp prices

Cost Impact: The code change proposal will not increase or decrease the cost of construction. To use this reduced lighting power option to meet C406 requirements in buildings with residential areas this proposal will require higher efficacy lamps in dwelling units and sleeping units. However, these lamps are readily available in the market place, and checking internet sources has found them to actually be less costly than the slightly lower efficacy alternative required under the residential code. LED lamps were found to be about 85% the cost of similar output compact fluorescent lamps. If compared to incandescent lamps, there may be a cost increase, but the life of either the CFL or LED lamps is 10 or 15 times as long, resulting in a much lower cost per year of service.

Actual costs will vary based on the items selected by the building designer—architects, engineers, and other involved trades—based on the needs and goals of the individual project.

Proposal # 5767

CE228-19

CE229-19

IECC: C202, C406.1, TABLE C406.1(1) (New), TABLE C406.1(2) (New), TABLE C406.1(3) (New), TABLE C406.1(4) (New), TABLE C406.1(5) (New), C406.1.1, C406.2, C406.2.1 (New), C406.2.3 (New), C406.2.4 (New), C406.4, C406.5, C406.5.1 (New), C406.5.2 (New), C406.7, C406.7.1 (New), C406.7.1, C406.7.3 (New), C406.7.4 (New)

Proponent: Jonathan McHugh, representing McHugh Energy Consultants Inc. (jon@mchughenergy.com)

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Add new definition as follows:

LUMEN MAINTENANCE CONTROLS: A lighting control strategy that adjusts luminaire power over time to maintain constant light output as luminaires age, dirt accumulates or both. This strategy allows for energy savings in the life of the system then increases power as the system ages.

HIGH END TRIM: A lighting control strategy that sets the required maximum light level for each space.

SECTION C406 ADDITIONAL EFFICIENCY PACKAGE OPTIONS REQUIREMENTS

C406.1 Requirements. Buildings shall comply New buildings shall achieve a total of 10 credits from Tables C406.1(1) through C406.1(5) where the table is selected based on the use group of the building. Where a building contains multiple use groups, credits from each use group shall be weighted by floor area of each group to determine the weighted average building credit. Alternatively, credits shall be as calculated in accordance the relevant subsection of Section C406. Credits from the tables or calculation shall be achieved where a building complies with one or more of the following:

1. More efficient HVAC performance in accordance with Section C406.2.
2. Reduced lighting power in accordance with Section C406.3.
3. Enhanced lighting controls in accordance with Section C406.4.
4. On-site supply of renewable energy in accordance with Section C406.5.
5. Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with Section C406.6.
6. High-efficiency service water heating in accordance with Section C406.7.
7. Enhanced envelope performance in accordance with Section C406.8.
8. Reduced air infiltration in accordance with Section C406.9

Add new text as follows:

TABLE C406.1(1)
ADDITIONAL ENERGY EFFICIENCY CREDITS FOR GROUP B OCCUPANCY

Sub-section / Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6 A	6 B	7	8
C406.2.1: 5% Heating Eff Imprv.	NA	1	NA	NA	1	1	NA	1									
C406.2.2: 5% Cooling Eff Imprv.	6	6	5	5	4	4	3	3	3	2	2	2	1	2	2	2	1

C406.2.3: 10 % Heating Eff Imprv.	NA	1	NA	NA	2	1	1	2	2	NA	1						
C406.2.4: 10 % Cooling Eff Imprv.	11	12	10	9	7	7	6	5	6	4	4	5	3	4	3	3	3
C406.3: Reduced Light Power	9	8	9	9	9	9	10	8	9	9	7	8	8	6	7	7	6
C406.4: Enh. Digital Light Ctrl	4	4	4	4	4	4	4	3	4	4	3	3	4	3	3	3	3
C406.5.1: On-site Renewable Egy.	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
C406.6 : Dedicated OA Sys (DOAS)	4	4	4	4	4	3	2	5	3	2	5	3	2	7	4	5	3
C406.7.2: Recovered/Renew SWH	NA																
C406.7.3: Eff fossil fuel SWH	NA																
C406.7.4: Heat Pump SWH	NA																
C406.8: Enhanced Envelope Perf	1	4	2	4	4	3	NA	7	4	5	10	7	6	11	10	14	16
C406.9: Reduced Air Infiltration	2	1	1	2	4	1	NA	8	2	3	11	4	1	15	8	11	6

**TABLE C406.1(2)
ADDITIONAL ENERGY EFFICIENCY CREDITS FOR GROUP R AND I OCCUPANCIES**

Sub-section / Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6 A	6 B	7	8
C406 .2.1: 5% Heating Eff Imprv.	NA	NA	NA	NA	1	NA	NA	1	NA	1	1	1	1	2	1	2	2
C406 .2.2: 5% Cooling Eff Imprv.	3	3	2	2	1	1	1	1	1	NA	1	1	NA	1	1	1	NA
C406 .2.3: 10 % Heating Eff Imprv.	NA	NA	NA	NA	1	NA	NA	1	1	1	2	2	1	3	2	3	4
C406 .2.4: 10 % Cooling Eff Imprv.	5	5	4	3	2	3	1	2	2	1	1	1	1	1	1	1	1
C406 .3: Reduced Light Power	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2
C406 .4: Enh. Digital Light Ctrl	NA	NA	NA	NA													
C406 .5.1: On-site Renewable Egy.	8	8	8	8	7	8	8	7	7	7	7	7	7	7	7	7	7
C406 .6 : Dedicated OA Sys (DOAS)	3	4	3	3	4	2	NA	6	3	4	8	5	5	10	7	11	12
C406 .7.2: Recovered/Renew SWH	10	9	11	10	13	12	15	14	14	15	14	14	16	14	15	15	15
C406 .7.3: Eff fossil fuel SWH	5	5	6	6	8	7	8	8	8	9	9	9	10	10	9	10	11
C406 .7.4: Heat Pump SWH	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
C406 .8: Enhanced Envelope Perf	3	6	3	5	4	4	1	4	3	3	4	5	3	5	4	6	6
C406 .9: Reduced Air Infiltration	6	5	3	11	6	4	NA	7	3	3	9	5	1	13	6	8	3

**TABLE C406.1(3)
ADDITIONAL ENERGY EFFICIENCY CREDITS FOR GROUP E OCCUPANCY**

Sub-section / Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6 A	6 B	7	8
C406.2.1: 5% Heating Eff Imprv.	NA	NA	NA	NA	1	1	1	1	1	2	1	2	1	2	2	3	4
C406.2.2: 5% Cooling Eff Imprv.	4	4	3	3	2	2	2	2	1	1	1	1	NA	1	1	1	NA
C406.2.3: 10 % Heating Eff Imprv.	NA	NA	NA	1	1	1	1	2	3	4	3	4	3	4	3	5	7
C406.2.4: 10 % Cooling Eff Imprv.	7	8	7	6	5	4	3	4	3	1	2	2	1	2	2	2	1
C406.3: Reduced Light Power	8	8	8	9	8	9	9	8	9	9	8	9	8	7	8	7	7
C406.4: Enh. Digital Light Ctrl	3	4	3	4	3	4	3	4	5	4	4	5	3	4	4	3	2
C406.5.1: On-site Renewable Egy.	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	5
C406.6 : Dedicated OA Sys (DOAS)	NA	NA	NA	NA													

C406.7.2: Recovered/Renew SWH ^a	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
C406 .7.3: Eff fossil fuel SWH ^a	NA	1	1	1	1	1	1	2	2	3	2	3	2	3	3	3	5
C406 .7.4: Heat Pump SWH ^a	NA	1	NA	NA	1	1	NA	1	1	1	1						
C406.8: Enhanced Envelope Perf	3	7	3	4	2	4	1	1	3	1	2	3	NA	4	3	6	9
C406.9: Reduced Air Infiltration	1	1	1	2	NA	NA	NA	NA	NA	NA	1	NA	NA	4	1	4	3

a. For schools with showers or full service kitchens

**TABLE C406.1(4)
ADDITIONAL ENERGY EFFICIENCY CREDITS FOR GROUP M OCCUPANCIES**

Sub-section / Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6 A	6 B	7	8
C406 .2.1: 5% Heating Eff Imprv.	NA	NA	NA	NA	1	1	NA	1	1	2	2	2	2	3	2	3	4
C406 .2.2: 5% Cooling Eff Imprv.	5	6	4	4	3	3	1	2	2	1	1	2	NA	1	1	1	NA
C406 .2.3: 10 % Heating Eff Imprv.	NA	NA	NA	1	1	1	1	2	2	4	3	4	5	5	3	6	8
C406 .2.4: 10 % Cooling Eff Imprv.	9	12	9	8	6	6	3	4	4	1	2	3	NA	2	2	2	1
C406 .3: Reduced Light Power	13	13	15	14	16	14	17	15	15	14	12	14	14	16	16	14	12
C406 .4: Enh. Digital Light Ctrl	NA	NA	NA	NA													
C406 .5.1: On-site Renewable Egy.	8	8	8	8	8	8	8	8	8	7	7	7	7	7	7	7	6
C406 .6 : Dedicated OA Sys (DOAS)	3	4	3	3	3	3	1	3	2	2	2	3	2	4	3	4	4
C406 .7.2: Recovered/Renew SWH	NA	NA	NA	NA													
C406 .7.3: Eff fossil fuel SWH	NA	NA	NA	NA													
C406 .7.4: Heat Pump SWH	NA	NA	NA	NA													
C406 .8: Enhanced Envelope Perf	4	6	3	4	3	3	1	6	4	4	4	5	4	6	5	8	9
C406 .9: Reduced Air Infiltration	1	1	1	2	1	1	NA	3	1	1	3	2	1	7	3	6	3

**C406.1(5)
TABLE Additional Energy Efficiency Credits for Other^a Occupancies**

Sub-section / Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6 A	6 B	7	8
C406.2.1: 5% Heating Eff Imprv.	NA	NA	NA	NA	1	1	1	1	1	2	1	2	1	2	2	3	3
C406.2.2: 5% Cooling Eff Imprv.	5	5	4	4	3	3	2	2	2	1	1	2	1	1	1	1	1
C406.2.3: 10 % Heating Eff Imprv.	NA	NA	NA	1	1	1	1	2	2	3	3	3	3	4	3	5	5
C406.2.4: 10 % Cooling Eff Imprv.	8	9	8	7	5	5	3	4	4	2	2	3	2	2	2	2	2
C406.3: Reduced Light Power	8	8	9	9	9	9	10	8	9	9	7	8	8	8	8	7	7
C406.4: Enh. Digital Light Ctrl	4	4	4	4	4	4	4	4	5	4	4	4	4	4	4	3	3
C406.5.1: On-site Renewable Egy.	8	8	8	8	8	8	8	8	8	7	7	7	7	7	7	7	7
C406.6 : Dedicated OA Sys (DOAS)	3	4	3	3	4	3	2	5	3	3	5	4	3	7	5	7	6
C406.7.2: Recovered/Renew SWH ^b	10	9	11	10	13	12	15	14	14	15	14	14	16	14	15	15	15
C406.7.3: Eff fossil fuel SWH ^b	5	5	6	6	8	7	8	8	8	9	9	9	10	10	9	10	11
C406.7.4: Heat Pump SWH ^b	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
C406.8: Enhanced Envelope Perf	3	6	3	4	3	4	1	5	4	3	5	5	4	7	6	9	10

C406.9: Reduced Air Infiltration	<u>3</u>	<u>2</u>	<u>2</u>	<u>4</u>	<u>4</u>	<u>2</u>	<u>NA</u>	<u>6</u>	<u>2</u>	<u>2</u>	<u>6</u>	<u>4</u>	<u>1</u>	<u>10</u>	<u>5</u>	<u>7</u>	<u>4</u>
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a. Other occupancy groups include all Groups except for Groups B, R, I, E, and M.

b. For occupancy groups listed in Section C406.7.1.

C406.1.1 Tenant spaces. Tenant spaces shall comply with sufficient options form Tables C406 .1(1) through C406 .1(5) to achieve a minimum number of 5 credits, where credits are selected from Section C406.2, C406.3, C406.4, C406.6 or C406.7. Alternatively, tenant spaces shall Where the entire building complies using credits from Section C406.5, C406.8 or C406.9 tenant spaces within the buildings shall be deemed to comply with Section C406.5 where the entire building is in compliance.

Exception: Previously occupied tenant spaces that comply with this code in accordance with Section C501.

C406.2 More efficient HVAC equipment performance. Equipment shall exceed the minimum efficiency requirements listed in Tables C403.3.2(1) through C403.3.2(7) ~~by 10 percent, in addition to the requirements of Section C403. Where multiple performance requirements are provided, the equipment shall exceed all requirements by 10 percent.~~ 9) and Variable refrigerant flow systems shall exceed listed in the energy efficiency provisions of ANSI/ASHRAE/IESNA 90.1 by 10 percent. in accordance with Section C406.2.1, C406.2.2, C406.2.3 or C406.2.4. Equipment shall also meet applicable requirements of Section C403. Energy efficiency credits for heating shall be selected from Section C406.2.1 or C406.2.3 and energy efficiency credits for cooling shall be selected from Section C406.2.2 or C406.2.4. Selected credits shall include a heating or cooling energy efficiency credit or both. . Equipment not listed in Tables C403.3.2(1) through C403.3.2(7) 9) and Variable refrigerant flow systems not listed in the energy efficiency provisions of ANSI/ASHRAE/IES 90 .1 shall be limited to 10 percent of the total building system capacity. capacity for heating equipment where selecting Section C406.2.1 or C406.2.3 and cooling equipment where selecting Section C406.2.2 or C406.2.4.

Add new text as follows:

C406.2.1 Five percent heating efficiency improvement Equipment shall exceed the minimum heating efficiency requirements by 5 percent.

C406.2.2 Five percent cooling efficiency improvement Equipment shall exceed the minimum cooling and heat rejection efficiency requirements by 5 percent. Where multiple cooling performance requirements are provided, the equipment shall exceed the annual energy requirement, including IEER, SEER, and IPLV.

C406.2.3 Ten percent heating efficiency improvement Equipment shall exceed the minimum heating efficiency requirements by 10 percent.

C406.2.4 Ten percent cooling efficiency improvement Equipment shall exceed the minimum cooling and heat rejection efficiency requirements by 10 percent. Where multiple cooling performance requirements are provided, the equipment shall exceed the annual energy requirement, including IEER, SEER, and IPLV.

Revise as follows:

C406.4 Enhanced digital lighting controls. ~~Interior lighting in~~ At least 90 percent of the building floor area shall have interior lighting with the following enhanced lighting controls for luminaires providing general lighting, that shall be located, scheduled and operated in accordance with Section ~~C405.2.2. C405.2.~~

1. Luminaires shall be configured for continuous dimming.
2. Luminaires shall be addressed individually. Where individual addressability is not available for the luminaire class type, a controlled group of not more than four luminaries shall be allowed.

3. Not more than eight luminaires shall be controlled together in a *daylight zone*.
4. Fixtures shall be controlled through a digital control system that includes the following function:
 - 4.1. Control reconfiguration based on digital addressability.
 - 4.2. Load shedding.
 - 4.3. Individual user control of overhead general illumination in open offices.
 - 4.4. Occupancy sensors shall be capable of being reconfigured through the digital control system.
5. Construction documents shall include submittal of a Sequence of Operations, including a specification outlining each of the functions in Item 4.
6. Functional testing of lighting controls shall comply with Section C408. High end trim controls shall be enabled and configured to limit the initial maximum output or maximum power draw of the controlled lighting to 85 percent or less of full light output or full power draw for both of the following:
 - 6.1 All areas that have *lumen maintenance controls*
 - 6.2 50% of the remaining floor area.

C406.5 On-site renewable energy. ~~The total minimum ratings of on-site renewable energy systems shall be one of the following:~~

- ~~1. Not less than 1.71 Btu/h per square foot (5.4 W/m²) or 0.50 watts per square foot (5.4 W/m²) of conditioned floor area.~~
 - ~~2. Not less than 3 percent of the energy used within the building for building mechanical and service water heating equipment and lighting regulated in Chapter 4.~~
- ~~Buildings shall comply with Section C406 .5.1 or C406 .5.2.~~

Add new text as follows:

C406.5.1 Basic renewable credits. The total minimum ratings of on-site renewable energy systems not including systems used for credits under Sections C406.7.2 shall be one of the following:

1. Not less than 0.86 Btu/h per square foot (2.7 W/m²) or 0.25 watts per square foot (2.7 W/m²) of conditioned floor area.
2. Not less than 2 percent of the energy used within the building for building mechanical and service water heating equipment and lighting regulated in Chapter 4.

C406.5.2 Enhanced Renewable Credits Where the total minimum ratings of on-site renewable energy systems exceeds the rating in C406.5.1(1), additional energy efficiency credits shall be determined based on Equation 4-13, rounded to the nearest whole number.

$$AEEC_{RRa} = AEEC_{2.5} \times RR_a / RR_1 \text{ (Equation 4-13)}$$

Where:

$$AEEC_{RRa} = \text{C406 .5.2 additional energy efficiency credits}$$

RR_a = actual total minimum ratings of on-site renewable energy systems in Btu/h, watts per square foot or W/m²

RR_1 = minimum ratings of on-site renewable energy systems required by C406 .5.1(1) in Btu/h, watts per square foot or W/m²

$$AEEC_{2.5} = \text{C406 .5.1 credits from Tables C406.1(1) through C406.1(5)}$$

Revise as follows:

C406.7 Reduced energy use in service water heating. Buildings shall comply with Section C406 .7.1 and Section C406.7.2, C406.7.3 or C406 .7.4. be of the following types to use this compliance method:

1. ~~Group R-1: Boarding houses, hotels or motels.~~
2. ~~Group I-2: Hospitals, psychiatric hospitals and nursing homes.~~
3. ~~Group A-2: Restaurants and banquet halls or buildings containing food preparation areas.~~
4. ~~Group F: Laundries.~~
5. ~~Group R-2.~~
6. ~~Group A-3: Health clubs and spas.~~
7. ~~Buildings showing a service hot water load of 10 percent or more of total building energy loads, as shown with an energy analysis as described in Section C407.~~

Add new text as follows:

C406.7.1 Building type. To qualify for this credit, the building shall contain one be of the following use groups and the additional energy efficiency credit shall be prorated by conditioned floor area of the portion of the building comprised of the following use groups:

1. Group R-1: Boarding houses, hotels or motels.
2. Group I-2: Hospitals, psychiatric hospitals and nursing homes.
3. Group A-2: Restaurants and banquet halls or buildings containing food preparation areas.
4. Group F: Laundries.
5. Group R-2.
6. Group A-3: Health clubs and spas.
7. Group E: Schools with full-service kitchens or locker rooms with showers
8. Buildings showing a service hot water load of 10 percent or more of total building energy loads, as shown with an energy analysis as described in Section C407.

~~C406.7.1 C406.7.2~~ **Load fraction. Recovered or renewable water heating.** The building service water-heating system shall have one or more of the following that are sized to provide not less than ~~60-30~~ percent of the building's annual hot water requirements, or sized to provide ~~40-70~~ percent of the building's annual hot water requirements if the building ~~shall otherwise is required to~~ comply with Section C403.9.5:

1. Waste heat recovery from service hot water, heat-recovery chillers, building equipment, or process equipment.
2. *On-site renewable energy* water-heating systems.

Add new text as follows:

C406.7.3 Efficient fossil fuel water heater. The combined input-capacity-weighted-average equipment rating of all fossil fuel water heating equipment in the building shall be not less than 95 percent Et or 0.95 EF. This option shall receive only half the listed credits for buildings required to comply with C404.2.1.

C406.7.4 Heat pump water heater. Where electric resistance water heaters are allowed, all service hot water system heating requirements shall be met using heat pump technology with a combined input-capacity-weighted-average EF of 3.0. Air-source heat pump water heaters shall not draw conditioned air from within the building, except exhaust air that would otherwise be exhausted to the exterior.

Reason:

C406 Credits for Enhanced digital lighting controls.

This proposal builds on top of a proposal (CE218-19) that assigns energy efficiency credits to each option in Section C406. For clarity, that entire base proposal is included here. Additional provisions and table row

modifications are as follows:

- The provisions of Enhanced Digital lighting are clarified to require high end trim tuning, including definitions to support those clarifications.
- The credits in the tables are increased for enhanced digital light control based on the clarified provisions in C406.4 that are expected to produce increased savings.

Compared to the existing enhanced lighting controls in C406.4, this proposal provides for more certain savings through light level tuning with the option of lumen maintenance control.

Enhanced lighting controls (Section C406.4) can save more energy by tuning maximum light levels to just what is needed throughout the building. Making this requirement explicit and requiring documentation can actually achieve greater savings.

In the proposed code language, changes are made to allow for the following:

- Definitions are added for lumen maintenance controls and high end trim. These definitions are adapted from NEMA-LSD-64. The high end trim definition exactly matches the NEMA definition, and the lumen maintenance definition is adjusted to refer to luminaire power rather than lamp power.
- The area required with the specified controls is adjusted to 90%. Under current language, all luminaires in the building would need to meet the control requirements. This does not make sense for areas like mechanical and electrical rooms, stairwells, and restrooms, where the specified controls would not provide an energy benefit.
- The specified controls are required only for luminaires providing general lighting.
- A requirement for high end trim was added for any areas with lumen maintenance controls, plus 50% of the remaining area.

High end trim or tuning accounts for the fact that maximum lighting with full output at the lighting power allowance level typically provides more lighting than necessary, due to increments in luminaire size and limits on exact luminaire spacing. Requiring tuning that reduces light levels and power by at least 15%, along with documentation in the lighting functional testing process will reduce actual light power levels. While the original language for this type of control provides the capability to tune, without the trim requirement, there is not a strong argument for savings actually occurring. Lumen maintenance controls also start with a lower light level and adjust the lighting upward to compensate for lumen and dirt depreciation. Requiring tuning to 85% or lower will result in more savings than the savings shown for the existing requirement without this trim language. In the field, tuning down to 70% light and power levels or lower is often possible.

This proposal addresses lumen maintenance controlled luminaires, but does not require lumen maintenance controls. Lumen maintenance controls will adjust the lighting power over time to increase power as the light output reduces from lamp, dirt and room lumen depreciation. This strategy can save average energy over time, but only if the controls are tuned initially. When these controls are applied, all areas with lumen maintenance control require tuning, with half the remaining area also requiring high end trim tuning. Where lumen maintenance controls are not used, the high trim requirement applies to 50% of the lit area.

Note: Tables C406.1(1) through C406.1(5) include entries for climate zones 1A through 8. Should climate zones 0A and 0B be added to the IECC, use values for 1A in 0A and values for 1B in 0B.

Bibliography:

Hart, R., R. Nambiar, M. Tyler, M., Y. Xie, and J. Zhang. "Relative Credits for Extra Efficiency Measures: Technical Brief." Pacific Northwest National Laboratory (PNNL), Richland, WA (US), January 2019.
https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-28370Rev.1.pdf.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal makes the application easier to implement on the one hand. Making the applicability only to 90% of general lighting reduces the cost. Requiring tuning appears to increase the cost; however, it is currently required by C408 in daylighting areas, so the area where tuning is already required could be equivalent to 50% of the lighting area. In all, this proposal is more a clarification and a reinforcement of tuning requirements that are already found for daylighting areas in Section C408.

Proposal # 5134

CE229-19

CE230-19

IECC: C202, C406, C406.1, C406.4

Proponent: Mark Lyles, representing Northwest Energy Codes Group (markl@newbuildings.org)

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Add new definition as follows:

LUMEN MAINTENANCE CONTROLS. A lighting control strategy that adjusts luminaire power over time to maintain constant light output as luminaires age, dirt accumulates or both. This strategy allows for energy savings in the life of the system then increases power as the system ages.

HIGH END TRIM. A lighting control strategy that sets the required maximum light level for each space.

SECTION C406 ADDITIONAL EFFICIENCY PACKAGE OPTIONS REQUIREMENTS

C406.1 Requirements- Additional energy efficiency requirements. Buildings-~~New buildings~~ shall comply with one or more of the following:

1. More efficient HVAC performance in accordance with Section C406.2.
2. Reduced lighting power in accordance with Section C406.3.
3. Enhanced lighting controls in accordance with Section C406.4.
4. On-site supply of renewable energy in accordance with Section C406.5.
5. Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with Section C406.6.
6. High-efficiency service water heating in accordance with Section C406.7.
7. Enhanced envelope performance in accordance with Section C406.8.
8. Reduced air infiltration in accordance with Section C406.9

C406.4 Enhanced digital lighting controls. Interior lighting in ~~At least 90 percent of the building floor area~~ shall have interior lighting with the following enhanced lighting controls for luminaires providing general lighting that shall be located, scheduled and operated in accordance with Section ~~C405.2.2- C405.2.~~

1. Luminaires shall be configured for continuous dimming.
2. Luminaires shall be addressed individually. Where individual addressability is not available for the luminaire class type, a controlled group of not more than four luminaries shall be allowed.
3. Not more than eight luminaires shall be controlled together in a *daylight zone*.
4. Fixtures shall be controlled through a digital control system that includes the following function:
 - 4.1. Control reconfiguration based on digital addressability.
 - 4.2. Load shedding.
 - 4.3. Individual user control of overhead general illumination in open offices.
 - 4.4. Occupancy sensors shall be capable of being reconfigured through the digital control system.
5. Construction documents shall include submittal of a Sequence of Operations, including a specification outlining each of the functions in Item 4.

6. Functional testing of lighting controls shall comply with Section C408. High end trim controls shall be enabled and configured to limit the initial maximum output or maximum power draw of the controlled lighting to 85 percent or less of full light output or full power draw for the following:
- 6.1 All areas that have lumen maintenance controls, and
 - 6.2 50% of the remaining floor area.

Reason: C406 revise digital lighting controls:

Compared to the existing enhanced lighting controls in C406.4, the proposal provides for more certain savings through light level tuning with the option of lumen maintenance control. With the clear requirement for tuning in this proposal, the potential savings is more reliable, and the credits listed in this proposal are higher than the credits for this measure in the base proposal for additional energy efficiency credits.

This proposal will improve the C406.4 requirements to provide more energy savings. Enhanced lighting controls (Section C406.4) can save more energy by tuning maximum light levels to just what is needed throughout the building. Making this requirement explicit and requiring documentation can actually achieve greater savings.

In the proposed code language, changes are made to allow for the following:

- Definitions are added for lumen maintenance controls and high end trim. These definitions are adapted from NEMALSD- 64. The high end trim definition exactly matches the NEMA definition, and the lumen maintenance definition is adjusted to refer to luminaire power rather than lamp power.
- The area required with the specified controls is adjusted to 90%. Under current language, all luminaires in the building would need to meet the control requirements. This does not make sense for areas like mechanical and electrical rooms, stairwells, and restrooms, where the specified controls would not provide an energy benefit.
- The specified controls are required only for luminaires providing general lighting.
- A requirement for high end trim was added for any areas with lumen maintenance controls, plus 50% of the remaining area.

High end trim or tuning accounts for the fact that maximum lighting with full output at the lighting power allowance level typically provides more lighting than necessary, due to increments in luminaire size and limits on exact luminaire spacing. Requiring tuning that reduces light levels and power by at least 15%, along with documentation in the lighting functional testing process will reduce actual light power levels. While the original language for this type of control provides the capability to tune, without the trim requirement, there is not a strong argument for savings actually occurring. Lumen maintenance controls also start with a lower light level and adjust the lighting upward to compensate for lumen and dirt depreciation. Requiring tuning to 85% or lower will result in more savings than the savings shown for the existing requirement without this trim language. In the field, tuning down to 70% light and power levels or lower is often possible.

This proposal addresses lumen maintenance controlled luminaires, but does not require lumen maintenance controls. Lumen maintenance controls will adjust the lighting power over time to increase power as the light output reduces from lamp, dirt and room lumen depreciation. This strategy can save average energy over time, but only if the controls are tuned initially. When these controls are applied, all areas with lumen maintenance control require tuning, with half the remaining area also requiring high end trim tuning. Where lumen maintenance controls are not used, the high trim requirement applies to 50% of the lit area.

Bibliography: Hart, R., R. Nambiar, M. Tyler, M., Y. Xie, and J. Zhang. "Relative Credits for Extra Efficiency Measures: Technical Brief." Pacific Northwest National Laboratory (PNNL), Richland, WA (US), January 2019. https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-28370Rev.1.pdf.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The current proposal does not require more investment, but rather expands existing options permitted under section C406 of the 2018 IECC. The intention is to identify additional options to increase flexibility and more effectively utilize new technologies and construction practices. There is not expected to be an increased cost, as this simply increases the options for C406 beyond what is included in current code. Actual costs will vary based on the items selected by the building designer—architects, engineers, and other involved trades—based on the needs and goals of the individual project.

Proposal # 5769

CE230-19

CE231-19

IECC: C406.4

Proponent: Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers (glenn@lampartners.com); Jack Bailey, representing International Association of Lighting Designers (jbailey@oneluxstudio.com)

2018 International Energy Conservation Code

Revise as follows:

C406.4 Enhanced digital lighting controls. Interior general lighting in the building shall have the following enhanced lighting controls that shall be located, scheduled and operated in accordance with Section C405.2.2.

1. Luminaires shall be configured for continuous dimming.
2. Luminaires shall be addressed individually. Where individual addressability is not available for the luminaire class type, a controlled group of not more than four luminaries shall be allowed.
3. Not more than eight luminaires shall be controlled together in a daylight zone.
4. Fixtures shall be controlled through a digital control system that includes the following function:
 - 4.1. Control reconfiguration based on digital addressability.
 - 4.2. Load shedding.
 - 4.3. ~~Individual user control of overhead general illumination in open offices.~~ 4.4. Occupancy sensors shall be capable of being reconfigured through the digital control system.
5. Construction documents shall include submittal of a Sequence of Operations, including a specification outlining each of the functions in Item 4.
6. Functional testing of lighting controls shall comply with Section C408.

Reason:

1. As currently written in the code this control requirement would apply to all lighting fixtures in a project. This is not a problem for most fixtures typically used in commercial construction, but there are all sorts of specialized luminaires or decorative luminaires where it would not be sensible, practical, or cost effective to control in this manner. As a solution to this problem, this proposal limits the requirement for Enhanced Digital Lighting controls to *General Lighting*, a defined term in IECC.
2. We also propose to remove the requirement for "individual user control of overhead general illumination in open offices". Giving each occupant in an open office their own control of overhead lighting (it is not clear if this means the lighting only over their desk or over the whole space) might lead to less energy use, but it adds a very high level of complexity to the design, construction, and operation of the lighting system that is unlikely to be cost effective. Control systems that provide this type of control are not commonly available.

Requiring individual user control does not align with the Design Light Consortium technical requirements, which qualifies and provides acceptability guidance for enhanced digital lighting controls. Many in the design and energy program communities will not specify an enhanced digital lighting control system without the controls being listed on the Design Light Consortium's Qualified Product List (QLP) for networked lighting controls.

An application requirement for individual user control is out of context; as this provision is a list of functional enhanced digital lighting controls requirements, which includes luminaire configurability, load shedding and occupancy sensor zoning. Removing individual user control will retain proper functional requirements for the provision.

For these reasons, C406.4 as currently written, is highly unlikely to ever be chosen as an additional efficiency option. Making these changes will greatly increase its usability as an additional efficiency option.

Cost Impact: The code change proposal will decrease the cost of construction

Will decrease the cost of construction when C406.4 is applied to open office areas because the code will no longer require the installation of additional lighting controls to provide individual control of overhead lighting.

Proposal # 4664

CE231-19

CE232-19

IECC: C406, TABLE C406.1(1) (New), TABLE C406.1(2) (New), TABLE C406.1(3) (New), TABLE C406.1(4) (New), TABLE C406.1(5) (New), C406.1.1, C406.2, C406.2.1 (New), C406.2.4 (New), C406.5, C406.5.1 (New), C406.7, C406.7.1 (New), C406.7.1, C406.7.3 (New), C406.7.4 (New), C406.10 (New)

Proponent: Sean Denniston (sean@newbuildings.org)

2018 International Energy Conservation Code

Revise as follows:

SECTION C406 ADDITIONAL EFFICIENCY PACKAGE OPTIONS REQUIREMENTS

C406.1 Requirements- Additional energy efficiency credit requirements. Buildings shall comply ~~New buildings shall achieve a total of 10 credits from Tables C406.1(1) through C406.1(5) where the table is selected based on the use group of the building. Where a building contains multiple use groups, credits from each use group shall be weighted by floor area of each group to determine the weighted average building credit. Alternatively, credits shall be as calculated in accordance the relevant subsection of Section C406. Credits from the tables or calculation shall be achieved where a building complies with one or more of the following:~~

1. More efficient HVAC performance in accordance with Section C406.2.
2. Reduced lighting power in accordance with Section C406.3.
3. Enhanced lighting controls in accordance with Section C406.4.
4. On-site supply of renewable energy in accordance with Section C406.5.
5. Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with Section C406.6.
6. High-efficiency service water heating in accordance with Section C406.7.
7. Enhanced envelope performance in accordance with Section C406.8.
8. Reduced air infiltration in accordance with Section C406.9
9. Controlled receptacles in accordance with Section C406.10

Add new text as follows:

**TABLE C406.1(1)
ADDITIONAL ENERGY EFFICIENCY CREDITS FOR GROUP B OCCUPANCIES**

Sub-section / Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6 A	6 B	7	8
C406.2.1: 5% Heating Eff Imprv.	NA	1	NA	NA	1	1	NA	1									
C406.2.2: 5% Cooling Eff Imprv.	6	6	5	5	4	4	3	3	3	2	2	2	1	2	2	2	1
C406.2.3: 10 % Heating Eff Imprv.	NA	1	NA	NA	2	1	1	2	2	NA	1						
C406.2.4: 10 % Cooling Eff Imprv.	11	12	10	9	7	7	6	5	6	4	4	5	3	4	3	3	3
C406.3: Reduced Light Power	9	8	9	9	9	9	10	8	9	9	7	8	8	6	7	7	6
C406.4: Enh. Digital Light Ctrl	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	1	1
C406.5.1: On-site Renewable Egy.	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
C406.6 : Dedicated OA Sys (DOAS)	4	4	4	4	4	3	2	5	3	2	5	3	2	7	4	5	3
C406.7.2: Recovered/Renew SWH	NA	NA	NA	NA													

C406.7.3: Eff fossil fuel SWH	NA																
C406.7.4: Heat Pump SWH	NA																
C406.8: Enhanced Envelope Perf	1	4	2	4	4	3	NA	7	4	5	10	7	6	11	10	14	16
C406.9: Reduced Air Infiltration	2	1	1	2	4	1	NA	8	2	3	11	4	1	15	8	11	6
C406.10 Controlled Receptacles	15	14	15	15	14	15	17	12	15	13	11	13	13	10	12	10	9

TABLE C406.1(2)
ADDITIONAL ENERGY EFFICIENCY CREDITS F OR GROUP R AND I OCCUPANCIES

Sub-section / Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6 A	6 B	7	8
C406.2.1: 5% Heating Eff Imprv.	NA	NA	NA	NA	1	NA	NA	1	NA	1	1	1	1	2	1	2	2
C406.2.2: 5% Cooling Eff Imprv.	3	3	2	2	1	1	1	1	1	NA	1	1	NA	1	1	1	NA
C406.2.3: 10 % Heating Eff Imprv.	NA	NA	NA	NA	1	NA	NA	1	1	1	2	2	1	3	2	3	4
C406.2.4: 10 % Cooling Eff Imprv.	5	5	4	3	2	3	1	2	2	1	1	1	1	1	1	1	1
C406.3: Reduced Light Power	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2
C406.4: Enh. Digital Light Ctrl	NA	NA	NA	NA													
C406.5.1: On-site Renewable Egy.	8	8	8	8	7	8	8	7	7	7	7	7	7	7	7	7	7
C406.6 : Dedicated OA Sys (DOAS)	3	4	3	3	4	2	NA	6	3	4	8	5	5	10	7	11	12
C406.7.2: Recovered/Renew SWH	10	9	11	10	13	12	15	14	14	15	14	14	16	14	15	15	15
C406.7.3: Eff fossil fuel SWH	5	5	6	6	8	7	8	8	8	9	9	9	10	10	9	10	11
C406.7.4: Heat Pump SWH	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
C406.8: Enhanced Envelope Perf	3	6	3	5	4	4	1	4	3	3	4	5	3	5	4	6	6
C406.9: Reduced Air Infiltration	6	5	3	11	6	4	NA	7	3	3	9	5	1	13	6	8	3
C406.10 Controlled Receptacles	NA	NA	NA	NA													

TABLE C406.1(3)
ADDITIONAL ENERGY EFFICIENCY CREDITS FOR GROUP E OCCUPANCIES

Sub-section / Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6 A	6 B	7	8
C406.2.1: 5% Heating Eff Imprv.	NA	NA	NA	NA	1	1	1	1	1	2	1	2	1	2	2	3	4
C406.2.2: 5% Cooling Eff Imprv.	4	4	3	3	2	2	2	2	1	1	1	1	NA	1	1	1	NA
C406.2.3: 10 % Heating Eff Imprv.	NA	NA	NA	1	1	1	1	2	3	4	3	4	3	4	3	5	7
C406.2.4: 10 % Cooling Eff Imprv.	7	8	7	6	5	4	3	4	3	1	2	2	1	2	2	2	1
C406.3: Reduced Light Power	8	8	8	9	8	9	9	8	9	9	8	9	8	7	8	7	7
C406.4: Enh. Digital Light Ctrl	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	1
C406.5.1: On-site Renewable Egy.	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	5
C406.6 : Dedicated OA Sys (DOAS)	NA	NA	NA	NA													
C406.7.2: Recovered/Renew SWH ^a	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
C406.7.3: Eff fossil fuel SWH ^a	NA	1	1	1	1	1	1	2	2	3	2	3	2	3	3	3	5
C406.7.4: Heat Pump SWH ^a	NA	1	NA	NA	1	1	NA	1	1	1	1						
C406.8: Enhanced Envelope Perf	3	7	3	4	2	4	1	1	3	1	2	3	NA	4	3	6	9

C406.9: Reduced Air Infiltration	1	1	1	2	NA	NA	NA	NA	NA	NA	1	NA	NA	4	1	4	3
C406.10 Controlled Receptacles	20	19	20	20	20	21	22	20	21	21	20	20	21	18	19	17	15

a. For schools with showers or full service kitchens

TABLE C406.1(4)
ADDITIONAL ENERGY EFFICIENCY CREDITS FOR OTHER GROUP OCCUPANCIES

Sub-section / Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
C406.2.1: 5% Heating Eff Imprv.	NA	NA	NA	NA	1	1	NA	1	1	2	2	2	2	3	2	3	4
C406.2.2: 5% Cooling Eff Imprv.	5	6	4	4	3	3	1	2	2	1	1	2	NA	1	1	1	NA
C406.2.3: 10 % Heating Eff Imprv.	NA	NA	NA	1	1	1	1	2	2	4	3	4	5	5	3	6	8
C406.2.4: 10 % Cooling Eff Imprv.	9	12	9	8	6	6	3	4	4	1	2	3	NA	2	2	2	1
C406.3: Reduced Light Power	13	13	15	14	16	14	17	15	15	14	12	14	14	16	16	14	12
C406.4: Enh. Digital Light Ctrl	NA																
C406.5.1: On-site Renewable Egy.	8	8	8	8	8	8	8	8	8	7	7	7	7	7	7	7	6
C406.6 : Dedicated OA Sys (DOAS)	3	4	3	3	3	3	1	3	2	2	2	3	2	4	3	4	4
C406.7.2: Recovered/Renew SWH	NA																
C406.7.3: Eff fossil fuel SWH	NA																
C406.7.4: Heat Pump SWH	NA																
C406.8: Enhanced Envelope Perf	4	6	3	4	3	3	1	6	4	4	4	5	4	6	5	8	9
C406.9: Reduced Air Infiltration	1	1	1	2	1	1	NA	3	1	1	3	2	1	7	3	6	3
C406.10 Controlled Receptacles	NA																

TABLE C406.1(5)
ADDITIONAL ENERGY EFFICIENCY CREDITS FOR OTHER^A OCCUPANCIES

Sub-section / Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
C406.2.1: 5% Heating Eff Imprv.	NA	NA	NA	NA	1	1	1	1	1	2	1	2	1	2	2	3	3
C406.2.2: 5% Cooling Eff Imprv.	5	5	4	4	3	3	2	2	2	1	1	2	1	1	1	1	1
C406.2.3: 10 % Heating Eff Imprv.	NA	NA	NA	1	1	1	1	2	2	3	3	3	3	4	3	5	5
C406.2.4: 10 % Cooling Eff Imprv.	8	9	8	7	5	5	3	4	4	2	2	3	2	2	2	2	2
C406.3: Reduced Light Power	8	8	9	9	9	9	10	8	9	9	7	8	8	8	8	8	7
C406.4: Enh. Digital Light Ctrl	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	1
C406.5.1: On-site Renewable Egy.	8	8	8	8	8	8	8	8	8	7	7	7	7	7	7	7	7
C406.6 : Dedicated OA Sys (DOAS)	3	4	3	3	4	3	2	5	3	3	5	4	3	7	5	7	6
C406.7.2: Recovered/Renew SWH ^b	10	9	11	10	13	12	15	14	14	15	14	14	16	14	15	15	15
C406.7.3: Eff fossil fuel SWH ^b	5	5	6	6	8	7	8	8	8	9	9	9	10	10	9	10	11
C406.7.4: Heat Pump SWH ^b	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
C406.8: Enhanced Envelope Perf	3	6	3	4	3	4	1	5	4	3	5	5	4	7	6	9	10
C406.9: Reduced Air Infiltration	3	2	2	4	4	2	NA	6	2	2	6	4	1	10	5	7	4
C406.10 Controlled Receptacles	18	17	18	18	17	18	20	16	18	17	16	17	17	14	16	14	12

a. Other occupancy groups include all Groups except for Groups B, R, I, E, and M.

b. For occupancy groups listed in C406 .7.1.

C406.1.1 Tenant spaces. Tenant spaces shall comply with sufficient options form Tables C406 .1(1) through C406 .1(5) to achieve a minimum number of 5 credits, where credits are selected from Section C406.2, C406.3, C406.4, C406.6 or C406.7. Alternatively, C406.7 or C406.10. Where the entire building complies using credits from Section C406 .5, C406 .8 or C406 .9, tenant spaces within the building shall be deemed to comply with Section C406.5 where the entire building is in compliance. this section.

Exception: Previously occupied tenant spaces that comply with this code in accordance with Section C501.

Revise as follows:

C406.2 More efficient HVAC equipment performance. Equipment shall exceed the minimum efficiency requirements listed in Tables C403.3.2(1) through C403.3.2(7) ~~by 10 percent, in addition to the requirements of Section C403. Where multiple performance requirements are provided, the equipment shall exceed all requirements by 10 percent.~~ 9) and Variable refrigerant flow systems shall exceed listed in the energy efficiency provisions of ANSI/ASHRAE/IESNA 90.1 by 10 percent. in accordance with Sections C406 .2.1, C406 .2.2, C406 .2.3 or C406 .2.4. Equipment shall also meet applicable requirements of Section C403. Energy efficiency credits for heating shall be selected from Section C406 .2.1 or C406 .2.3 and energy efficiency credits for cooling shall be selected from Section C406 .2.2 or C406 .2.4. Selected credits shall include a heating or cooling energy efficiency credit or both. . Equipment not listed in Tables C403.3.2(1) through C403.3.2(7) 9) and Variable refrigerant flow systems not listed in the energy efficiency provisions of ANSI/ASHRAE/IES 90 .1 shall be limited to 10 percent of the total building system capacity. capacity for heating equipment where selecting Section C406 .2.1 or C406 .2.3 and cooling equipment where selecting Section C406 .2.2 or C406 .2.4.

Add new text as follows:

C406.2.1 Five percent heating efficiency improvement. Equipment shall exceed the minimum heating efficiency requirements by 5 percent.

C406.2.2 Five percent cooling efficiency improvement Equipment shall exceed the minimum cooling and heat rejection efficiency requirements by 5 percent. Where multiple cooling performance requirements are provided, the equipment shall exceed the annual energy requirement, including IEER, SEER, and IPLV.

C406.2.3 Ten percent heating efficiency improvement Equipment shall exceed the minimum heating efficiency requirements by 10 percent.

C406.2.4 Ten percent cooling efficiency improvment Equipment shall exceed the minimum cooling and heat rejection efficiency requirements by 10 percent. Where multiple cooling performance requirements are provided, the equipment shall exceed the annual energy requirement, including IEER, SEER, and IPLV.

C406.5 On-site renewable energy. Buildings shall comply with Section C406 .5.1 or C406 .5.2. The total minimum ratings of on-site renewable energy systems shall be one of the following:

1. Not less than 1.71 Btu/h per square foot (5.4 W/m²) or 0.50 watts per square foot (5.4 W/m²) of conditioned floor area.
2. Not less than 3 percent of the energy used within the building for building mechanical and service water heating equipment and lighting regulated in Chapter 4.

Add new text as follows:

C406.5.1 Basic renewable credits The total minimum ratings of on-site renewable energy systems, not including systems used for credits under Section C406.7.2, shall be one of the following:

1. Not less than 0.86 Btu/h per square foot (2.7 W/m²) or 0.25 watts per square foot (2.7 W/m²) of conditioned floor area.
2. Not less than 2 percent of the energy used within the building for building mechanical and service water heating equipment and lighting regulated in Chapter 4.

C406.5.2 Enhanced renewable credit. Where the total minimum ratings of on-site renewable energy systems exceeds the rating in Item 1 of Section C406 .5.1, additional energy efficiency credits shall be determined based on Equation 4-13, rounded to the nearest whole number.

$$AEEC_{RRa} = AEEC_{2.5} \times RR_a / RR_1 \text{ (Equation 4-13)}$$

Where:

$$AEEC_{RRa} = \text{C406 .5.2 additional energy efficiency credits}$$

RR_a = actual total minimum ratings of *on-site renewable energy* systems (in Btu/h, watts per square foot or W/m²)

RR_1 = minimum ratings of *on-site renewable energy* systems required by C406.5.1(1) (in Btu/h, watts per square foot or W/m²)

$$AEEC_{2.5} = \text{C406.5.1 credits from Tables C406 1(1) through C406.1(5)}$$

Revise as follows:

C406.7 Reduced energy use in service water heating. Buildings shall comply with Section C406.7.1 and Section C406.7.2, C406.7.3 or C406.7.4. be of the following types to use this compliance method:

1. ~~Group R-1: Boarding houses, hotels or motels.~~
2. ~~Group I-2: Hospitals, psychiatric hospitals and nursing homes.~~
3. ~~Group A-2: Restaurants and banquet halls or buildings containing food preparation areas.~~
4. ~~Group F: Laundries.~~
5. ~~Group R-2.~~
6. ~~Group A-3: Health clubs and spas.~~
7. ~~Buildings showing a service hot water load of 10 percent or more of total building energy loads, as shown with an energy analysis as described in Section C407.~~

Add new text as follows:

C406.7.1 Building type. To qualify for this credit, the building shall contain one of the following use groups and the additional energy efficiency credit shall be prorated by conditioned floor area of the portion of the building comprised of the following use group:

1. Group R-1: Boarding houses, hotels or motels.
2. Group I-2: Hospitals, psychiatric hospitals and nursing homes.
3. Group A-2: Restaurants and banquet halls or buildings containing food preparation areas.
4. Group F: Laundries.
5. Group R-2.
6. Group A-3: Health clubs and spas.
7. Group E: Schools with full-service kitchens or locker rooms with showers
8. Buildings showing a service hot water load of 10 percent or more of total building energy loads, as shown with an energy analysis as described in Section C407.

~~C406.7.1 C406.7.2 Load fraction. Recovered or renewable water heating.~~ The building service water-heating system shall have one or more of the following that are sized to provide not less than ~~60~~30 percent of the building's annual hot water requirements, or sized to provide ~~100~~70 percent of the building's annual hot water requirements if the building ~~shall otherwise be required to~~ comply with Section C403.9.5:

1. Waste heat recovery from service hot water, heat-recovery chillers, building equipment, or process equipment.
2. *On-site renewable energy* water-heating systems.

Add new text as follows:

C406.7.3 Efficient fossil fuel water heater. The combined input-capacity-weighted-average equipment rating of all fossil fuel water heating equipment in the building shall be not less than 95 percent Et or 0.95 EF. This option shall receive only half the listed credits for buildings required to comply with Section C404.2.1.

C406.7.4 Heat pump water heater. Where electric resistance water heaters are allowed, all service hot water system heating requirements shall be met using heat pump technology with a combined input-capacity-weighted-average EF of 3.0. Air-source heat pump water heaters shall not draw conditioned air from within the building, except exhaust air that would otherwise be exhausted to the exterior.

C406.10 Controlled Receptacles At least 50 percent of all 125 volt 15- and 20-ampere receptacles installed in private offices, open offices, conference rooms, breakrooms, individual workstations, and classrooms, including those installed in modular partitions and modular office workstation systems, shall be controlled as required by this section. Either split receptacles shall be provided, with the top receptacle(s) controlled, or a controlled receptacle shall be located within 12 inches (0.3 m) of each uncontrolled receptacle. Alternatively, non-controlled receptacles in a single modular workstation shall be located not more than 72 inches from a controlled receptacle serving that workstation. Controlled receptacles shall be visibly differentiated from standard receptacles and shall be controlled by one of the following automatic control devices:

1. An occupant sensor that turns receptacle power off when no occupants have been detected for a maximum of 20 minutes.
2. A time-of-day operated control device that turns receptacle power off at specific programmed times and can be programmed separately for each day of the week. The control device shall be capable of providing an independent schedule for each portion of the building not to exceed 5,000 square feet (460 m²) and not to exceed one full floor. The device shall be capable of being overridden for periods of up to two hours by an override switch accessible to occupants. Any individual override switch shall control the controlled receptacles for a maximum area of 5,000 square feet (460 m²).

Exception: Receptacles designated for specific equipment requiring 24-hour operation, for building maintenance functions, or for specific safety or security equipment.

Reason: C406 Credits for Controlled Receptacles

This proposal builds on top of a proposal that assigns energy efficiency credits to each option in Section C406 (CE218-19). For clarity, that entire base proposal is included here with the following additions or changes:

- Requirements for automatic receptacle controls when extra credits are used for this option in the building.
- Table row additions that provide additional energy efficiency credits for controlled receptacles.
- Addition of this option to the items allowed for tenant spaces.

Note: Tables C406.1(1) through C406.1(5) include entries for climate zones 1A through 8. Should climate zones 0A and 0B be added to the IECC, use values for 1A in 0A and values for 1B in 0B.

The code change proposal would provide a credit if occupancy sensor or a time-of-day control devices are

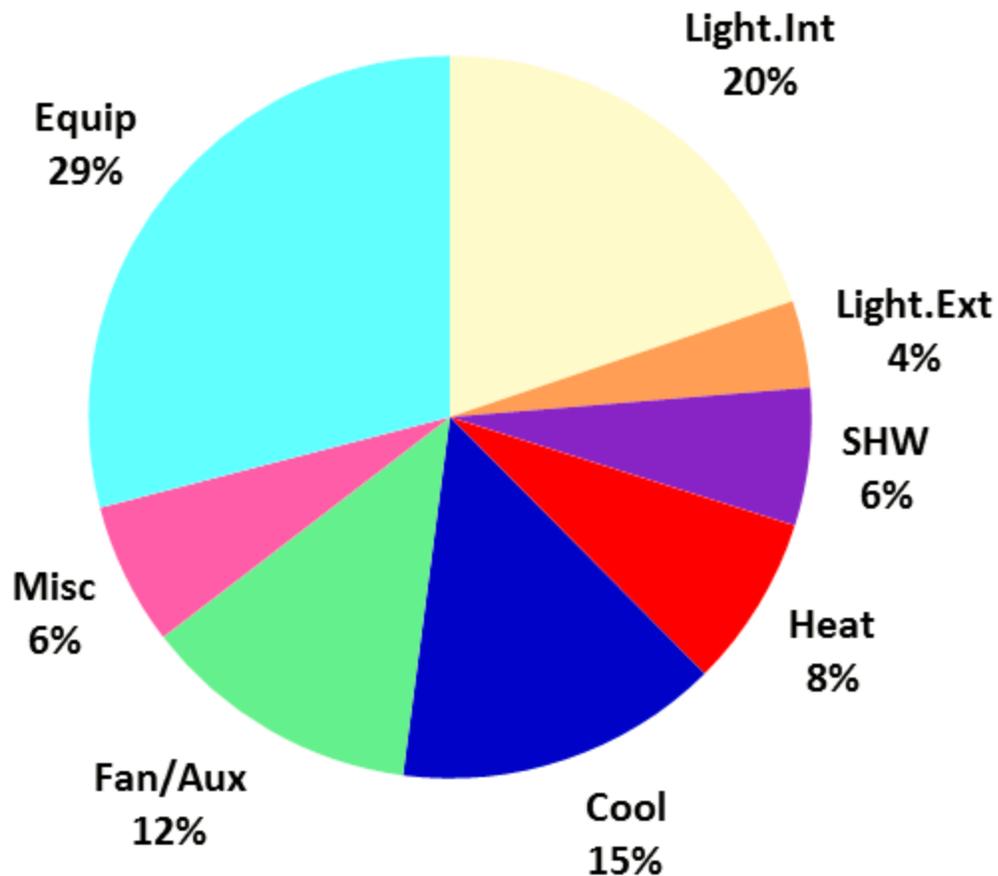
placed on 50% of receptacles installed in private offices, open offices, conference rooms, breakrooms, individual workstations, and classrooms, including those installed in modular partitions and modular office workstation systems. This proposed option is designed to be consistent with the C406 Points Option submitted by the Northwest Energy Codes Group and is based on the PNNL Technical Brief “Relative Credits for Extra Efficiency Code Measures” which can be accessed at http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-28370.pdf.

This measure provides more flexibility to building designers when it is added to the energy efficiency credit choices. The recommended language requires location of controlled receptacles adjacent to non-controlled receptacles. That requirement would avoid “daisy chained” power strips and extension cords from the non-controlled receptacles to their office equipment to avoid their equipment from being automatically turned off. The recommended language was adopted by the Seattle Nonresidential Energy Code and would require that either a split receptacle be installed that would contain both a controlled and uncontrolled receptacle, or the uncontrolled receptacle be located no more than 12” from the controlled receptacle.

Savings Estimate

Controlled receptacles saves energy by turning off unneeded equipment during unoccupied hours. As shown in Figure 3, office equipment is one of the highest energy costs in typical buildings representing 29% of the total cost on a building (Hart and Xie 2014). While the efficiency of office equipment is increasing it still represents a proportionally higher percentage of energy usage in buildings today.

The estimated savings are estimated to be 0.49 kWh/ft² in small office and 0.61 kWh/ft² in large office spaces through reduced equipment run times and other plug loads that are connected to the receptacle. These requirements are currently in ASHRAE Standard 90.1-2016, in the Washington State Nonresidential Energy Code and the Seattle Energy Code.



Bibliography:

Hart, R., R. Nambiar, M. Tyler, M., Y. Xie, and J. Zhang. "Relative Credits for Extra Efficiency Measures: Technical Brief." Pacific Northwest National Laboratory (PNNL), Richland, WA (US), January 2019. https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-28370Rev.1.pdf.

Hart R and Y Xie. 2014. *End-Use Opportunity Analysis from Progress Indicator Results for ASHRAE Standard 90.1-2013*. PNNL-24043, Pacific Northwest National Laboratory, Richland, WA. http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-24043.pdf

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Because Controlled Recetacles are an option as part of proposed credits for additional energy efficiency requirements, there is no requirement to comply with this provision. Designers and code users will have the option to use this credit based on project need and cost. Adding the option may reduce costs where this option is lower in cost than the current C406 options.

CE233-19

IECC: C406.10 (New), SECTION C406, C406.1, C406.1.1

Proponent: Harold Jepsen, representing National Electrical Manufacturers Association
(harold.jepsen@legrand.us)

2018 International Energy Conservation Code

Add new text as follows:

C406.10 Automation Receptacle Control The following shall be automatically controlled:

1. At least 50% of all 125 V, 15 and 20-amp receptacles installed in enclosed offices, conference rooms, rooms used primarily for copy and/or print functions, breakrooms, classrooms, and individual workstations, including those installed in modular partitions and module office workstation systems.
2. At least 25% of branch circuit feeders installed for modular furniture not shown on the construction documents.
3. Either split controlled receptacles shall be provided, with the top receptacle controlled, or a controlled receptacle shall be located within 12 inches of each uncontrolled receptacle.

This control shall function on:

1. A scheduled basis using a time-of-day operated control device that turns receptacle power off at specific programmed times and can be programmed separately for each day of the week. The control device shall be configured to provide an independent schedule for each portion of the building of not more than 5000 ft² and not more than one floor. The occupant shall be able to manually override an area for not more than two hours. Any individual override switch shall control the receptacles of not more than 5000 ft
2. An occupant sensor control that shall turn receptacles off within 20 minutes of all occupants leaving a space; or
3. An automated signal from another control or alarm system that shall turn receptacles off within 20 minutes after determining that the area is unoccupied.

All controlled receptacles shall be permanently marked in accordance with NFPA 70 and be uniformly distributed throughout the space. Plug-in devices shall not comply.

Exceptions: Receptacles for the following shall not require an automatic control device:

1. Receptacles specifically designated for equipment requiring continuous operation (24/day, 365 days/year).
2. Spaces where an automatic control would endanger the safety or security of the room or building occupants.
3. Within a single modular office workstation, non-controlled receptacles are permitted to be located more than 12 inches, but not more than 72 inches from the controlled receptacles serving that workstation.

SECTION C406 ADDITIONAL EFFICIENCY PACKAGE OPTIONS

Revise as follows:

C406.1 Requirements. Buildings shall comply with one or more of the following:

1. More efficient HVAC performance in accordance with Section C406.2.
2. Reduced lighting power in accordance with Section C406.3.
3. Enhanced lighting controls in accordance with Section C406.4.
4. On-site supply of renewable energy in accordance with Section C406.5.
5. Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with Section C406.6.
6. High-efficiency service water heating in accordance with Section C406.7.
7. Enhanced envelope performance in accordance with Section C406.8.
8. Reduced air infiltration in accordance with Section C406.9.
9. Automatic receptacle control in accordance with Section C406.10.

C406.1.1 Tenant spaces. Tenant spaces shall comply with Section C406.2, C406.3, C406.4, C406.6, C406.7 or ~~C406.7, C406.10.~~ Alternatively, tenant spaces shall comply with Section C406.5 where the entire building is in compliance.

Exception: Previously occupied tenant spaces that comply with this code in accordance with Section C501.

Reason: This proposal will:

1. Increase building energy efficiency
2. Offer a well-studied, cost effective efficiency measure
3. Maintain building occupant's safe usability
4. Keep enforceability simple
5. Align with other energy efficiency codes, increasing design compliance

Although commercial buildings continue to decrease their energy use through more efficient lighting, mechanical, and domestic water systems, the Miscellaneous Electrical Loads (MELs) energy segment continues to rise. More and more electrical power consuming devices are being plugged into building electrical systems. Some, such as fans, space heaters, printers, monitors, plug-in lamps are left on, when spaces are unoccupied. Other devices may be left plugged in and continue to draw power even when inactive or in standby modes. This wastes energy and is counter to the energy efficiency aim of the IECC.

Further explanation of this proposal can be read in the attachment.

Cost Impact: The code change HVAC proposal will increase the cost of construction. Costs estimated to be \$0.26/ft² for small office implementation and \$0.19/ft² for large office. Payback estimated at 4.2 years for small office buildings (10,000swft) and 2.4 years for large office buildings (100,000sqft). Source: 2013 California Building Energy Efficiency Standards CASE report.

Proposal # 4365

CE233-19

CE234-19

IECC: SECTION C406, C406.1, C406.1.1, C406.10 (New)

Proponent: Mark Lyles, representing Northwest Energy Codes Group (markl@newbuildings.org)

2018 International Energy Conservation Code

SECTION C406 ADDITIONAL EFFICIENCY PACKAGE OPTIONS REQUIREMENTS

C406.1 Requirements. ~~Additional energy efficiency requirements.~~ ~~Buildings~~ New buildings shall comply with one or more of the following:

1. More efficient HVAC performance in accordance with Section C406.2.
2. Reduced lighting power in accordance with Section C406.3.
3. Enhanced lighting controls in accordance with Section C406.4.
4. On-site supply of renewable energy in accordance with Section C406.5.
5. Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with Section C406.6.
6. High-efficiency service water heating in accordance with Section C406.7.
7. Enhanced envelope performance in accordance with Section C406.8.
8. Reduced air infiltration in accordance with Section C406.9.
9. Controlled receptacles in accordance with Section C406.10.

C406.1.1 Tenant spaces. Tenant spaces shall comply with Section C406.2, C406.3, C406.4, C406.6 ~~or C406.7. Alternatively, C406.7 or C406.10.~~ Where the entire building complies using credits from Section C406.5, C406.8 or C406.9, tenant spaces within the building shall be deemed to comply with Section C406.5 where the entire building is in compliance. this section.

Exception: Previously occupied tenant spaces that comply with this code in accordance with Section C501.

Add new text as follows:

C406.10 Controlled Receptacles At least 50 percent of all 125 volt 15- and 20-ampere receptacles installed in private offices, open offices, conference rooms, breakrooms, individual workstations, and classrooms, including those installed in modular partitions and modular office workstation systems, shall be controlled as required by this section. Either split receptacles shall be provided, with the top receptacle(s) controlled, or a controlled receptacle shall be located within 12 inches (0.3 m) of each uncontrolled receptacle. Alternatively, non-controlled receptacles in a single modular workstation shall be located not more than 72 inches from a controlled receptacle serving that workstation. Controlled receptacles shall be visibly differentiated from standard receptacles and shall be controlled by one of the following automatic control devices:

1. An occupant sensor that turns receptacle power off when no occupants have been detected for a maximum of 20 minutes, or
2. A time-of-day operated control device that turns receptacle power off at specific programmed times and can be programmed separately for each day of the week. The control device shall be capable of providing an independent schedule for each portion of the building not to exceed 5,000 square feet (460 m²) and not to exceed one full floor. The device shall be capable of being overridden for periods of up to two hours by an override switch accessible to occupants. Any individual override switch shall control the controlled receptacles for a maximum area of 5,000 (460 m²).

Exception: Receptacles designated for specific equipment requiring 24-hour operation, for building

maintenance functions, or for specific safety or security equipment..

Reason:

C406 add Controlled Receptacles

This proposal adds a new option in Section C406, increasing flexibility in meeting this additional efficiency requirement. This proposal allows selection of a provision where occupancy sensor or a time-of-day control devices are placed on 50% of receptacles installed in private offices, open offices, conference rooms, breakrooms, individual workstations, and classrooms, including those installed in modular partitions and modular office workstation systems. Modifications include:

- A new subsection added to C406 with provisions for automatic receptacle control.
- The tenant space requirements in C406.1.1 are revised to allow this new option in tenant spaces.

This measure provides more flexibility to building designers when it is added to the energy efficiency requirement choices. The recommended language requires location of controlled receptacles adjacent to non-controlled receptacles. That requirement would avoid “daisy chained” power strips and extension cords from the non-controlled receptacles to their office equipment to avoid their equipment from being automatically turned off. The recommended language was adopted by the Seattle Nonresidential Energy Code and would require that either a split receptacle be installed that would contain both a controlled and uncontrolled receptacle, or the uncontrolled receptacle be located no more than 12” from the controlled receptacle.

Savings Estimate

Controlled receptacles saves energy by turning off unneeded equipment during unoccupied hours. As shown in Figure 1, office equipment is one of the highest energy costs in typical buildings representing 29% of the total cost on a building (Hart and Xie 2014). While the efficiency of office equipment is increasing it still represents a proportionally higher percentage of energy usage in buildings today.

The estimated savings are estimated to be 0.49 kWh/ft² in small office and 0.61 kWh/ft² in large office spaces through reduced equipment run times and other plug loads that are connected to the receptacle. These requirements are currently in ASHRAE Standard 90.1-2016, in the Washington State Nonresidential Energy Code, and the Seattle Energy Code.

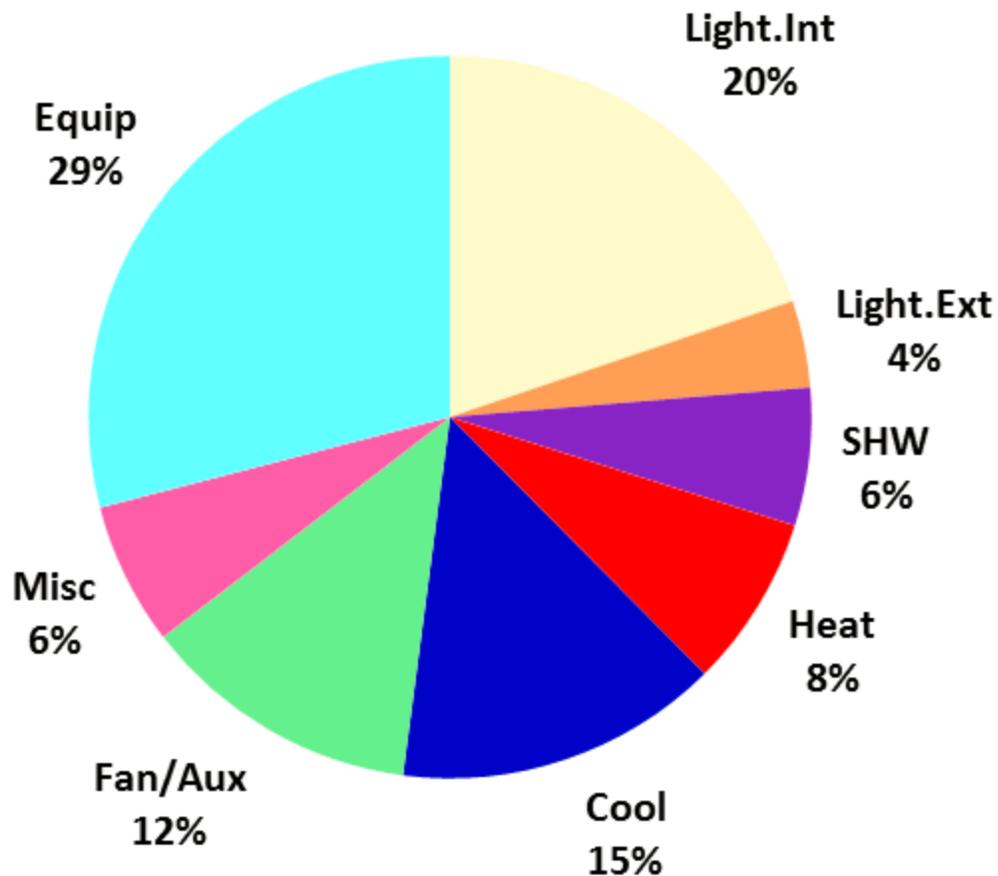


Figure 1. End-use cost for buildings in all U.S. climate zones

Bibliography:

Savings is reported in:

Hart, R., R. Nambiar, M. Tyler, M., Y. Xie, and J. Zhang. "Relative Credits for Extra Efficiency Measures: Technical Brief." Pacific Northwest National Laboratory (PNNL), Richland, WA (US), January 2019. https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-28370Rev.1.pdf.

Hart R and Y Xie. 2014. *End-Use Opportunity Analysis from Progress Indicator Results for ASHRAE Standard 90.1-2013*. PNNL-24043, Pacific Northwest National Laboratory, Richland, WA. http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-24043.pdf

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Because Controlled Receptacles are an option in section C406, there is no requirement to comply with this provision. Designers and code users will have the option to use this option based on project need and cost. The intention is to identify additional options to increase flexibility and more effectively utilize new technologies and construction practices. There is not expected to be an increased cost, as this simply increases the options for C406 beyond what is included in current

code. Actual costs will vary based on the items selected by the building designer—architects, engineers, and other involved trades—based on the needs and goals of the individual project.

Proposal # 5768

CE234-19

CE235-19

IECC: SECTION C406, C406.1, Table C406.1(1) (New), Table C406.1(2) (New), Table C406.1(3) (New), Table C406.1(4) (New), Table C406.1(5) (New), C406.1.1, C406.2, C 406.2.1 (New), C 406.2.2 (New), C 406.2.3 (New), C 406.2.4 (New), C406.5. (New), C406.5, C 406.5.2 (New), C406.7 (New), C406.7, C406.7.1, C406.7.3 (New), C406.7.4 (New), C406.10 (New)

Proponent: jim edelson, representing New Buildings Institute (jim@newbuildings.org); Eric Makela, representing Northwest Energy Codes Group (ericm@newbuildings.org)

2018 International Energy Conservation Code

SECTION C406 ADDITIONAL EFFICIENCY PACKAGE OPTIONS REQUIREMENTS

Revise as follows:

C406.1 Requirements. ~~Buildings shall comply~~ New buildings shall achieve a total of 10 credits from Tables C406.1(1) through C406.1(5) where the table is selected based on the use group of the building. Where a building contains multiple use groups, credits from each use group shall be weighted by floor area of each group to determine the weighted average building credit. Credits may also be as calculated in accordance the relevant subsection of C406. Credits from the tables or calculation shall be achieved where a building complies with one or more of the following:

1. More efficient HVAC performance in accordance with Section C406.2.
2. Reduced lighting power in accordance with Section C406.3.
3. Enhanced lighting controls in accordance with Section C406.4.
4. On-site supply of renewable energy in accordance with Section C406.5.
5. Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with Section C406.6.
6. High-efficiency service water heating in accordance with Section C406.7.
7. Enhanced envelope performance in accordance with Section C406.8.
8. Reduced air infiltration in accordance with Section C406.9
9. Extra daylit area with *daylight responsive controls* in accordance with Section C406.10

Add new text as follows:

Table C406.1(1)
Additional Energy Efficiency Credits for Group B Occupancies

Sub-section / Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6 A	6 B	7	8
C406.2.1: 5% Heating Eff Imprv.	NA	1	NA	NA	1	1	NA	1									
C406.2.2: 5% Cooling Eff Imprv.	6	6	5	5	4	4	3	3	3	2	2	2	1	2	2	2	1
C406.2.3: 10 % Heating Eff Imprv.	NA	1	NA	NA	2	1	1	2	2	NA	1						
C406.2.4: 10 % Cooling Eff Imprv.	11	12	10	9	7	7	6	5	6	4	4	5	3	4	3	3	3
C406.3: Reduced Light Power	9	8	9	9	9	9	10	8	9	9	7	8	8	6	7	7	6
C406.4: Enh. Digital Light Ctrl	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	1	1
C406.5.1: On-site Renewable Egy.	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
C406.6 : Dedicated OA Sys (DOAS)	4	4	4	4	4	3	2	5	3	2	5	3	2	7	4	5	3

C406.7.2: Recovered/Renew SWH	NA																
C406.7.3: Eff fossil fuel SWH	NA																
C406.7.4: Heat Pump SWH	NA																
C406.8: Enhanced Envelope Perf	1	4	2	4	4	3	NA	7	4	5	10	7	6	11	10	14	16
C406.9: Reduced Air Infiltration	2	1	1	2	4	1	NA	8	2	3	11	4	1	15	8	11	6
C406.10 Extra Daylit Area	7	6	7	7	6	7	8	6	7	6	5	6	6	5	6	5	4

Table C406.1(2)
Additional Energy Efficiency Credits for Group R and I Occupancies

Sub-section / Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6 A	6 B	7	8
C406 .2.1: 5% Heating Eff Imprv.	NA	NA	NA	NA	1	NA	NA	1	NA	1	1	1	1	2	1	2	2
C406 .2.2: 5% Cooling Eff Imprv.	3	3	2	2	1	1	1	1	1	NA	1	1	NA	1	1	1	NA
C406 .2.3: 10 % Heating Eff Imprv.	NA	NA	NA	NA	1	NA	NA	1	1	1	2	2	1	3	2	3	4
C406 .2.4: 10 % Cooling Eff Imprv.	5	5	4	3	2	3	1	2	2	1	1	1	1	1	1	1	1
C406 .3: Reduced Light Power	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2
C406 .4: Enh. Digital Light Ctrl	NA	NA	NA	NA													
C406 .5.1: On-site Renewable Egy.	8	8	8	8	7	8	8	7	7	7	7	7	7	7	7	7	7
C406 .6 : Dedicated OA Sys (DOAS)	3	4	3	3	4	2	NA	6	3	4	8	5	5	10	7	11	12
C406 .7.2: Recovered/Renew SWH	10	9	11	10	13	12	15	14	14	15	14	14	16	14	15	15	15
C406 .7.3: Eff fossil fuel SWH	5	5	6	6	8	7	8	8	8	9	9	9	10	10	9	10	11
C406 .7.4: Heat Pump SWH	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
C406 .8: Enhanced Envelope Perf	3	6	3	5	4	4	1	4	3	3	4	5	3	5	4	6	6
C406 .9: Reduced Air Infiltration	6	5	3	11	6	4	NA	7	3	3	9	5	1	13	6	8	3
C406.10 Extra Daylit Area	NA	NA	NA	NA													

Table C406.1(3)
Additional Energy Efficiency Credits for Group E Occupancies

Sub-section / Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6 A	6 B	7	8
C406 .2.1: 5% Heating Eff Imprv.	NA	NA	NA	NA	1	1	1	1	1	2	1	2	1	2	2	3	4
C406 .2.2: 5% Cooling Eff Imprv.	4	4	3	3	2	2	2	2	1	1	1	1	NA	1	1	1	NA
C406 .2.3: 10 % Heating Eff Imprv.	NA	NA	NA	1	1	1	1	2	3	4	3	4	3	4	3	5	7
C406 .2.4: 10 % Cooling Eff Imprv.	7	8	7	6	5	4	3	4	3	1	2	2	1	2	2	2	1
C406 .3: Reduced Light Power	8	8	8	9	8	9	9	8	9	9	8	9	8	7	8	7	7
C406 .4: Enh. Digital Light Ctrl	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	1
C406 .5.1: On-site Renewable Egy.	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	5
C406 .6 : Dedicated OA Sys (DOAS)	NA	NA	NA	NA													
C406 .7.2: Recovered/Renew SWH ^a	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
C406 .7.3: Eff fossil fuel SWH ^a	NA	1	1	1	1	1	1	2	2	3	2	3	2	3	3	3	5
C406 .7.4: Heat Pump SWH ^a	NA	1	NA	NA	1	1	NA	1	1	1	1						

C406 .8: Enhanced Envelope Perf	3	7	3	4	2	4	1	1	3	1	2	3	NA	4	3	6	9
C406 .9: Reduced Air Infiltration	1	1	1	2	NA	NA	NA	NA	NA	NA	1	NA	NA	4	1	4	3
C406.10 Extra Daylit Area	2	1	2	2	3	3	3	3	3	2	3	3	3	1	2	NA	NA

^a for schools with full service kitchens or showers

**Table C406.1(4)
Additional Energy Efficiency Credits for Group M Occupancies**

Sub-section / Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6 A	6 B	7	8
C406 .2.1: 5% Heating Eff Imprv.	NA	NA	NA	NA	1	1	NA	1	1	2	2	2	2	3	2	3	4
C406 .2.2: 5% Cooling Eff Imprv.	5	6	4	4	3	3	1	2	2	1	1	2	NA	1	1	1	NA
C406 .2.3: 10 % Heating Eff Imprv.	NA	NA	NA	1	1	1	1	2	2	4	3	4	5	5	3	6	8
C406 .2.4: 10 % Cooling Eff Imprv.	9	12	9	8	6	6	3	4	4	1	2	3	NA	2	2	2	1
C406 .3: Reduced Light Power	13	13	15	14	16	14	17	15	15	14	12	14	14	16	16	14	12
C406 .4: Enh. Digital Light Ctrl	NA	NA	NA	NA													
C406 .5.1: On-site Renewable Egy.	8	8	8	8	8	8	8	8	8	7	7	7	7	7	7	7	6
C406 .6 : Dedicated OA Sys (DOAS)	3	4	3	3	3	3	1	3	2	2	2	3	2	4	3	4	4
C406 .7.2: Recovered/Renew SWH	NA	NA	NA	NA													
C406 .7.3: Eff fossil fuel SWH	NA	NA	NA	NA													
C406 .7.4: Heat Pump SWH	NA	NA	NA	NA													
C406 .8: Enhanced Envelope Perf	4	6	3	4	3	3	1	6	4	4	4	5	4	6	5	8	9
C406 .9: Reduced Air Infiltration	1	1	1	2	1	1	NA	3	1	1	3	2	1	7	3	6	3
C406.10 Extra Daylit Area	NA	NA	NA	NA													

**Table C406.1(5)
Additional Energy Efficiency Credits for Other^a Occupancies**

Sub-section / Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6 A	6 B	7	8
C406 .2.1: 5% Heating Eff Imprv.	NA	NA	NA	NA	1	1	1	1	1	2	1	2	1	2	2	3	3
C406 .2.2: 5% Cooling Eff Imprv.	5	5	4	4	3	3	2	2	2	1	1	2	1	1	1	1	1
C406 .2.3: 10 % Heating Eff Imprv.	NA	NA	NA	1	1	1	1	2	2	3	3	3	3	4	3	5	5
C406 .2.4: 10 % Cooling Eff Imprv.	8	9	8	7	5	5	3	4	4	2	2	3	2	2	2	2	2
C406 .3: Reduced Light Power	8	8	9	9	9	9	10	8	9	9	7	8	8	8	8	8	7
C406 .4: Enh. Digital Light Ctrl	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	1
C406 .5.1: On-site Renewable Egy.	8	8	8	8	8	8	8	8	8	7	7	7	7	7	7	7	7
C406 .6 : Dedicated OA Sys (DOAS)	3	4	3	3	4	3	2	5	3	3	5	4	3	7	5	7	6
C406 .7.2: Recovered/Renew SWH ^b	10	9	11	10	13	12	15	14	14	15	14	14	16	14	15	15	15
C406 .7.3: Eff fossil fuel SWH ^b	5	5	6	6	8	7	8	8	8	9	9	9	10	10	9	10	11
C406 .7.4: Heat Pump SWH ^b	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
C406 .8: Enhanced Envelope Perf	3	6	3	4	3	4	1	5	4	3	5	5	4	7	6	9	10
C406 .9: Reduced Air Infiltration	3	2	2	4	4	2	NA	6	2	2	6	4	1	10	5	7	4

C406.10 Extra Daylit Area	3	2	3	3	3	3	4	3	3	3	3	3	2	3	2	NA
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^a Other occupancy groups include all Groups except for Groups B, R, I, E, and M.

^b for occupancy groups listed in C406 .7.1.

Revise as follows:

C406.1.1 Tenant spaces. Tenant spaces shall comply with sufficient options from Tables C406.1(1) through C406.1(5) to achieve a minimum number of 5 credits, where credits are selected from Section C406.2, C406.3, C406.4, C406.6 or C406.7. Alternatively, tenant spaces shall comply with Section C406.5 where the entire building is in compliance, C406.7, or C406.10. Where the entire building complies using credits from Section C406.5, C406.8 or C406.9, tenant spaces within the building shall be deemed to comply this section.

Exception: Previously occupied tenant spaces that comply with this code in accordance with Section C501.

C406.2 More efficient HVAC equipment performance. Equipment shall exceed the minimum efficiency requirements listed in Tables C403.3.2(1) through C403.3.2(7) ~~by 10 percent, in addition to the requirements of Section C403. Where multiple performance requirements are provided, the equipment shall exceed all requirements by 10 percent.~~ 9). Variable refrigerant flow systems shall exceed listed in the energy efficiency provisions of ANSI/ASHRAE/IESNA 90.1 by 10 percent. 90.1. in accordance with Sections C406 .2.1, C406 .2.2, C406 .2.3 or C406 .2.4. Equipment shall also meet applicable requirements of Section C403. Energy efficiency credits for heating shall be selected from C406 .2.1 or C406.2.3 and energy efficiency credits for cooling shall be selected from C406.2.2 or C406.2.4. Selected credits shall include a heating or cooling energy efficiency credit or both. Equipment not listed in Tables C403.3.2(1) through C403.3.2(7-9) and Variable refrigerant flow systems not listed in the energy efficiency provisions of ANSI/ASHRAE/IES 90 .1 shall be limited to 10 percent of the total building system capacity. capacity for heating equipment where selecting C406.2.1 or C406.2.3 and cooling equipment where selecting C406.2.2 or C406.2.4. .

Add new text as follows:

C 406.2.1 Five percent heating efficiency improvement. Equipment shall exceed the minimum heating efficiency requirements by 5 percent.

C 406.2.2 Five percent cooling efficiency improvement Equipment shall exceed the minimum cooling and heat rejection efficiency requirements by 5 percent. Where multiple cooling performance requirements are provided, the equipment shall exceed the annual energy requirement, including IEER, SEER, and IPLV.

C 406.2.3 Ten percent heating efficiency improvement Equipment shall exceed the minimum heating efficiency requirements by 10 percent.

C 406.2.4 Ten percent cooling efficiency improvement Equipment shall exceed the minimum cooling and heat rejection efficiency requirements by 10 percent. Where multiple cooling performance requirements are provided, the equipment shall exceed the annual energy requirement, including IEER, SEER, and IPLV.

C406.5. On-site renewable Buildings shall comply with Section C406 .5.1 or C406 .5.2.

Revise as follows:

C ~~C406.5~~ C406.5.1 On-site-Basic renewable energy- credit The total minimum ratings of on-site renewable energy systems not including systems used for credits under Section C406.7.2 shall be one of the following:

1. Not less than ~~4.74~~0.86 Btu/h per square foot (~~5.4~~2.7 W/m²) or ~~0.50~~0.25 watts per square foot

(5.4-2.7 W/m²) of conditioned floor area.

2. Not less than ~~3~~2 percent of the annual energy used within the building for building mechanical and service water heating equipment and lighting regulated in Chapter 4.

Add new text as follows:

C 406.5.2 Enhanced Renewable Credits. Where the total minimum ratings of on-site renewable energy systems exceeds the rating in C406 .5.1(1), additional energy efficiency credits shall be determined based on Equation 4-13, rounded to the nearest whole number.

$$AEEC_{RRa} = AEEC_{2.5} \times RRa / RR_1 \text{ (Equation 4-13)}$$

Where:

$AEEC_{RRa}$ = C406 .5.2 additional energy efficiency credits

RRa = actual total minimum ratings of *on-site renewable energy* systems in Btu/h, watts per square foot or W/m²

$RR1$ = minimum ratings of *on-site renewable energy* systems required by C406 .5.1(1) in Btu/h, watts per square foot or W/m²

$AEEC_{2.5}$ = C406 .5.1 credits from Tables C406 .1(1) through C406 .1(5)

C406.7 Reduced energy use in service water heating. Buildings shall comply with Sections C406.7.1 and either C406 .7.2, C406 .7.3 or C406 .7.4.

Revise as follows:

~~**C406.7 C406.7.1 Reduced energy use in service water heating.**~~ **Building Type** Buildings shall be of the following types to use this compliance method To qualify for this credit, the building shall contain one of the following use groups and the additional energy efficiency credit shall be prorated by conditioned floor area of the portion of the building comprised of the following use groups:

1. *Group R-1: Boarding houses, hotels or motels.*
2. *Group I-2: Hospitals, psychiatric hospitals and nursing homes.*
3. *Group A-2: Restaurants and banquet halls or buildings containing food preparation areas.*
4. *Group F: Laundries.*
5. *Group R-2.*
6. *Group A-3: Health clubs and spas.*
7. *Group E: Schools with full-service kitchens or locker rooms with showers.*
8. Buildings showing a service hot water load of 10 percent or more of total building energy loads, as shown with an energy analysis as described in Section C407.

~~**C406.7.1 C406.7.2 Load fraction. Recovered or renewable water heating**~~ The building service water-heating system shall have one or more of the following that are sized to provide not less than ~~60~~30 percent of the building's annual hot water requirements, or sized to provide ~~100~~70 percent of the building's annual hot water requirements if the building ~~shall otherwise be required to~~ comply with Section C403.9.5:

1. Waste heat recovery from service hot water, heat-recovery chillers, building equipment, or process equipment.
2. *On-site renewable energy* water-heating systems.

Add new text as follows:

C406.7.3 Efficient fossil fuel water heater. The combined input-capacity-weighted-average equipment rating of all fossil fuel water heating equipment in the building shall be not less than 95% Et or 0.95 EF. This option shall receive only half the listed credits for buildings required to comply with C404.2.1.

C406.7.4 Heat pump water heater. Where electric resistance water heaters are allowed, all service hot water system heating requirements shall be met using heat pump technology with a combined input-capacity-weighted-average EF of 3.0. Air-source heat pump water heaters shall not draw conditioned air from within the building, except exhaust air that would otherwise be exhausted to the exterior.

C406.10 Extra Daylit Area Building shall not use the energy efficiency credits for Section C406.7, enhanced lighting control, and shall provide continuous dimming daylight responsive controls for 150 percent of the area required to have daylight responsive controls in toplit zones and sidelit zones in Section C405.2.3 or as required by Section C402.4.1.1. Toplit and sidelit zones as defined in Sections C405.2.3.2 and C405.2.3.3 shall be controlled separately from adjacent daylight zones.

Reason:

C406 Credits for Added Daylighting Area

This proposal builds on top of a proposal that assigns energy efficiency credits to each option in Section C406 (CE218-19). For clarity, that entire base proposal is included here with additional provisions and table row additions that provide an additional energy efficiency credit option when extra daylit area included in the building. As part of the comprehensive analysis of C406 measures that is listed in the bibliography, the relative energy cost savings for each measure was determined. Then points or credits were assigned to each measure by climate zone and building type based on one point per 0.25% building cost savings.

This proposal allows credit for increased daylighting area in Section C406 where extra efficiency options are required and includes the following:

- Adds provisions to increase the daylit area to 150% of prescriptively required area.
- Add rows with appropriate credits to the 5 occupancy group tables for this provision.

The current daylighting requirements apply only to what are considered primary daylit zones. These are toplit and sidelit zones as defined in Sections C405.2.3.2 and C405.2.3.3. This measure extends the primary daylit area by adding 50% more daylit area.

Expanding the daylit control area (Section C406.10) saves energy by reducing lighting power when daylighting is available in these areas. This measure provides more flexibility to building designers when it is added to the energy efficiency credit choices. It specifically provides an expansion in the daylit area, which allows lighting to be reduced in a larger portion of the building with daylight responsive controls. The proposal requires separate control of the luminaire light levels in primary and secondary daylit areas.

Bibliography: Hart, R., R. Nambiar, M. Tyler, M., Y. Xie, and J. Zhang. "Relative Credits for Extra Efficiency Measures: Technical Brief." Pacific Northwest National Laboratory (PNNL), Richland, WA (US), January 2019.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The current proposal does not require more investment, but rather expands existing options permitted under the 2018 IECC. The intention is to identify additional options to increase flexibility and more effectively utilize new technologies and construction practices. There is not expected to be an increased cost, as this simply increases the options for C406 beyond what is included in current code. In some cases, costs may be reduced, as the outlined approach provides partial credit for selected items as well as credit for items that may have previously been included in the building design without credit. Costs, and cost effectiveness, are not evaluated for individual measures due to the vast number of potential combinations amongst building types, climates, and selected options. Actual costs will vary based on the items selected by the building designer—architects, engineers, and other involved trades—based on the needs and goals of the individual project.

Proposal # 5107

CE235-19

CE236-19

IECC: C406.1, C406.1.1, C406.10 (New)

Proponent: Mark Lyles, representing Northwest Energy Codes Group (markl@newbuildings.org)

2018 International Energy Conservation Code

C406.1 Requirements. Buildings shall comply with one or more of the following:

1. More efficient HVAC performance in accordance with Section C406.2.
2. Reduced lighting power in accordance with Section C406.3.
3. Enhanced lighting controls in accordance with Section C406.4.
4. On-site supply of renewable energy in accordance with Section C406.5.
5. Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with Section C406.6.
6. High-efficiency service water heating in accordance with Section C406.7.
7. Enhanced envelope performance in accordance with Section C406.8.
8. Reduced air infiltration in accordance with Section C406.9
9. Extra Daylit Area with Daylight Responsive Controls in accordance with Section C406.10.

C406.1.1 Tenant spaces. Tenant spaces shall comply with Section C406.2, C406.3, C406.4, C406.6 or ~~C406.7. Alternatively, C406.7 or C406.10.~~ Where the entire building complies using Section C406.5, C406.8 or C406.9, tenant spaces within the building shall be deemed to comply with Section C406.5 where the entire building is in compliance. this Section.

Exception: Previously occupied tenant spaces that comply with this code in accordance with Section C501.

Add new text as follows:

C406.10 Extra Daylit Area Building shall not use the energy efficiency credits for Section C406.7, enhanced lighting control, and shall provide continuous dimming daylight responsive controls for 150 percent of the area required to have daylight responsive controls in toplit zones and sidelit zones in Section C405.2.3 or as required by Section C402.4.1.1. Toplit and sidelit zones as defined in Sections C405.2.3.2 and C405.2.3.3 shall be controlled separately from adjacent daylight zones.

Reason:

C406 add Added Daylighting Area

This proposal adds a new option in Section C406, increasing flexibility in meeting this additional efficiency requirement. This proposal allows selection of a provision with increased daylighting area in Section C406 where extra efficiency options are required and includes the following:

- Adds provisions to increase the daylit area to 150% of prescriptively required area.

The current daylighting requirements apply only to what are considered primary daylit zones. These are toplit and sidelit zones as defined in Sections C405.2.3.2 and C405.2.3.3. This measure extends the primary daylit area by adding 50% more daylit area.

Expanding the daylit control area (Section C406.10) saves energy by reducing lighting power when daylighting is available in these areas. This measure provides more flexibility to building designers

when it is added to the energy efficiency credit choices. It specifically provides an expansion in the daylit area, which allows lighting to be reduced in a larger portion of the building with daylight responsive controls. The proposal requires separate control of the luminaire light levels in primary and secondary daylit areas.

Bibliography: *Savings for this measure is illustrated here:*

Hart, R., R. Nambiar, M. Tyler, M., Y. Xie, and J. Zhang. "Relative Credits for Extra Efficiency Measures: Technical Brief." Pacific Northwest National Laboratory (PNNL), Richland, WA (US), January 2019.

https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-28370Rev.1.pdf.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The current proposal does not require more investment, but rather expands existing options permitted under section C406 of the 2018 IECC. The intention is to identify additional options to increase flexibility and more effectively utilize new technologies and construction practices. There is not expected to be an increased cost, as this simply increases the options for C406 beyond what is included in current code. Actual costs will vary based on the items selected by the building designer—architects, engineers, and other involved trades—based on the needs and goals of the individual project.

Proposal # 5766

CE236-19

CE237-19

IECC: C406.1, C406.10 (New), C406.10.1 (New), C406.10.2 (New), TABLE 406.10.2 (New), C406.10.3 (New), C406.10.4 (New), C406.10.5 (New)

Proponent: Harold Jepsen, representing National Electrical Manufacturers Association
(harold.jepsen@legrand.us)

2018 International Energy Conservation Code

Revise as follows:

C406.1 Requirements. Buildings shall comply with one or more of the following:

1. More efficient HVAC performance in accordance with Section C406.2.
2. Reduced lighting power in accordance with Section C406.3.
3. Enhanced lighting controls in accordance with Section C406.4.
4. On-site supply of renewable energy in accordance with Section C406.5.
5. Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with Section C406.6.
6. High-efficiency service water heating in accordance with Section C406.7.
7. Enhanced envelope performance in accordance with Section C406.8.
8. Reduced air infiltration in accordance with Section C406.9
9. Include an energy monitoring system in accordance with C406.10

Add new text as follows:

C406.10 Energy Monitoring Buildings shall comply with Section C406.10.1 through C406.10.5. Buildings shall be equipped to measure, monitor, record and report energy consumption data for each end-use category required by Section C406.10.2.

C406.10.1 Electrical energy metering. For electrical energy, including all electrical energy supplied to the building and its associated site, including but not limited to site lighting, parking, recreational facilities, and other areas that serve the building and its occupants, meters or other measurement devices shall be provided to collect energy consumption data for each end-use category required by Section C406.10.2.

C406.10.2 End-use metering categories. Meters or other approved measurement devices shall be provided to collect energy use data for each end-use category listed in Table 406.10.2. These meters shall have the capability to collect energy consumption data for the whole building or for each separately metered portion of the building. Where multiple meters are used to measure any end-use category, the data acquisition system shall total all of the energy used by that category. Not more than 5 percent of the measured load for each of the end-use categories listed in Table 406.10.2 is permitted to be from a load not within the category.

Exceptions:

1. HVAC and water heating equipment serving only an individual dwelling unit does not require end-use metering.
2. End-use metering is not required for fire pumps, stairwell pressurization fans or any system that operates only during testing or emergency.

TABLE 406.10.2 ENERGY USE CATEGORIES

LOAD CATEGORY	DESCRIPTION OF ENERGY USE
<u>Total HVAC system</u>	<u>Heating, cooling and ventilation including, but not limited to fans, pumps, boilers, chillers and water heating. Energy used by 120 volt equipment, or by 208/120 volt equipment that is located in a building where the main service is 480/277 volt power, is permitted to be excluded from Total HVAC system energy use.</u>
<u>Interior lighting</u>	<u>Lighting systems located within the <i>building</i>.</u>
<u>Exterior lighting</u>	<u>Lighting systems located on the building site but not within the building.</u>
<u>Plug loads</u>	<u>Devices, appliances and equipment connected to convenience receptacle outlets.</u>
<u>Process loads</u>	<u>Any single load that is not included in a HVAC, lighting, or plug load category and that exceeds 5 percent of the peak connected load of the whole building including, but not limited to data centers, manufacturing equipment and commercial kitchens.</u>
<u>Building operations and other miscellaneous loads</u>	<u>The remaining loads not included elsewhere in this table including, but not limited to, vertical transportation systems, automatic doors,</u>

C406.10.3 Meters. Meters or other measurement devices required by this Section shall be configured to automatically communicate energy consumption data to the data acquisition system required by Section C406.10.4. Source meters shall be allowed to be any digital-type meter. Lighting, HVAC, or other building systems that can monitor their energy consumption shall be permitted instead of meters. Current sensors shall be permitted, provided that they have a tested accuracy of +/-2 percent. Required metering systems and equipment shall have the capability to provide at least hourly data that is fully integrated into the data acquisition system and graphical energy report in accordance with Sections 406.10.4 and C406.10.5.

C406.10.4 Data acquisition system. A data acquisition system shall have the capability to store the data from the required meters and other sensing devices for a minimum of 36 months. The data acquisition system shall

have the capability to store real-time energy consumption data and provide hourly, daily, monthly, and yearly logged data for each end-use category required by Section C406.10.2.

C406.10.5 Graphical energy report. A permanent and readily accessible reporting mechanism shall be provided in the building that is accessible by building operation and management personnel. The reporting mechanism shall have the capability to graphically provide the energy consumption for each end-use category required by Section C406.10.2 at least every hour, day, month and year for the previous 36 months.

Reason: The investment made for the infrastructure of a building in order to comply with the IECC is significant. The assumption that is currently made upon commissioning a facility is that energy efficiency measures will not degrade, or go out of calibration, over time and their energy consumption will not increase as time passes from the time they were commissioned. Such an assumption is completely inaccurate and any payback assumed for energy efficient infrastructure investments will be lengthened, thereby reducing the ROI and increasing the payback period. The only means to retain the energy performance of a building is to continuously monitor energy consumption levels of various energy consuming systems and compare them to previous levels. Monitoring sub-systems provides key indications when changes have been made or systems are not operating to specification, which increases energy consumption. Examples include, but are not limited to:

1. Increased energy consumption in HVAC system loads will point to failures in motors, drive systems, bearings, etc.

2. Degrading building envelope

3. Configuration changes to the building that may drive increased energy consumption.

4. Increase of energy consumption from lighting loads may indicate changes in arrangement of the office space that resulted in reduced lighting loads may indicate change in arrangement of the office space that resulted in reduced lighting driving the installation of more lighting above permitted energy code levels, failure of occupant sensors, inappropriate lighting schedules, lamps that need to be replaced or cleaned, etc.

5. Monitoring plug loads will indicate then computer equipment is left on during non-working hours and use of space heaters that compromise the efficiency of the facility due to set points on the HVAC system.

The requirements in this proposal save energy by continually monitoring and reporting actionable energy consumption data to building owners and operators. For large buildings, this data is further broken out by the major sub-systems (HVAC, lighting, process loads, and plug loads). There are well documented studies that demonstrate the energy savings from metering and monitoring systems. Several state energy codes have recognized the benefits and require energy monitoring to support a continual high level of performance from the energy efficient investment.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code change proposal “will” increase the cost of construction because it will require additional hardware, software and labor during installation. Providing specific cost would violate antitrust laws, however the following link to a report provided by the GSA demonstrates an example of cost and savings:

https://www.gsa.gov/cdnstatic/Energy_Submetering_Finance_Paper_Knetwork_2012_11_269%28508%29.pdf

Proposal # 4428

CE237-19

CE238-19

IECC: C202 (New), C406.1, C406.10(New), C406.10.1(New)

Proponent: Sharon Bonesteel, representing Salt River Project (sharon.bonesteel@srpnet.com); Steven Rosenstock, representing Edison Electric Institute (srosenstock@eei.org)

2018 International Energy Conservation Code

SECTION C202 GENERAL DEFINITIONS

Add new definition as follows:

ELECTRICAL ENERGY STORAGE SYSTEM (EESS). A system used to provide standby or emergency power, an uninterruptable power supply, load shedding, load sharing or similar capabilities in accordance with Section 1206 of the *International Fire Code*.

LOAD. A portion of a system that consumes electric energy. The total electrical *load* of a building is the sum of all electricity consuming appliances, lights and systems, necessary for a building to function as designed.

ON-PEAK. The time of use during which the cost per kiloWatt-hour (kWh) is the highest and when the maximum generation resources are required to supply electricity to the customer.

OFF-PEAK. The time of use during which the cost per kiloWatt-hour (kWh) is the lowest and when generation resources are being underutilized.

ENERGY MANAGEMENT SYSTEM. An electronic system that protects stationary storage batteries from operating outside of their safe operating parameters, and generates an alarm and trouble signal for off normal conditions.

SECTION C406 ADDITIONAL EFFICIENCY PACKAGE OPTIONS

Revise as follows:

C406.1 Requirements. Buildings shall comply with one or more of the following:

1. More efficient HVAC performance in accordance with Section C406.2.
2. Reduced lighting power in accordance with Section C406.3.
3. Enhanced lighting controls in accordance with Section C406.4.
4. On-site supply of renewable energy in accordance with Section C406.5.
5. Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with Section C406.6.
6. High-efficiency service water heating in accordance with Section C406.7.
7. Enhanced envelope performance in accordance with Section C406.8.
8. Reduced air infiltration in accordance with Section C406.9.
9. Provision of an electrical energy storage system (EESS) controlled via an energy management system that shall be programed to shift a portion of the building load from on-peak to off-peak, in accordance with Section C406.10.

Add new text as follows:

C406.10 Electrical energy storage system (EESS). EESS shall be controlled by an energy management system that is programmed to shift the load from on-peak to off-peak.

C406.10.1 System storage capabilities. The system shall be capable of storing the following:

1. Not less than 0.05 watts per square foot (0.54 W/m²) of conditioned floor area.
2. Not less than 10 percent of the energy used within the building for building mechanical and service water heating equipment and lighting regulated in Chapter 4.

Reason: The conservation of energy and its related cost are the foundation of the IECC. Demand charges make a large impact on a businesses' utility bill. The inclusion of energy storage will allow these businesses to shift that load from on-peak (most expensive per kw) to off-peak (least expensive per kw) and thus reduce their demand charges. Utilizing off-peak energy to charge up the energy storage for use during on-peak times results in efficient use of the energy generation facilities available to the business.

Definitions that are common in the utility world are not defined in the codes. Utilities clearly indicate on their websites the on-peak and off-peak hours, as well as the cost difference between a kw based upon the time of use. Referencing definitions for EESS from the 2018 IFC and Load calculations clearly being defined in 2017 NFPA Art.220.40, facilitates consistency between codes.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This code change provides another option within Section C406, allowing businesses to utilize their energy efficiently. The shift of a load from on-peak period to off-peak is an important aspect of the effective use of energy. This code change also provides definitions that are common in the utility world and are necessary for the inclusion of energy storage in the effective use of energy. Referencing definitions in the IFC and the NEC facilitate consistency between codes.

Proposal # 5032

CE238-19

CE239-19

IECC: C202, C406.1, C406.10 (New)

Proponent: Marilyn Williams, representing National Electrical Manufacturers Association
(mar_williams@nema.org)

2018 International Energy Conservation Code

Add new definition as follows:

FAULT DETECTION AND DIAGNOSTICS (FDD) SYSTEM. A software platform that utilizes building analytic algorithms to convert data provided by sensors and devices to automatically identify faults in building systems and provide a prioritized list of actionable resolutions to those faults based on cost or energy avoidance, comfort and maintenance impact.

Revise as follows:

C406.1 Requirements. Buildings shall comply with one or more of the following:

1. More efficient HVAC performance in accordance with Section C406.2.
2. Reduced lighting power in accordance with Section C406.3.
3. Enhanced lighting controls in accordance with Section C406.4.
4. On-site supply of renewable energy in accordance with Section C406.5.
5. Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with Section C406.6.
6. High-efficiency service water heating in accordance with Section C406.7.
7. Enhanced envelope performance in accordance with Section C406.8.
8. Reduced air infiltration in accordance with Section C406.9
9. Include a fault detection and diagnostics (FDD) system in accordance with Section C406.10.

Add new text as follows:

C406.10 Fault detection and diagnostics system. A fault detection and diagnostics system shall be installed to monitor the HVAC system's performance and automatically identify faults. The system shall:

1. Include permanently installed sensors and devices to monitor the HVAC system's performance;
2. Sample the HVAC system performance at least once per 15 minutes;
3. Automatically identify and report HVAC system faults;
4. Automatically notify authorized personnel of identified HVAC system faults;
5. Automatically provide prioritized recommendations for repair of identified faults based on analysis of data collected from the sampling of the HVAC system performance; and
6. Be capable of transmitting the prioritized fault repair recommendations to remotely located authorized personnel.

Reason: Energy efficiency of a new building's HVAC system will degrade over time caused by poorly maintained, failing and improperly controlled equipment. The proposed FDD requirement will reduce that degradation by detecting HVAC system faults and notifying building operators so that actions may be taken to reduce energy consumption of the building. Additionally, FDD systems are being utilized to drive operational efficiency, make better use of maintenance personnel, and resolve comfort issues.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. If the alternative being proposed to the list of additional energy efficiency measures by this proposal is selected, it "will" increase the cost of construction because it will require additional hardware, software and labor during

installation. Providing specific cost would violate antitrust laws, however a published example of cost and savings is provided from the following link <https://ecobuilding.schneider-electric.com/documents/10807/217223/Lab+Project+Building+Analytics+Case+Study/a6d8b9b6-7fdd-4e87-a90b-c98ece595a25>: Setup/install cost - \$23,190, Annual maintenance cost - \$35,407, and Annual savings - \$286,000.

Proposal # 4438

CE239-19

CE240-19

IECC: SECTION C406, C406.1, Table C406.1(1) (New), Table C406.1(2) (New), Table C406.1(3) (New), Table C406.1(4) (New), Table C406.1(5) (New), C406.1.1, C406.2, C406.2.1 (New), C406.2.2 (New), C406.2.3 (New), C406.2.4 (New), C406.5, C406.5.2 (New), C406.7, C406.7.1, C406.7.3 (New), C406.7.4 (New), C406.10 (New), Table C406.10(1) (New), Table C406.10(2) (New), Table C406.10(3) (New), Table C406.10(4) (New), ASTM Chapter 06 (New)

Proponent: Nicholas O'Neil, NW Energy Codes Group, representing NW Energy Codes Group (noneil@energy350.com); Mark Lyles, representing Northwest Energy Codes Group (markl@newbuildings.org)

2018 International Energy Conservation Code

SECTION C406 ADDITIONAL EFFICIENCY PACKAGE OPTIONS REQUIREMENTS

C406.1 Requirements- Additional energy efficiency requirements Buildings shall comply ~~Buildings shall comply~~ New buildings shall achieve a total of 10 credits from Tables C406.1(1) through C406.1(5) where the table is selected based on the use group of the building. Where a building contains multiple use groups, credits from each use group shall be weighted by floor area of each group to determine the weighted average building credit. Credits may also be as calculated in accordance the relevant subsection of C406. Credits from the tables or calculation shall be achieved where a building complies with one or more of the following:

1. More efficient HVAC performance in accordance with Section C406.2.
2. Reduced lighting power in accordance with Section C406.3.
3. Enhanced lighting controls in accordance with Section C406.4.
4. On-site supply of renewable energy in accordance with Section C406.5.
5. Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with Section C406.6.
6. High-efficiency service water heating in accordance with Section C406.7.
7. Enhanced envelope performance in accordance with Section C406.8.
8. Reduced air infiltration in accordance with Section C406.9
9. Efficient Kitchen Equipment in accordance with Section C406.10.

Add new text as follows:

Table C406.1(1)
Additional Energy Efficiency Credits for Group B Occupancies

Sub-section / Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6 A	6 B	7	8
C406.2.1: 5% Heating Eff Imprv.	NA	1	NA	NA	1	1	NA	1									
C406.2.2: 5% Cooling Eff Imprv.	6	6	5	5	4	4	3	3	3	2	2	2	1	2	2	2	1
C406.2.3: 10 % Heating Eff Imprv.	NA	1	NA	NA	2	1	1	2	2	NA	1						
C406.2.4: 10 % Cooling Eff Imprv.	11	12	10	9	7	7	6	5	6	4	4	5	3	4	3	3	3
C406.3: Reduced Light Power	9	8	9	9	9	9	10	8	9	9	7	8	8	6	7	7	6
C406.4: Enh. Digital Light Ctrl	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	1	1
C406.5.1: On-site Renewable Egy.	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
C406.6 : Dedicated OA Sys (DOAS)	4	4	4	4	4	3	2	5	3	2	5	3	2	7	4	5	3
C406.7.2: Recovered/Renew SWH	NA	NA	NA	NA													

C406.7.3: Eff fossil fuel SWH	NA																
C406.7.4: Heat Pump SWH	NA																
C406.8: Enhanced Envelope Perf	1	4	2	4	4	3	NA	7	4	5	10	7	6	11	10	14	16
C406.9: Reduced Air Infiltration	2	1	1	2	4	1	NA	8	2	3	11	4	1	15	8	11	6

Table C406.1(2)
Additional Energy Efficiency Credits for Group R and I Occupancies

Sub-section / Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6 A	6 B	7	8
C406 .2.1: 5% Heating Eff Imprv.	NA	NA	NA	NA	1	NA	NA	1	NA	1	1	1	1	2	1	2	2
C406 .2.2: 5% Cooling Eff Imprv.	3	3	2	2	1	1	1	1	1	NA	1	1	NA	1	1	1	NA
C406 .2.3: 10 % Heating Eff Imprv.	NA	NA	NA	NA	1	NA	NA	1	1	1	2	2	1	3	2	3	4
C406 .2.4: 10 % Cooling Eff Imprv.	5	5	4	3	2	3	1	2	2	1	1	1	1	1	1	1	1
C406 .3: Reduced Light Power	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2
C406 .4: Enh. Digital Light Ctrl	NA	NA	NA	NA													
C406 .5.1: On-site Renewable Egy.	8	8	8	8	7	8	8	7	7	7	7	7	7	7	7	7	7
C406 .6 : Dedicated OA Sys (DOAS)	3	4	3	3	4	2	NA	6	3	4	8	5	5	10	7	11	12
C406 .7.2: Recovered/Renew SWH	10	9	11	10	13	12	15	14	14	15	14	14	16	14	15	15	15
C406 .7.3: Eff fossil fuel SWH	5	5	6	6	8	7	8	8	8	9	9	9	10	10	9	10	11
C406 .7.4: Heat Pump SWH	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
C406 .8: Enhanced Envelope Perf	3	6	3	5	4	4	1	4	3	3	4	5	3	5	4	6	6
C406 .9: Reduced Air Infiltration	6	5	3	11	6	4	NA	7	3	3	9	5	1	13	6	8	3

Table C406.1(3)
Additional Energy Efficiency Credits for Group E Occupancies

Sub-section / Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6 A	6 B	7	8
C406 .2.1: 5% Heating Eff Imprv.	NA	NA	NA	NA	1	1	1	1	1	2	1	2	1	2	2	3	4
C406 .2.2: 5% Cooling Eff Imprv.	4	4	3	3	2	2	2	2	1	1	1	1	NA	1	1	1	NA
C406 .2.3: 10 % Heating Eff Imprv.	NA	NA	NA	1	1	1	1	2	3	4	3	4	3	4	3	5	7
C406 .2.4: 10 % Cooling Eff Imprv.	7	8	7	6	5	4	3	4	3	1	2	2	1	2	2	2	1
C406 .3: Reduced Light Power	8	8	8	9	8	9	9	8	9	9	8	9	8	7	8	7	7
C406 .4: Enh. Digital Light Ctrl	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	1
C406 .5.1: On-site Renewable Egy.	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	5
C406 .6 : Dedicated OA Sys (DOAS)	NA	NA	NA	NA													
C406 .7.2: Recovered/Renew SWH ^a	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
C406 .7.3: Eff fossil fuel SWH ^a	NA	1	1	1	1	1	1	2	2	3	2	3	2	3	3	3	5
C406 .7.4: Heat Pump SWH ^a	NA	1	NA	NA	1	1	NA	1	1	1	1						
C406 .8: Enhanced Envelope Perf	3	7	3	4	2	4	1	1	3	1	2	3	NA	4	3	6	9
C406 .9: Reduced Air Infiltration	1	1	1	2	NA	NA	NA	NA	NA	NA	1	NA	NA	4	1	4	3

^a for schools with full service kitchens or showers

Table C406.1(4)
Additional Energy Efficiency Credits for Group M Occupancies

Sub-section / Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6 A	6 B	7	8
C406 .2.1: 5% Heating Eff Imprv.	NA	NA	NA	NA	1	1	NA	1	1	2	2	2	2	3	2	3	4
C406 .2.2: 5% Cooling Eff Imprv.	5	6	4	4	3	3	1	2	2	1	1	2	NA	1	1	1	NA
C406 .2.3: 10 % Heating Eff Imprv.	NA	NA	NA	1	1	1	1	2	2	4	3	4	5	5	3	6	8
C406 .2.4: 10 % Cooling Eff Imprv.	9	12	9	8	6	6	3	4	4	1	2	3	NA	2	2	2	1
C406 .3: Reduced Light Power	13	13	15	14	16	14	17	15	15	14	12	14	14	16	16	14	12
C406 .4: Enh. Digital Light Ctrl	NA	NA	NA	NA													
C406 .5.1: On-site Renewable Egy.	8	8	8	8	8	8	8	8	8	7	7	7	7	7	7	7	6
C406 .6 : Dedicated OA Sys (DOAS)	3	4	3	3	3	3	1	3	2	2	2	3	2	4	3	4	4
C406 .7.2: Recovered/Renew SWH	NA	NA	NA	NA													
C406 .7.3: Eff fossil fuel SWH	NA	NA	NA	NA													
C406 .7.4: Heat Pump SWH	NA	NA	NA	NA													
C406 .8: Enhanced Envelope Perf	4	6	3	4	3	3	1	6	4	4	4	5	4	6	5	8	9
C406 .9: Reduced Air Infiltration	1	1	1	2	1	1	NA	3	1	1	3	2	1	7	3	6	3

Table C406.1(5)
Additional Energy Efficiency Credits for Other^a Occupancies

Sub-section / Climate Zone:	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6 A	6 B	7	8
C406 .2.1: 5% Heating Eff Imprv.	NA	NA	NA	NA	1	1	1	1	1	2	1	2	1	2	2	3	3
C406 .2.2: 5% Cooling Eff Imprv.	5	5	4	4	3	3	2	2	2	1	1	2	1	1	1	1	1
C406 .2.3: 10 % Heating Eff Imprv.	NA	NA	NA	1	1	1	1	2	2	3	3	3	3	4	3	5	5
C406 .2.4: 10 % Cooling Eff Imprv.	8	9	8	7	5	5	3	4	4	2	2	3	2	2	2	2	2
C406 .3: Reduced Light Power	8	8	9	9	9	9	10	8	9	9	7	8	8	8	8	8	7
C406 .4: Enh. Digital Light Ctrl	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	1
C406 .5.1: On-site Renewable Egy.	8	8	8	8	8	8	8	8	8	7	7	7	7	7	7	7	7
C406 .6 : Dedicated OA Sys (DOAS)	3	4	3	3	4	3	2	5	3	3	5	4	3	7	5	7	6
C406 .7.2: Recovered/Renew SWH ^b	10	9	11	10	13	12	15	14	14	15	14	14	16	14	15	15	15
C406 .7.3: Eff fossil fuel SWH ^b	5	5	6	6	8	7	8	8	8	9	9	9	10	10	9	10	11
C406 .7.4: Heat Pump SWH ^b	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
C406 .8: Enhanced Envelope Perf	3	6	3	4	3	4	1	5	4	3	5	5	4	7	6	9	10
C406 .9: Reduced Air Infiltration	3	2	2	4	4	2	NA	6	2	2	6	4	1	10	5	7	4

a. Other occupancy groups include all Groups except for Groups B, R, I, E, and M.

b. For occupancy groups listed in C406 .7.1.

C406.1.1 Tenant spaces. Tenant spaces shall comply with sufficient options from Tables C406 .1(1) through C406 .1(5) to achieve a minimum number of 5 credits, where credits are selected from Section C406.2, C406.3, C406.4, C406.6 or C406.7. Alternatively, C406.7 or C406.10. Where the entire building complies using credits

from Section C406 .5, C406 .8 or C406 .9, tenant spaces within the building shall be deemed to comply with Section C406.5 where the entire building is in compliance. this section.

Exception: Previously occupied tenant spaces that comply with this code in accordance with Section C501.

C406.2 More efficient HVAC equipment performance. Equipment shall exceed the minimum efficiency requirements listed in Tables C403.3.2(1) through C403.3.2(7) ~~by 10 percent, in addition to the requirements of Section C403. Where multiple performance requirements are provided, the equipment shall exceed all requirements by 10 percent.~~ ~~9) and Variable refrigerant flow systems shall exceed listed in the energy efficiency provisions of ANSI/ASHRAE/IESNA 90.1 by 10 percent. in accordance with Sections C406 .2.1, C406 .2.2, C406 .2.3 or C406 .2.4. Equipment shall also meet applicable requirements of Section C403. Energy efficiency credits for heating shall be selected from C406.2.1 or C406.2.3 and energy efficiency credits for cooling shall be selected from C406.2.2 or C406.2.4. Selected credits shall include a heating or cooling energy efficiency credit or both. Equipment not listed in Tables C403.3.2(1) through C403.3.2(7) ~~9) and Variable refrigerant flow systems not listed in the energy efficiency provisions of ANSI/ASHRAE/IESNA 90.1 shall be limited to 10 percent of the total building system capacity. capacity for heating equipment where selecting C406.2.1 or C406.2.3 and cooling equipment where selecting C406.2.2 or C406.2.4.~~~~

Add new text as follows:

C406.2.1 Five percent heating efficiency improvement Equipment shall exceed the minimum heating efficiency requirements by 5 percent.

C406.2.2 Five percent cooling efficiency improvement Equipment shall exceed the minimum cooling and heat rejection efficiency requirements by 5 percent. Where multiple cooling performance requirements are provided, the equipment shall exceed the annual energy requirement, including IEER, SEER, and IPLV.

C406.2.3 Ten percent heating efficiency improvement Equipment shall exceed the minimum heating efficiency requirements by 10 percent.

C406.2.4 Ten percent cooling efficiency improvement. Equipment shall exceed the minimum cooling and heat rejection efficiency requirements by 10 percent. Where multiple cooling performance requirements are provided, the equipment shall exceed the annual energy requirement, including IEER, SEER, and IPLV.

Revise as follows:

C406.5 On-site renewable energy. Buildings shall comply with Section C406 .5.1 or C406 .5.2. The total minimum ratings of on-site renewable energy systems shall be one of the following:

1. Not less than 1.71 Btu/h per square foot (5.4 W/m²) or 0.50 watts per square foot (5.4 W/m²) of conditioned floor area.
2. Not less than 3 percent of the energy used within the building for building mechanical and service water heating equipment and lighting regulated in Chapter 4.

~~C406.5 C406.5.1 On-site Basic renewable energy credits~~ The total minimum ratings of on-site renewable energy systems not including systems used for credits under Section C406.7, shall be one of the following:

1. Not less than ~~1.71~~0.86 Btu/h per square foot (~~5.4~~2.7 W/m²) or ~~0.50~~0.25 watts per square foot (~~5.4~~2.7 W/m²) of conditioned floor area.
2. Not less than ~~3~~2 percent of the energy used within the building for building mechanical and service water heating equipment and lighting regulated in Chapter 4.

Add new text as follows:

C406.5.2 Enhanced Renewable Credits Where the total minimum ratings of on-site renewable energy

systems exceeds the rating in C406 .5.1(1), additional energy efficiency credits shall be determined based on Equation 4-13, rounded to the nearest whole number.

$$\text{AEEC}_{\text{RRa}} = \text{AEEC}_{2.5} \times \text{RRa} / \text{RR}_1 \text{ (Equation 4-13)}$$

Where:

AEEC_{RRa} = C406.5.2 additional energy efficiency credits

RRa = actual total minimum ratings of on-site renewable energy systems in Btu/h, watts per square foot or W/m²

RR1 = minimum ratings of on-site renewable energy systems required by C406.5.1(1) in Btu/h, watts per square foot or W/m²

AEEC_{2.5} = C406.5.1 credits from Tables C406.1(1) through C406.1(5)

Revise as follows:

C406.7 Reduced energy use in service water heating. Buildings shall comply with Sections C406 .7.1 and either C406 .7.2, C406 .7.3 or C406 .7.4. be of the following types to use this compliance method:

1. ~~Group R-1: Boarding houses, hotels or motels.~~
2. ~~Group I-2: Hospitals, psychiatric hospitals and nursing homes.~~
3. ~~Group A-2: Restaurants and banquet halls or buildings containing food preparation areas.~~
4. ~~Group F: Laundries.~~
5. ~~Group R-2.~~
6. ~~Group A-3: Health clubs and spas.~~
7. ~~Buildings showing a service hot water load of 10 percent or more of total building energy loads, as shown with an energy analysis as described in Section C407.~~

~~C406.7~~ C406.7.1 Reduced energy use in service water heating. Building Type Buildings shall be of the following types to use this compliance method To qualify for this credit, the building shall contain one of the following use groups and the additional energy efficiency credit shall be prorated by conditioned floor area of the portion of the building comprised of the following use groups:

1. ~~Group R-1: Boarding houses, hotels or motels.~~
2. ~~Group I-2: Hospitals, psychiatric hospitals and nursing homes.~~
3. ~~Group A-2: Restaurants and banquet halls or buildings containing food preparation areas.~~
4. ~~Group F: Laundries.~~
5. ~~Group R-2.~~
6. ~~Group A-3: Health clubs and spas.~~
7. Group E: Schools with full-service kitchens or locker rooms with showers
8. Buildings showing a service hot water load of 10 percent or more of total building energy loads, as shown with an energy analysis as described in Section C407.

~~C406.7.1~~ C406.7.2 Load fraction. Recovered or renewable water heating The building service water-heating system shall have one or more of the following that are sized to provide not less than ~~60~~30 percent of the building's annual hot water requirements, or sized to provide ~~40~~70 percent of the building's annual hot water requirements if the building ~~shall otherwise be required to~~ comply with Section C403.9.5:

1. ~~Waste heat recovery from service hot water, heat-recovery chillers, building equipment, or process equipment.~~
2. ~~On-site renewable energy water-heating systems.~~

Add new text as follows:

C406.7.3 Efficient fossil fuel water heater The combined input-capacity-weighted-average equipment rating of all fossil fuel water heating equipment in the building shall be not less than 95% Et or 0.95 EF. This option shall receive only half the listed credits for buildings required to comply with C404.2.1.

C406.7.4 Heat pump water heater Where electric resistance water heaters are allowed, all service hot water system heating requirements shall be met using heat pump technology with a combined input-capacity-weighted-average EF of 3.0. Air-source heat pump water heaters shall not draw conditioned air from within the building, except exhaust air that would otherwise be exhausted to the exterior.

C406.10 Efficient Kitchen Equipment For buildings and spaces designated as Group A-2 or facilities that include a commercial kitchen with at least one gas or electric fryer, all fryers, dishwashers, steam cookers and ovens shall comply with all of the following:

1. Achieve performance levels in accordance with the equipment specifications listed in Tables C406.10(1) through C406.10(4) when rated in accordance with the applicable test procedure.
2. Be installed prior to the issuance of the Certificate of Occupancy.
3. Have associated performance levels listed on the construction documents submitted for permitting.

Energy efficiency credits for efficient kitchen equipment shall be independent of climate zone and determined based on Equation 4-14, rounded to the nearest whole number.

$$AEEC_K = 20 \times Area_K / Area_B \text{ (Equation 4-14)}$$

Where:

$AEEC_K$ = C406.10 additional energy efficiency credits

$Area_K$ = Floor area of full service kitchen (ft² or m²)

$Area_B$ = Gross floor area of building (ft² or m²)

**Table C406.10(1)
Minimum Efficiency Requirements: Commercial Fryers**

Fryer Type	Heavy-Load Cooking Energy Efficiency	Idle Energy Rate	Test Procedure
Standard Open Deep-Fat Gas Fryers	≥ 50%	≤ 9,000 Btu/hr	ASTM Standard F1361-17
Standard Open Deep-Fat Electric Fryers	≥ 83%	≤ 800 watts	
Large Vat Open Deep-Fat Gas Fryers	≥ 50%	≤ 12,000 Btu/hr	ASTM Standard F2144-17
Large Vat Open Deep-Fat Electric Fryers	≥ 80%	≤ 1,100 watts	

**Table C406.10(2)
Minimum Efficiency Requirements: Commercial Steam Cookers**

<u>Fuel Type</u>	<u>Pan Capacity</u>	<u>Cooking Energy Efficiency^a</u>	<u>Idle Rate</u>	<u>Test Procedure</u>
Electric Steam	3-pan	50%	400 watts	ASTM Standard F1484-18
	4-pan	50%	530 watts	
	5-pan	50%	670 watts	
	6-pan and larger	50%	800 watts	
Gas Steam	3-pan	38%	6,250 Btu/h	
	4-pan	38%	8,350 Btu/h	
	5-pan	38%	10,400 Btu/h	
	6-pan and larger	38%	12,500 Btu/h	

a. Cooking Energy Efficiency is based on heavy load (potato) cooking capacity

Table C406.10(3)
Minimum Efficiency Requirements: Commercial Dishwashers

<u>Machine Type</u>	<u>High Temp Efficiency Requirements</u>		<u>Low Temp Efficiency Requirements</u>		<u>Test Procedure</u>	
	<u>Idle Energy Rate^a</u>	<u>Water Consumption^b</u>	<u>Idle Energy Rate^a</u>	<u>Water Consumption^b</u>		
<u>Under Counter</u>	≤ 0.50 kW	≤ 0.86 GPR	≤ 0.50 kW	≤ 1.19 GPR	ASTM Standard F1696-18	
<u>Stationary Single Tank Door</u>	≤ 0.70 kW	≤ 0.89 GPR	≤ 0.60 kW	≤ 1.18 GPR		
<u>Pot, Pan, and Utensil</u>	≤ 1.20 kW	≤ 0.58 GPR	≤ 1.00 kW	≤ 0.58 GPSF		
<u>Single Tank Conveyor</u>	≤ 1.50 kW	≤ 0.70 GPR	≤ 1.50 kW	≤ 0.79 GPR		
<u>Multiple Tank Conveyor</u>	≤ 2.25 kW	≤ 0.54 GPR	≤ 2.00 kW	≤ 0.54 GPR		ASTM Standard F1920-15
<u>Single Tank Flight Type</u>	Reported	GPH ≤ 2.975x + 55.00	Reported	GPH ≤ 2.975x + 55.00		
<u>Multiple Tank Flight Type</u>	Reported	GPH ≤ 4.96x + 17.00	Reported	GPH ≤ 4.96x + 17.00		

a. Idle results shall be measured with the door closed and represent the total idle energy consumed by the machine including all tank heater(s) and controls. Booster heater (internal or external) energy consumption shall not be part of this measurement unless it cannot be separately monitored.

b. GPR = gallons per rack; GPSF = gallons per square foot of rack; GPH = gallons per hour; x = sf of conveyor belt (i.e., W*L) /min (max conveyor speed).

Table C406.10(4)
Minimum Efficiency Requirements: Commercial Ovens

<u>Fuel Type</u>	<u>Classification</u>	<u>Idle Rate</u>	<u>Cooking-Energy Efficiency, %</u>	<u>Test Procedure</u>
<u>Convection Ovens</u>				

	Full-Size	$\leq 12,000 \text{ Btu/h}$	≥ 46	
Electric	Half-Size	$\leq 1.0 \text{ Btu/h}$	≥ 71	ASTM F1496-13
	Full-Size	$\leq 1.60 \text{ Btu/h}$		
Combination Ovens				
	Steam Mode	$\leq 200P^a + 6,511 \text{ Btu/h}$	≥ 41	ASTM F2861-17
	Convection Mode	$\leq 150P^a + 5,425 \text{ Btu/h}$	≥ 56	
Electric	Steam Mode	$\leq 0.133P^a + 0.6400 \text{ kW}$	≥ 55	
	Convection Mode	$\leq 0.080P^a + 0.4989 \text{ kW}$	≥ 76	
Rack Ovens				
	Single	$\leq 25,000 \text{ Btu/h}$	≥ 48	ASTM F2093-18
	Double	$\leq 30,000 \text{ Btu/h}$	≥ 52	

a. P = Pan Capacity: The number of steam table pans the combination oven is able to accommodate as per the ASTM F1495-14a standard specification.

Add new standard(s) as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428-
2959

F1361-17: Standard Test Method for Performance of Open Deep Fat Fryers

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428-
2959

F2144-17: Standard Test Method for Performance of Large Open Vat Fryers

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428-
2959

F1484-18: Standard Test Method for Performance of Steam Cookers

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428-
2959

F1696-18: Standard Test Method for Energy Performance of Stationary-Rack, Door-Type Commercial Dishwashing Machines

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428-
2959

F1920-15: Standard Test Method for Performance of Rack Conveyor Commercial Dishwashing Machines

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428-
2959

F1496-13: Standard Test Method for Performance of Convection Ovens

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428-
2959

F2861-17: Standard Test Method for Enhanced Performance of Combination Oven in Various Modes

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428-
2959

F2093-18: Standard Test Method for Performance of Rack Ovens

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428-
2959

F1495-14a: Standard Specification for Combination Oven Electric or Gas Fired

Reason: C406 Credits for Efficient Kitchen Equipment

Kitchen equipment uses a large share of building energy use in restaurants, schools, dormitories, hotels, and other facilities with full service kitchens. More efficient equipment saves energy by improving the heat transfer to the cooking process, either through better equipment insulation or other innovations in the appliances. This proposal provides more flexibility to building designers when it is added to the energy efficiency credit choices. It specifically addresses the large energy use of kitchen equipment.

This proposal allows credit for efficient kitchen equipment in Section C406 where extra efficiency options are required. There is a separate proposal that modifies Section C406 from the current requirement to select one of the listed options, to assigning credits to each measure and requiring a certain number of credits (CE218-19).

For clarity, that proposal is included here. In addition to the changes that are the same as that proposal, this proposal adds:

- Requirements for a new kitchen equipment efficiency option.
- A formula to calculate the extra efficiency credits based on the ratio of kitchen area to building area.
- Adding the reference to the new kitchen equipment efficiency credits in the tenant section (C406.1.1).

Bibliography:

Hart, R., R. Nambiar, M. Tyler, M., Y. Xie, and J. Zhang. "Relative Credits for Extra Efficiency Measures: Technical Brief." Pacific Northwest National Laboratory (PNNL), Richland, WA (US), January 2019. https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-28370Rev.1.pdf.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The current proposal does not require more investment, but rather expands existing options permitted under the 2018 IECC Section C406. The intention is to identify additional options to increase flexibility and more effectively utilize new technologies and construction practices. There is not expected to be an increased cost, as this simply increases the options for C406 beyond what is included in current code. In some cases, costs may be reduced, as the outlined approach provides partial credit for selected items as well as credit for items that may have previously been included in the building design without credit. Costs, and cost effectiveness, are not evaluated for individual measures due to the vast number of potential combinations amongst building types, climates, and selected options. Actual costs will vary based on the items selected by the building designer—architects, engineers, and other involved trades—based on the needs and goals of the individual project.

Staff Analysis: A review of the standards proposed for inclusion in the code, ASTM F1361-17, F2144-17, F1484-18, F1696-18, F1920-15, F1496-13, F2861-17, F2093-18 and F1495-14a with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 4927

CE240-19

CE241-19

IECC: SECTION C406, C406.1, C406.1.1, C406.10 (New), Table C406.10 (1) (New), Table C406.10(2) (New), Table C406.10 (3) (New), Table C406.10(4) (New), ASTM Chapter 06 (New)

Proponent: Mark Lyles, representing Northwest Energy Codes Group (markl@newbuildings.org)

2018 International Energy Conservation Code

SECTION C406 ADDITIONAL EFFICIENCY PACKAGE OPTIONS REQUIREMENTS

C406.1 Requirements: ~~Additional energy efficiency requirements.~~ Buildings ~~New buildings~~ shall comply with one or more of the following:

1. More efficient HVAC performance in accordance with Section C406.2.
2. Reduced lighting power in accordance with Section C406.3.
3. Enhanced lighting controls in accordance with Section C406.4.
4. On-site supply of renewable energy in accordance with Section C406.5.
5. Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with Section C406.6.
6. High-efficiency service water heating in accordance with Section C406.7.
7. Enhanced envelope performance in accordance with Section C406.8.
8. Reduced air infiltration in accordance with Section C406.9
9. Efficient Kitchen Equipment in accordance with Section C406.10.

C406.1.1 Tenant spaces. Tenant spaces shall comply with Section C406.2, C406.3, C406.4, C406.6 ~~or C406.7. Alternatively, C406.7, or C406.10. Where the entire building complies with Section C406.5, C406.8, or C406.9, tenant spaces within the building shall be deemed to comply with Section C406.5 where the entire building is in compliance. this section.~~

Exception: Previously occupied tenant spaces that comply with this code in accordance with Section C501.

Add new text as follows:

C406.10 Efficiency Kitchen Equipment ~~For buildings and spaces designated as Group A-2 or facilities that include a commercial kitchen with at least one gas or electric fryer, all fryers, dishwashers, steam cookers and ovens shall comply with all of the following:~~

1. Achieve performance levels in accordance with the equipment specifications listed in Tables C406.10 (1) through (4) when rated in accordance with the applicable test procedure.
2. Be installed prior to the issuance of the Certificate of Occupancy.
3. Have associated performance levels listed on the construction documents submitted for permitting.

Table C406.10 (1)
Minimum Efficiency Requirements: Commercial Fryers

	Heavy-Load Cooking Energy Efficiency	Idle Energy Rate	Test Procedure
Standard Open Deep-Fat Gas Fryers	≥ 50%	≤ 9,000 Btu/hr	ASTM Standard

Standard Open Deep-Fat Electric Fryers	≥ 83%	≤ 800 watts	F1361-17
Large Vat Open Deep-Fat Gas Fryers	≥ 50%	≤ 12,000 Btu/hr	ASTM Standard F2144-17
Large Vat Open Deep-Fat Electric Fryers	≥ 80%	≤ 1,100 watts	

Table C406.10(2)

Minimum Efficiency Requirements: Commercial Steam Cookers

Fuel Type	Pan Capacity	Cooking Energy Efficiency ^a	Idle Rate	Test Procedure
Electric Steam	3-pan	50%	400 watts	ASTM Standard F1484-18
	4-pan	50%	530 watts	
	5-pan	50%	670 watts	
	6-pan and larger	50%	800 watts	
Gas Steam	3-pan	38%	6,250 Btu/h	
	4-pan	38%	8,350 Btu/h	
	5-pan	38%	10,400 Btu/h	
	6-pan and larger	38%	12,500 Btu/h	

^a Cooking Energy Efficiency is based on heavy load (potato) cooking capacity

Table C406.10 (3)

Minimum Efficiency Requirements: Commercial Dishwashers

Machine Type	High Temp Efficiency Requirements		Low Temp Efficiency Requirements		Test Procedure
	Idle Energy Rate ^a	Water Consumption ^b	Idle Energy Rate ^a	Water Consumption ^b	
Under Counter	≤ 0.50 kW	≤ 0.86 GPR	≤ 0.50 kW	≤ 1.19 GPR	ASTM Standard F1696-18, Standard Test Method for Energy Performance of Stationary-Rack, Door-Type Commercial Dishwashing Machines
Stationary Single Tank Door	≤ 0.70 kW	≤ 0.89 GPR	≤ 0.60 kW	≤ 1.18 GPR	
Pot, Pan, and Utensil	≤ 1.20 kW	≤ 0.58 GPR	≤ 1.00 kW	≤ 0.58 GPSF	
Single Tank Conveyor	≤ 1.50 kW	≤ 0.70 GPR	≤ 1.50 kW	≤ 0.79 GPR	
Multiple Tank Conveyor	≤ 2.25 kW	≤ 0.54 GPR	≤ 2.00 kW	≤ 0.54 GPR	
Single Tank Flight Type	Reported	GPH ≤ 2.975x + 55.00	Reported	GPH ≤ 2.975x + 55.00	ASTM Standard F1920-15, Standard Test Method for Performance of Rack Conveyor Commercial Dishwashing Machines

Multiple Tank Flight Type	Reported	GPH \leq 4.96x + 17.00	Reported	GPH \leq 4.96x + 17.00
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^aIdle results shall be measured with the door closed and represent the total idle energy consumed by the machine including all tank heater(s) and controls. Booster heater (internal or external) energy consumption shall not be part of this measurement unless it cannot be separately monitored.

^bGPR = gallons per rack; GPSF = gallons per square foot of rack; GPH = gallons per hour; x = sf of conveyor belt (i.e., W*L) /min (max conveyor speed).

Table C406.10(4)
Minimum Efficiency Requirements: Commercial Ovens

Fuel Type	Classification	Idle Rate	Cooking-Energy Efficiency, %	Test Procedure
Convection Ovens				-
Gas	Full-Size	\leq 12,000 Btu/h	\geq 46	ASTM F1496 - 13
Electric	Half-Size	\leq 1.0 Btu/h	\geq 71	
	Full-Size	\leq 1.60 Btu/h		
Combination Ovens				-
Gas	Steam Mode	\leq 200P ^a +6,511 Btu/h	\geq 41	ASTM F2861 - 17
	Convection Mode	\leq 150P ^a +5,425 Btu/h	\geq 56	
Electric	Steam Mode	\leq 0.133P ^a +0.6400 kW	\geq 55	
	Convection Mode	\leq 0.080P ^a +0.4989 kW	\geq 76	
Rack Ovens				-
Gas	Single	\leq 25,000 Btu/h	\geq 48	ASTM F2093 - 18
	Double	\leq 30,000 Btu/h	\geq 52	

^aP = Pan Capacity: The number of steam table pans the combination oven is able to accommodate as per the ASTM F – 1495 – 14a standard specification.

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428-
2959

F1361-17:
Standard Test Method for Performance of Open Deep Fat Fryers

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428-
2959

F2144-17:

Standard Test Method for Performance of Large Open Vat Fryers

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428-
2959

F1484-18: Standard Test Method for Performance of Steam Cookers

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428-
2959

F1696-18:

Standard Test Method for Energy Performance of Stationary-Rack, Door-Type Commercial Dishwashing Machines

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428-
2959

F1920-15:

Standard Test Method for Performance of Rack Conveyor Commercial Dishwashing Machines

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428-
2959

1496-13: Standard Test Method for Performance of Convection Ovens

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428-
2959

F2861-17: Standard Test Method for Enhanced Performance of Combination Oven in Various Modes

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428-
2959

F2093-18:

F1495-14a: Standard Specification for Combination Oven Electric or Gas Fired

Reason: C406 add Efficient Kitchen Equipment

This proposal adds a new option in Section C406, increasing flexibility in meeting this additional efficiency requirement. This proposal allows selection of a provision with high efficiency kitchen equipment in Section C406 where extra efficiency options are required and includes the following:

- Adds provisions to improve kitchen equipment efficiency.
- Revises Section C406.1.1 on tenant spaces to include the new kitchen equipment option in the tenant space portion and update the building compliance portion based on whole building compliance.

Kitchen equipment uses a large share of building energy use in restaurants, schools, dormitories, hotels, and other facilities with full service kitchens. More efficient equipment saves energy by improving the heat transfer to the cooking process, either through better equipment insulation or other innovations in the appliances. This proposal provides more flexibility to building designers when it is added to the energy efficiency credit choices. It specifically addresses the large energy use of kitchen equipment.

Bibliography: Hart, R., R. Nambiar, M. Tyler, M., Y. Xie, and J. Zhang. "Relative Credits for Extra Efficiency Measures: Technical Brief." Pacific Northwest National Laboratory (PNNL), Richland, WA (US), January 2019. https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-28370Rev.1.pdf.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The current proposal does not require more investment, but rather expands existing options permitted under the 2018 IECC. The intention is to identify additional options to increase flexibility and more effectively utilize new technologies and construction practices. There is not expected to be an increased cost, as this simply increases the options for C406 beyond what is included in current code. Actual costs will vary based on the items selected by the building designer—architects, engineers, and other involved trades—based on the needs and goals of the individual project.

Proposal # 5770

CE241-19

CE242-19

IECC: C406.1, C406.11 (New)

Proponent: Steven Rosenstock, Edison Electric Institute, representing Edison Electric Institute (srosenstock@eei.org)

2018 International Energy Conservation Code

Revise as follows:

C406.1 Requirements. Buildings shall comply with one or more of the following:

1. More efficient HVAC performance in accordance with Section C406.2.
2. Reduced lighting power in accordance with Section C406.3.
3. Enhanced lighting controls in accordance with Section C406.4.
4. On-site supply of renewable energy in accordance with Section C406.5.
5. Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with Section C406.6.
6. High-efficiency service water heating in accordance with Section C406.7.
7. Enhanced envelope performance in accordance with Section C406.8.
8. Reduced air infiltration in accordance with Section C406.9
9. Electric Vehicle Supply Equipment in accordance with Section 406.11.

Add new text as follows:

C406.11 Electric Vehicle Supply Equipment. In buildings with at least 20 parking spaces, electric vehicle charging stations rated at 208/240 Volts and 40-80 Amps (Level 2) shall be installed to serve at least 5 percent of the parking spaces. Fractional values shall be rounded up to the nearest whole number.

Reason: There are now over 1 million electric vehicles being driven in the United States. As of November 2018, over 300,000 light duty vehicles were sold in the United States.

According to a report published by the Edison Electric Institute and the Edison Foundation Institute for Electric Innovation:

- The stock of EVs in the US is projected to reach **18.7 million in 2030**, up from slightly more than 1 million at the end of 2018. This is approximately 7% of the 259 million vehicles (cars and light trucks) expected to be on U.S. roads in 2030.
- It took 8 years to sell 1 million EVs. The report projects that the next 1 million EVs will be on the road in less than 3 years—by early 2021.
- Annual sales of EVs will exceed 3.5 million vehicles in 2030, reaching more than 20 percent of annual vehicle sales in 2030. EV sales are estimated to be 1.4 million in 2025.

Most importantly,

- About 9.6 million charge ports will be required to support the 18.7 million EVs in 2030. This represents a significant investment in EV charging infrastructure. About 1.2 million Level 2 charging ports will be needed at workplaces, according to the report.

This proposal provides an option to install the EV charging station at the lowest cost - when a building is being built.

In addition, Level 2 charging stations are compatible with all electric vehicles that are sold in the US (which have charging connections that meet the SAE J1772 specifications), and they can provide anywhere from 10 to 50 miles of driving range per hour of charging (depending on the size of the EV battery and the on-board charging rate). There are multiple vendors of Level 2 charging stations, and there are state and utility incentives available in many parts of the US for their installation.

This proposal will improve the efficiency of transportation associated with the building (transportation that moves people, products, and services to and from the building). Electric vehicles get anywhere from 80 to over 130 miles per gallon equivalent (MPGe).

Bibliography: EEI and IEI, *Electric Vehicle Sales Forecast and the Charging Infrastructure Required Through 2030*, November 2018
http://www.edisonfoundation.net/iei/publications/Documents/IEI_EEI%20EV%20Forecast%20Report_Nov2018.pdf

Cost Impact: The code change proposal will increase the cost of construction. This is one of several efficiency options that increase the cost of construction. For Level 2 charging stations, the total installation costs per station will vary from \$1000 to over \$2000, depending on the number of stations installed and any addition conduits/raceways/panel spaces that are needed. The cost for these stations are likely to be similar or lower than the cost of other efficiency options in Section C406.

Proposal # 4457

CE242-19

CE243-19

IECC: C407.3

Proponent: Steven Rosenstock, Edison Electric Institute, representing Edison Electric Institute (srosenstock@eei.org)

2018 International Energy Conservation Code

Revise as follows:

C407.3 Performance-based compliance. Compliance based on total building performance requires that a proposed building (*proposed design*) be shown to have an annual energy cost that is less than or equal to the annual energy cost of the *standard reference design*. Energy prices shall be taken from a source *approved* by the *code official*, such as the Department of Energy, Energy Information Administration's State Energy Price and Expenditure Report. ~~Data System Prices and Expenditures reports.~~ *Code officials* shall be permitted to require time-of-use pricing in energy cost calculations. The reduction in energy cost of the proposed design associated with *on-site renewable energy* shall be not more than 5 percent of the total energy cost. The amount of renewable energy purchased from off-site sources shall be the same in the *standard reference design* and the *proposed design*.

Exception: Jurisdictions that require site energy (1 kWh = 3413 Btu) rather than energy cost as the metric of comparison.

Reason: This is an editorial change to be consistent with the language that is already in Section R405.3. This information can be found at the DOE/EIA State Energy Data System website: <https://www.eia.gov/state/seds/>

Bibliography: U.S. Energy Information Administration *State Profiles and Energy Estimates*, "About SEDS" website <https://www.eia.gov/state/seds/>

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is an editorial change / update that has no cost impact.

Proposal # 4706

CE243-19

CE244-19

IECC: C407.3

Proponent: Craig Conner, representing self (craig.conner@mac.com)

2018 International Energy Conservation Code

Revise as follows:

C407.3 Performance-based compliance. Compliance based on total building performance requires that a proposed building (*proposed design*) be shown to have an annual energy cost that is less than or equal to the annual energy cost of the *standard reference design*. Energy prices shall be taken from a source *approved* by the *code official*, such as the Department of Energy, Energy Information Administration's *State Energy Price and Expenditure Report*. *Code officials* shall be permitted to require time-of-use pricing in energy cost calculations. ~~The reduction in energy cost of the proposed design associated with on-site renewable energy shall be not more than 5 percent of the total energy cost. The amount of renewable energy purchased from off-site sources shall be the same in the standard reference design and the proposed design.~~

Exception: Jurisdictions that require site energy (1 kWh = 3413 Btu) rather than energy cost as the metric of comparison.

Reason: The goal should be to reduce the use of non-renewable energy, not to limit the use of renewable energy. Most of this type of limitation is an attempt by some types of products to restrict their competition. Very high efficiency and near zero energy buildings are usually well above 5% renewable energy. Many commercial buildings need off-site renewables to get to very low net energy. There simply is not enough roof top on large buildings to get sufficient renewable energy to get to very low levels of net energy use. Advocating very low or zero energy is inconsistent with advocating renewables must to onsite. Many times it simply is not possible to find the needed surface area on a large building.

Cost Impact: The code change proposal will decrease the cost of construction
Renewables can be part of the least cost way to get to low energy buildings

Proposal # 5659

CE244-19

CE245-19

IECC: C407.3

Proponent: Joseph H. Cain, Solar Energy Industries Association (SEIA), representing Solar Energy Industries Association (SEIA) (JoeCainPE@gmail.com)

2018 International Energy Conservation Code

Revise as follows:

C407.3 Performance-based compliance. Compliance based on total building performance requires that a proposed building (*proposed design*) be shown to have an annual energy cost that is less than or equal to the annual energy cost of the *standard reference design*. Energy prices shall be taken from a source *approved* by the *code official*, such as the Department of Energy, Energy Information Administration's *State Energy Price and Expenditure Report*. *Code officials* shall be permitted to require time-of-use pricing in energy cost calculations. The reduction in energy cost of the proposed design ~~associated with on-site renewable energy shall be not more than 5 percent of the total energy cost. The amount of renewable energy purchased from off-site sources shall be the same in the standard reference design and the proposed design shall be permitted to include renewable energy systems.~~

Exception: Jurisdictions that require site energy (1 kWh = 3413 Btu) rather than energy cost as the metric of comparison.

Reason: Effective integration of energy efficiency measures and renewable energy systems is critical to the future of energy codes and green/stretch/reach codes. At the time of submittal of these code change proposals, there are four states with 100% renewable energy goals: Hawaii, California, New Jersey, and New York. Other communities are committing to renewable energy goals through their own local renewable goals for power supply or for installation of renewable energy systems. Distributed Generation (DG) is an important component of these overall portfolio standards.

When looking forward for future energy codes, Zero Net Energy and Zero Carbon are common goals/aspirations. It should be clear that we cannot get to Zero Net Energy or Zero Carbon buildings without renewable energy systems. This is just as true for commercial buildings as for residential buildings.

In the process of development of the 2018 IECC, Proposal CE250-16 sought to constrain the contribution of renewable energy systems in the performance approach. The original proposal set a renewable backstop of 10% of the energy cost, which is so restrictive that builders are unlikely to install a renewable energy system for the purpose of code compliance. Either they do or they don't, but a 10% constraint does not allow enough compliance credit to influence the economics or the decision to install or not install a solar PV system with the original construction. During the Committee Action Hearings, a modification by a committee member lowered the constraint even further, to only 5% of energy cost. By inspection, 5% is approximately equal to 0%. Projects that include a renewable energy system to offset consumption of energy and reduce energy flows at the meter are not rewarded in this revised approach. This does not provide an attractive option for builders to install renewable energy systems.

This proposal gives builders credit for what they do, and encourages the use of energy efficiency measures plus renewable energy systems.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal encourages the installation of renewable energy systems, which provides more flexibility to the builder and could result in either increased or decreased first cost of construction, depending on builder choices.

Proposal # 5562

CE245-19

CE246-19

IECC: C407.3

Proponent: Ted Williams, representing American Gas Association (twilliams@aga.org)

2018 International Energy Conservation Code

Revise as follows:

C407.3 Performance-based compliance. Compliance based on total building performance requires that a proposed building (*proposed design*) be shown to have an annual energy cost that is less than or equal to the annual energy cost of the *standard reference design*. Energy prices shall be taken from a source *approved* by the *code official*, such as the Department of Energy, Energy Information Administration's *State Energy Price and Expenditure Report*. *Code officials* shall be permitted to require time-of-use pricing in energy cost calculations. The reduction in energy cost of the proposed design associated with *on-site renewable energy* shall be not more than 5 percent of the total energy cost. The amount of renewable energy purchased from off-site sources shall be the same in the *standard reference design* and the *proposed design*.

~~**Exception:** Jurisdictions that require site energy (1 kWh = 3413 Btu) rather than energy cost as the metric of comparison. Where energy use based on source energy expressed in Btu or Btu per square foot of *conditioned floor area* is substituted for the energy cost, the source energy multipliers shall be 3.16 for electricity and 1.1 for fuels other than electricity, or other multipliers for national or regional annual average energy consumption from nationally-recognized and validated data sources.~~

Reason: The proposed change brings C407.3 into greater consistency with R405.3 and source energy metric usage in Federal energy programs including Energy Star for Commercial Buildings and Home Energy Score. This revised exception provides the only means of assessing energy performance on fuel cycle energy consumption and ultimately carbon footprints since site energy metrics alone cannot account for these upstream energy system losses. In addition, the allowance in the proposed exception language for use of "other multipliers" addresses a persistent criticism of national average multipliers, which may not reflect regional or local mixes of renewable energy in meeting building demands, and encourages authorities having jurisdiction to use locally-relevant multipliers that are available from utilities and other sources. Also, greater usefulness of the exception is critical since the basic requirements of C407.3 focusing on energy cost is not consistent with the intent of the IECC as stated in C101.3, which addresses energy use and conservation, not energy cost.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal would not increase the cost of construction since the proposal is for changes to an exception. If the use of source energy metrics allows more alternatives for achieving energy performance improvements, it may decrease construction costs ultimately.

Proposal # 5567

CE246-19

CE247-19

IECC: TABLE C407.5.1(1)

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

TABLE C407.5.1(1)

SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

Portions of table not shown remain unchanged.

BUILDING COMPONENT CHARACTERISTICS	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Walls, above-grade	Type: same as proposed Mass wall where proposed wall is mass; otherwise steel-framed wall	As proposed
	Gross area: same as proposed	As proposed
	U-factor: as specified in Table C402.1.4	As proposed
	Solar absorptance: 0.75	As proposed
	Emittance: 0.90	As proposed

SWHF = Service water heat recovery factor, DWHR = Drain water heat recovery.

- a. Where no heating system exists or has been specified, the heating system shall be modeled as fossil fuel. The system characteristics shall be identical in both the standard reference design and proposed design.
- b. The ratio between the capacities used in the annual simulations and the capacities determined by sizing runs shall be the same for both the standard reference design and proposed design.
- c. Where no cooling system exists or no cooling system has been specified, the cooling system shall be modeled as an air-cooled single-zone system, one unit per thermal zone. The system characteristics shall be identical in both the standard reference design and proposed design.
- d. If an economizer is required in accordance with Table C403.5(1) and where no economizer exists or is specified in the proposed design, then a supply-air economizer shall be provided in the standard reference design in accordance with Section C403.5.
- e. The SWHF shall be applied as follows:
 1. Where potable water from the DWHR unit supplies not less than one shower and not greater than two showers, of which the drain water from the same showers flows through the DWHR unit then $SWHF = [1 - (DWHR \text{ unit efficiency} \cdot 0.36)]$.
 2. Where potable water from the DWHR unit supplies not less than three showers and not greater than four showers, of which the drain water from the same showers flows through the DWHR unit then $SWHF = [1 - (DWHR \text{ unit efficiency} \cdot 0.33)]$.
 3. Where potable water from the DWHR unit supplies not less than five showers and not greater than six showers, of which the drain water from the same showers flows through the DWHR unit, then $SWHF = [1 - (DWHR \text{ unit efficiency} \cdot 0.26)]$.

4. Where Items 1 through 3 are not met, SWHF = 1.0.

Reason: The purpose of this code change proposal is to improve the efficiency of above-grade walls by eliminating an unnecessary loophole. The current standard reference design assumption for above-grade walls is based on mass walls (where mass walls are proposed) or steel-framed walls (regardless of whether steel or wood-framed walls are proposed). The result is that when a building design incorporates wood-framed walls (which are more efficient than steel-framed walls), the building receives a trade-off credit for the difference in efficiency between the steel and wood framing, even though the choice of framing type may have little or nothing to do with efficiency. While we would prefer a single reference design and related budget, if there are to be different standard reference designs for steel versus mass walls, then logically there should be a different design for wood walls as well.

This proposal applies a more consistent approach that will result in improved efficiency. Whether the wall is mass wall, steel-framed, or wood-framed, the baseline will be the insulation requirement for the corresponding wall type set in the prescriptive table. This will eliminate the trade-off loophole and improve efficiency in most climate zones and occupancy types.

Cost Impact: The code change proposal will increase the cost of construction

This proposal will increase the cost of construction for buildings with wood-framed walls because it will either require additional insulation or the incorporation of other energy efficient measures in Section C407 (to be consistent with the current prescriptive path requirements for wood framing). However, we view this as the elimination of an unnecessary loophole that is applying an incorrect baseline in the simulated performance alternative.

Proposal # 4205

CE247-19

CE248-19 Part I

PART I — IECC: Part I: TABLE C407.5.1(1)

IECC: Part II: TABLE R405.5.2(1) [(TABLE N1105.2(1))]

PART II — IECC: TABLE R405.5.2(1) [IRC N1105.2(1)]

Proponent: Erika Burns, D+R International, representing Attachments Energy Rating Council (AERC) (aerc316@gmail.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- COMMERCIAL COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

Revise as follows:

TABLE C407.5.1(1)

SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

Portions of table not shown remain unchanged.

BUILDING COMPONENT CHARACTERISTICS	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Vertical fenestration other than opaque doors	Area 1. The proposed vertical fenestration area; where the proposed vertical fenestration area is less than 40 percent of above-grade wall area. 2. 40 percent of above-grade wall area; where the proposed vertical fenestration area is 40 percent or more of the above-grade wall area.	As proposed
	U-factor: as specified in Table C402.4	As proposed
	SHGC: as specified in Table C402.4 except that for climates with no requirement (NR) SHGC = 0.40 shall be used	As proposed
	<u>Shading:</u> External shading and PF: None <u>Automatic and manually controlled shading devices such as blinds or shades are not required to be modeled.</u>	As proposed <u>Manual blinds or shades shall be modeled the same as in the standard reference design.</u> <u>Automatically controlled blinds or shades shall be modeled.</u>

Skylights	Area 1.The proposed skylight area; where the proposed skylight area is less than that permitted by Section C402.1.	As proposed
	2.The area permitted by Section C402.1; where the proposed skylight area exceeds that permitted by Section C402.1 U-factor: as specified in Table C402.4	As proposed
	SHGC: as specified in Table C402.4 except that for climates with no requirement (NR) SHGC = 0.40 shall be used.	As proposed
	<u>Shading: Automatic and manually controlled shading devices such as blinds or shades are not required to be modeled.</u>	<u>Manual blinds or shades shall be modeled the same as in the standard reference design. Automatically controlled blinds or shades shall be modeled.</u>

SWHF = Service water heat recovery factor, DWHR = Drain water heat recovery.

- a. Where no heating system exists or has been specified, the heating system shall be modeled as fossil fuel. The system characteristics shall be identical in both the standard reference design and proposed design.
- b. The ratio between the capacities used in the annual simulations and the capacities determined by sizing runs shall be the same for both the standard reference design and proposed design.
- c. Where no cooling system exists or no cooling system has been specified, the cooling system shall be modeled as an air-cooled single-zone system, one unit per thermal zone. The system characteristics shall be identical in both the standard reference design and proposed design.
- d. If an economizer is required in accordance with Table C403.5(1) and where no economizer exists or is specified in the proposed design, then a supply-air economizer shall be provided in the standard reference design in accordance with Section C403.5.
- e. The SWHF shall be applied as follows:
 1. Where potable water from the DWHR unit supplies not less than one shower and not greater than two showers, of which the drain water from the same showers flows through the DWHR unit then $SWHF = [1 - (DWHR \text{ unit efficiency} \cdot 0.36)]$.
 2. Where potable water from the DWHR unit supplies not less than three showers and not greater than four showers, of which the drain water from the same showers flows through the DWHR unit then $SWHF = [1 - (DWHR \text{ unit efficiency} \cdot 0.33)]$.
 3. Where potable water from the DWHR unit supplies not less than five showers and not greater than six showers, of which the drain water from the same showers flows through the DWHR unit, then $SWHF = [1 - (DWHR \text{ unit efficiency} \cdot 0.26)]$.
 4. Where Items 1 through 3 are not met, $SWHF = 1.0$.

Proposal # 4670

CE248-19 Part I

CE248-19 Part II

IECC: TABLE R405.5.2(1) [IRC N1105.2(1)]

Proponent: Erika Burns, D+R International, representing Attachments Energy Rating Council (AERC) (aerc316@gmail.com)

2018 International Energy Conservation Code

TABLE R405.5.2(1) [IRC N1105.2(1)]

SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

Portions of table not shown remain unchanged.

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Vertical fenestration other than opaque doors	Total area ^h = (a) The proposed glazing area, where the proposed glazing area is less than 15 percent of the conditioned floor area (b) 15 percent of the conditioned floor area, where the proposed glazing area is 15 percent or more of the conditioned floor area.	As proposed
	Orientation: equally distributed to four cardinal compass orientations (N, E, S & W).	As proposed
	U-factor: as specified in Table R402.1.4.	As proposed
	SHGC: as specified in Table R402.1.2 except for climate zones without an SHGC requirement, the SHGC shall be equal to 0.40.	As proposed
	Interior shade fraction: 0.92-(0.21 × SHGC for the standard reference design).	Interior shade fraction: 0.92-(0.21 × SHGC as proposed)
	External shading: <u>Automatic and manually controlled shading devices such as blinds or shades are not required to be modeled.</u>	<u>Manual blinds or shades shall be modeled the same as in the standard reference design. Automatically controlled blinds or shades shall be modeled.</u>
Skylights	None. <u>Shading: Automatic and manually controlled shading devices such as blinds or shades are not required to be modeled.</u>	As proposed <u>Manual blinds or shades shall be modeled the same as in the standard reference design. Automatically controlled blinds or shades shall be modeled.</u>

For SI: 1 square foot = 0.93 m², 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m², 1 gallon (US) = 3.785 L,

°C = (°F-32)/1.8, 1 degree = 0.79 rad.

a. Where required by the *code official*, testing shall be conducted by an *approved* party. Hourly

calculations as specified in the ASHRAE *Handbook of Fundamentals*, or the equivalent, shall be used to determine the energy loads resulting from infiltration.

- b. The combined air exchange rate for infiltration and mechanical ventilation shall be determined in accordance with Equation 43 of 2001 ASHRAE *Handbook of Fundamentals*, page 26.24 and the “Whole-house Ventilation” provisions of 2001 ASHRAE *Handbook of Fundamentals*, page 26.19 for intermittent mechanical ventilation.
- c. Thermal storage element shall mean a component that is not part of the floors, walls or ceilings that is part of a passive solar system, and that provides thermal storage such as enclosed water columns, rock beds, or phase-change containers. A thermal storage element shall be in the same room as fenestration that faces within 15 degrees (0.26 rad) of true south, or shall be connected to such a room with pipes or ducts that allow the element to be actively charged.
- d. For a proposed design with multiple heating, cooling or water heating systems using different fuel types, the applicable standard reference design system capacities and fuel types shall be weighted in accordance with their respective loads as calculated by accepted engineering practice for each equipment and fuel type present.
- e. For a proposed design without a proposed heating system, a heating system having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and proposed design.
- f. For a proposed design home without a proposed cooling system, an electric air conditioner having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and the proposed design.
- g. For a proposed design with a nonstorage-type water heater, a 40-gallon storage-type water heater having the prevailing federal minimum energy factor for the same fuel as the predominant heating fuel type shall be assumed. For a proposed design without a proposed water heater, a 40-gallon storage-type water heater having the prevailing federal minimum efficiency for the same fuel as the predominant heating fuel type shall be assumed for both the proposed design and standard reference design.
- h. For residences with conditioned basements, R-2 and R-4 residences, and for townhouses, the following formula shall be used to determine glazing area:

$$AF = A_s \times FA \times F$$

where:

AF	=	Total glazing area.
A_s	=	Standard reference design total glazing area.
FA	=	(Above-grade thermal boundary gross wall area)/(above-grade boundary wall area + 0.5 × below-grade boundary wall area).
F	=	(above-grade thermal boundary wall area)/(above-grade thermal boundary wall area + common wall area) or 0.56, whichever is greater.

and where:

Thermal boundary wall is any wall that separates conditioned space from unconditioned space or ambient conditions.

Above-grade thermal boundary wall is any thermal boundary wall component not in contact with soil.

Below-grade boundary wall is any thermal boundary wall in soil contact.

Common wall area is the area of walls shared with an adjoining dwelling unit.

L and *CFA* are in the same units.

Reason: The IECC is not currently clear on how manual or automated shades and blinds are to be addressed in the performance path, other than specifying an interior shade fraction. This could lead to potential gaming using different assumptions for shading in the reference and proposed designs, so should be clarified. First, this proposal specifies that manual blinds and shades are to be modeled the same in the reference and proposed designs. This ensures manual shades are treated neutrally, with no credit for manual shades since occupant behavior and the performance of manual controls cannot be guaranteed. Second, it does allow automatically controlled shades to be modeled in the proposed building, as this can provide advanced energy performance without relying on an occupant's behavior. To avoid proprietary issues, the control scheme for how the automated shades are modeled is not specified and is left up to the designer or builder, subject to approval by the code official. This is similar to how automated shades are already addressed in ASHRAE 90.1 for commercial applications, and a similar proposal has been submitted for the commercial IECC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This change simply clarifies how manual and automated blinds and shades are to be addressed in the performance path, and does not impact cost of construction.

Proposal # 4985

CE248-19 Part II

CE249-19

IECC: C408.3.1

Proponent: Aaron Gary, representing Self (aaron.gary@texenergy.org)

2018 International Energy Conservation Code

Revise as follows:

C408.3.1 Functional testing. Prior to passing final inspection, the registered design professional or approved agency shall provide evidence that the lighting control systems have been tested to ensure that control hardware and software are calibrated, adjusted, programmed and in proper working condition in accordance with the construction documents and manufacturer's instructions. Functional testing shall be in accordance with Sections C408.3.1.1 through C408.3.1.3 for the applicable control type.

Reason: The addition of 'or approved agency' will make the lighting systems requirements match the mechanical system requirements in C 408.2.1. This will facilitate and add flexibility to the enforcement of the commissioning requirements.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal does not change the underlying requirements of the Code but simply adds clarifying language that aligns the Lighting Commissioning requirements with those of the mechanical requirements such that a qualified Commissioning professional can perform the Commissioning activities in addition to the previously singularly called out design professional.

Proposal # 4590

CE249-19

CE250-19

IECC: SECTION C501, C501.1, C501.2, C501.4, SECTION C502, C502.1, C503.2, C502.2, C502.2.1, C502.2.2, C502.2.3, C502.2.6, C502.2.6.1, C502.2.6.2, SECTION C503, C503.1, C503.4, C503.5, C503.6

Proponent: David Collins, representing SEHPCAC (SEHPCAC@iccsafe.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Energy Conservation Code

SECTION C501 GENERAL

Revise as follows:

C501.1 Scope. The provisions of this chapter shall control the alteration, repair, addition and change of occupancy of existing buildings and structures.

~~C501.2~~ **C501.1.1 Existing buildings.** Except as specified in this chapter, this code shall not be used to require the removal, alteration or abandonment of, nor prevent the continued use and maintenance of, an existing building or building system lawfully in existence at the time of adoption of this code.

~~C501.4~~ **C501.2 Compliance.** ~~Alterations, Additions, alterations, repairs, additions and changes of occupancy to, or relocation of, existing buildings and structures shall comply Sections C502, C503, C504, or C505 of this code, and with the provisions for alterations, repairs, additions and changes of occupancy or relocation, respectively, in this code and in the International Building Code , International Existing Building Code , International Fire Code , International Fuel Gas Code , International Mechanical Code , International Plumbing Code , International Property Maintenance Code , International Private Sewage Disposal Code and NFPA 70. Changes where unconditioned space is changed to conditioned space shall comply with Section C502.~~

Exception: Additions, alterations, repairs, or changes of occupancy complying with ANSI/ASHRAE/IESNA 90.1

SECTION C502 ADDITIONS

C502.1 General. Additions to an existing building, building system or portion thereof shall conform to the provisions of this code as those provisions relate to new construction without requiring the unaltered portion of the existing building or building system to comply with this code. Additions shall not create an unsafe or hazardous condition or overload existing building systems. An addition shall be deemed to comply with this code if the addition alone complies or if the existing building and addition comply with this code as a single building. ~~Additions shall comply with Sections C402, C403, C404, C405 and C502.2. Additions complying with ANSI/ASHRAE/IESNA 90.1, need not comply with Sections C402, C403, C404 and C405.~~

~~C503.2~~ **C502.2 Change in space conditioning.** Any nonconditioned or low-energy space that is altered to become conditioned space shall be required to ~~be brought into full compliance with this code.~~ comply with Section C502.

Exceptions:

1. Where the component performance alternative in Section C402.1.5 is used to comply with this section, the proposed UA shall be not greater than 110 percent of the target UA.

2. Where the total building performance option in Section C407 is used to comply with this section, the annual energy cost of the proposed design shall be not greater than 110 percent of the annual energy cost otherwise permitted by Section C407.3.

~~C502.2 C502.3 Prescriptive compliance. Compliance.~~ Additions shall comply with Sections ~~C502.2.1 C502.3.1~~ through ~~C502.2.6.2 C502.3.6.2~~.

~~C502.2.1 C502.3.1 Vertical fenestration: fenestration area.~~ Additions shall comply in accordance with the following:

New

1. ~~Where an addition has new~~ vertical fenestration area that results in a total building fenestration area less than or equal to that ~~specified in permitted by~~ Section C402.4.1 ~~the addition~~ shall comply with Section C402.1.5, C402.4.3 or C407.
2. ~~Additions~~ ~~Where an additions~~ with vertical fenestration that ~~result results~~ in a total building fenestration area greater than Section C402.4.1 or additions that exceed the fenestration area greater than ~~that permitted by~~ Section C402.4.1 ~~the fenestration~~ shall comply with Section C402.4.1.1 for the addition only. ~~Additions that result~~
3. ~~Where an addition has vertical fenestration that results~~ in a total building vertical fenestration area exceeding that ~~specified in permitted by~~ Section C402.4.1.1 ~~the addition~~ shall comply with Section C402.1.5 or C407.

~~C502.2.2 C502.3.2 Skylight area.~~ Skylights shall comply as follows:

1. ~~Where an addition has new~~ skylight area that results in a total building fenestration area less than or equal to that ~~specified in permitted by~~ Section C402.4.1, ~~the addition~~ shall comply with Section C402.1.5 or C407.
2. ~~Additions with~~ ~~Where an addition has new~~ skylight area that ~~result results~~ in a total building skylight area greater than ~~permitted by~~ C402.4.1 or ~~where additions that exceed have skylight area greater than that permitted by~~ C402.4.1, the skylight area shall comply with Section C402.4.1.2 for the addition only.
3. ~~Additions that result~~ ~~Where an addition has skylight area that results~~ in a total building skylight area exceeding that specified in ~~permitted by~~ Section C402.4.1.2, ~~the addition~~ shall comply with Section C402.1.5 or C407.

~~C502.2.3 C502.3.3 Building mechanical systems.~~ New mechanical systems and equipment that are part of the addition and serve the building heating, cooling and ventilation needs shall comply with ~~Section Sections~~ C403, ~~and~~ C408.

~~C502.2.6 Lighting power and systems.~~ New lighting systems that are installed as part of the addition shall comply with ~~Section Sections~~ C405 ~~and~~ C408.

~~C502.2.6.1 Interior lighting power.~~ The total interior lighting power for the addition shall comply with Section C405.3.2 for the addition alone, or the existing building and the addition shall comply as a single building.

~~C502.2.6.2 Exterior lighting power.~~ The total exterior lighting power for the addition shall comply with Section C405.4.2 for the addition alone, or the existing building and the addition shall comply as a single building.

SECTION C503 ALTERATIONS

C503.1 General. Alterations to any building or structure shall comply with the requirements of Section C503 and the code for new construction. Alterations shall be such that the existing building or structure is not less conforming to the provisions of this code than the existing building or structure was prior to the *alteration*.

alteration. Alterations to an existing building, building system or portion thereof shall conform to the provisions of this code as those provisions relate to new construction without requiring the unaltered portions of the existing building or building system to comply with this code. Alterations shall not create an unsafe or hazardous condition or overload existing building systems.

~~Alterations complying with ANSI/ASHRAE/IESNA 90.1, need not comply with Sections C402, C403, C404 and C405.~~

Exception: The following alterations need not comply with the requirements for new construction, provided that the energy use of the building is not increased:

1. Storm windows installed over existing ~~fenestration~~, fenestration.
2. Surface-applied window film installed on existing single-pane fenestration assemblies reducing solar heat gain, provided that the code does not require the glazing or fenestration to be replaced.
3. Existing ceiling, wall or floor cavities exposed during construction, provided that these cavities are filled with insulation.
4. Construction where the existing roof, wall or floor cavity is not exposed.
5. Roof ~~recover~~, recover.
6. Air barriers shall not be required for roof recover and roof replacement where the alterations or renovations to the building do not include alterations, renovations or repairs to the remainder of the building envelope.

C503.4 Heating and cooling systems. New heating, cooling and duct systems that are part of the alteration shall comply with Sections C403 and C408.

C503.5 Service hot water systems. New service hot water systems that are part of the alteration shall comply with ~~Section~~ Sections C404, and C408.

C503.6 Lighting systems. New lighting systems that are part of the alteration shall comply with Section C405 and C408.

Exception. Alterations that replace less than 10 percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.

Reason: No technical changes are intended. No advantage to any proprietary interests governed by the code is intended. The intent is strictly to make the IECC more understandable and easier to use.

The "Compliance" is relocated from Sec. 501.4 to Sec. 501.2 as more proper code formatting; compliance immediately following scope.

The exception for the 90.1 compliance option applicable to additions and alterations is located under the relocated compliance section

This change clarifies:

- That changes from unconditioned space to condition space must comply as an addition.
- Vertical fenestration and skylight requirements for additions by putting the requirements into a list format for easier reading
- That the IECC and ASHRAE compliance paths cannot be combined.
- That new mechanical, service water, and lighting systems are subject to Section 408 (as per C401.2, requirements for prescriptive and total building performance compliance paths)

“Prescriptive” is stricken from the title of Section 502.2 as it is a misnomer since the section references the performance path as a compliance option.

This proposal is submitted by the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at:
<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>
(<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>)

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal does not change the design or construction requirements for a project.

Proposal # 4746

CE250-19

CE251-19

IECC: C502.2.3.1 (New), C502.2.4.1 (New), C502.2.6.3 (New)

Proponent: Eric Makela, New Buildings Institute, representing New Buildings Institute
(ericM@newbuildings.org)

2018 International Energy Conservation Code

Add new text as follows:

C502.2.3.1 Mechanical systems acceptance testing. New mechanical systems that serve alterations shall comply with Sections C408.2.2, C408.2.3 and C408.2.5.

Exceptions: The following systems are exempt:

1. Mechanical systems and service water heater systems in buildings where the total mechanical equipment capacity is less than 480,000 Btu/h (140.7 kW) cooling capacity and 600,000 Btu/h (175.8 kW) combined service water-heating and space-heating capacity.
2. Systems included in Section C403.5 that serve individual dwelling units and sleeping units

C502.2.4.1 Service hot water systems acceptance testing. New service hot water systems that serve additions shall comply with Sections C408.2.3 and C408.2.5

Exceptions: The following systems are exempt:

1. Service water heater systems in buildings where the total mechanical equipment capacity is less than 600,000 Btu/h (175.8 kW) combined service water-heating and space-heating capacity.
2. Systems included in Section C403.5 that serve individual dwelling units and sleeping units.

C502.2.6.3 Lighting acceptance testing. New lighting systems that serve additions shall comply with Section C408.3.

Reason: Due to the way that the charging language in the IECC is structured, new mechanical, water heating and lighting systems in additions do not need to meet the commissioning / acceptance testing requirements that the same systems in new construction would need to meet. This allows new systems in additions to go without this vital installation step and leaves them vulnerable to poor performance from installation. This proposal closes that loophole.

The proposal includes specific references to the appropriate commissioning /acceptance testing requirements in section C408:

- The balancing (C408.2.2), functional testing (C408.2.3) and documentation (C408.2.5) requirements for HVAC systems.
- The functional testing (C408.2.3) and documentation (C408.2.5) requirements for water heating systems
- The functional testing, documentation and reporting requirements for lighting (C408.3).

It repeats the system-size thresholds in the charging language in C408. The proposal also does not include references to the commissioning plan requirement (C408.2.1) for HVAC equipment. In this way, it has the same scope as the requirements for new construction. Since it references only new equipment in the addition itself, it avoids potentially requiring changes to the existing building systems.

Cost Impact: The code change proposal will increase the cost of construction. The proposal will increase the cost of construction. However, these requirements have already been found to be sufficiently cost effective to be included in the code for new construction.

Proposal # 5172

CE251-19

CE252-19

IECC: C503.1

Proponent: Darren Meyers, P.E., IECC_LLCC representing the National Roofing Contractors Association, representing the National Roofing Contractors Association (dmeyers@ieccode.com)

2018 International Energy Conservation Code

Revise as follows:

C503.1 General. Alterations to any building or structure shall comply with the requirements of Section C503 and the code for new construction. Alterations shall be such that the existing building or structure is not less conforming to the provisions of this code than the existing building or structure was prior to the alteration. Alterations to an existing building, building system or portion thereof shall conform to the provisions of this code as those provisions relate to new construction without requiring the unaltered portions of the existing building or building system to comply with this code. Alterations shall not create an unsafe or hazardous condition or overload existing building systems.

Alterations complying with ANSI/ASHRAE/IESNA 90.1. need not comply with Sections C402, C403, C404 and C405.

Exception: The following alterations need not comply with the requirements for new construction, provided that the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.
2. Surface-applied window film installed on existing single-pane fenestration assemblies reducing solar heat gain, provided that the code does not require the glazing or fenestration to be replaced.
3. Existing ceiling, wall or floor cavities exposed during construction, provided that these cavities are filled with insulation.
4. Construction where the existing roof, wall or floor cavity is not exposed.
5. Roof recover.
6. Removal and replacement of a roof membrane where there is existing roof insulation integral to or below the roof deck.
7. Air barriers shall not be required for roof recover and roof replacement where the alterations or renovations to the building do not include alterations, renovations or repairs to the remainder of the building envelope.

Reason: The intent of this proposal is to provide clarity and consistency in the IECC with ASHRAE Standard 90.1-2016, Section 5.1.3, Exception 6.

Bibliography: ASHRAE 90.1—2016: Energy Standard for Buildings Except Low-rise Residential Buildings ... In 2018 IECC Sections ... C401.2, Table C402.1.3, Table C402.1.4, C406.2, Table C407.6.1, C502.1, C503.1, C504.1

Cost Impact: The code change proposal will decrease the cost of construction. This change better positions the IECC to be clearer, more easily applied to removal and replacement operations, and competitive with the 90.1 Standard alternative; thereby no cost impact when compared with current provisions.

Proposal # 5257

CE252-19

CE253-19 Part I

PART I — IECC: C503.1

PART II — IECC: R503.1.1 (IRC N1109.1.1)

Proponent: William McHugh, The McHugh Company, representing Chicago Roofing Contractors Association (billmchugh-jr@att.net)

2018 International Energy Conservation Code

Revise as follows:

C503.1 General. *Alterations* to any *building* or structure shall comply with the requirements of Section C503 and the code for new construction. *Alterations* shall be such that the existing *building* or structure is not less conforming to the provisions of this code than the existing building or structure was prior to the *alteration*. *Alterations* to an existing building, building system or portion thereof shall conform to the provisions of this code as those provisions relate to new construction without requiring the unaltered portions of the existing building or building system to comply with this code. *Alterations* shall not create an unsafe or hazardous condition or overload existing *building* systems.

Alterations complying with ANSI/ASHRAE/IESNA 90.1. need not comply with Sections C402, C403, C404 and C405.

Exception: The following *alterations* need not comply with the requirements for new construction, provided that the energy use of the building is not increased:

1. Storm windows installed over existing *fenestration*.
2. Surface-applied window film installed on existing single-pane *fenestration* assemblies reducing solar heat gain, provided that the code does not require the glazing or *fenestration* to be replaced.
3. Existing ceiling, wall or floor cavities exposed during construction, provided that these cavities are filled with insulation.
4. Construction where the existing roof, wall or floor cavity is not exposed.
5. *Roof recover*.
6. *Air barriers* shall not be required for *roof recover* and roof replacement where the *alterations* or renovations to the building do not include *alterations*, renovations or *repairs* to the remainder of the building envelope.
7. . Roof replacements for roof systems less than 2:12 slope shall comply with the low slope roofing insulation requirements for new construction unless the installation of insulation above the structural roof deck necessary to achieve the code required R-value is deemed infeasible by the code official to accommodate the added thickness of insulation above the roof deck. Conditions of infeasibility include but are not limited to flashing height limitations at HVAC, equipment or skylight curbs, low door or glazing heights above the roof surface, parapet, weep holes, drainage patterns or due to cricket or saddle construction, subject to manufacturers installation instructions and code official approval.

Proposal # 5339

CE253-19 Part I

CE253-19 Part II

IECC: R503.1.1 (IRC N1109.1.1)

Proponent: William McHugh, The McHugh Company, representing Chicago Roofing Contractors Association (billmchugh-jr@att.net)

2018 International Energy Conservation Code

Revise as follows:

R503.1.1 (IRC N1109.1.1) Building envelope. Building envelope assemblies that are part of the alteration shall comply with Section R402.1.2 or R402.1.4, Sections R402.2.1 through R402.2.13, R402.3.1, R402.3.2, R402.4.3 and R402.4.5.

Exception: The following alterations shall not be required to comply with the requirements for new construction provided that the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.
2. Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation.
3. Construction where the existing roof, wall or floor cavity is not exposed.
4. Roof re-cover.
5. Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing.
6. Surface-applied window film installed on existing single pane fenestration assemblies to reduce solar heat gain provided that the code does not require the glazing or fenestration assembly to be replaced.
7. Roof replacements for roof systems less than 2:12 slope shall comply with the low slope roofing insulation requirements for new construction unless the installation of insulation above the structural roof deck necessary to achieve the code required R-value is deemed infeasible by the code official to accommodate the added thickness of insulation above the roof deck. Conditions of infeasibility include but are not limited to flashing height limitations at HVAC, equipment or skylight curbs, low door or glazing heights above the roof surface, parapet, weep holes, drainage patterns or due to cricket or saddle construction, subject to manufacturers installation instructions and code official approval.

Reason: The reason for this code proposal is to give code officials that use the International Energy Conservation Code the guidance for when flashing heights are not tall enough to accommodate the use of new construction insulation thicknesses. The IECC's 503.1 General speaks to the code official, roofing industry and building owner and manager through

R503.1 General. Alterations to any building or structure shall comply with the requirements of the code for new construction.

Alterations shall be such that the existing building or structure is not less conforming to the provisions of this code than the existing building or structure was prior to the alteration.

Alterations to an existing building, building system or portion thereof shall conform to the provisions of this code as they relate to new construction **without requiring the unaltered portions of the existing building or building system to comply with this code.** Alterations shall not create an unsafe

or hazardous condition or overload existing building systems. Alterations shall be such that the existing building or structure does not use more energy than the existing building or structure prior to the alteration. Alterations to existing buildings shall comply with Sections R503.1.1 through R503.2.

This 503.1 General Section, as bolded, clearly states that the building is not to be less conforming than it was before the alteration - it even says it twice. It is especially true of roofing work where the scope of work is to keep the building dry. Just because the insulation is exposed does not mean that the rooftop needs to be rebuilt to accommodate new construction insulation thicknesses.

Cost Impact: The code change proposal will decrease the cost of construction. The code change proposal will decrease the cost of construction. This option, if it becomes part of the IECC, will allow the building owner to not have to raise HVAC units, equipment, roof perimeter nailers, parapet walls, replace doors and windows that are not high enough to accommodate the insulation, stack vents, etc., as would occur on a low sloped residential structure. This action results in cost savings, allowed in the code.

Proposal # 5344

CE253-19 Part II

CE254-19

IECC: C503.1

Proponent: Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers (glenn@lampartners.com); Jack Bailey (jbailey@oneluxstudio.com)

2018 International Energy Conservation Code

Revise as follows:

C503.1 General. Alterations to any building or structure shall comply with the requirements of Section C503₁ and Sections C402, C403, C404, C405 of the code for new construction. Alterations shall be such that the existing building or structure is not less conforming to the provisions of this code than the existing building or structure was prior to the alteration. Alterations to an existing building, building system or portion thereof shall conform to the provisions of this code as those provisions relate to new construction without requiring the unaltered portions of the existing building or building system to comply with this code. Alterations shall not create an unsafe or hazardous condition or overload existing building systems. Alterations complying with ANSI/ASHRAE/IESNA 90.1. need not comply with Sections C402, C403, C404 and C405.

Exception: The following alterations need not comply with the requirements for new construction, provided that the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.
2. Surface-applied window film installed on existing single-pane fenestration assemblies reducing solar heat gain, provided that the code does not require the glazing or fenestration to be replaced.
3. Existing ceiling, wall or floor cavities exposed during construction, provided that these cavities are filled with insulation.
4. Construction where the existing roof, wall or floor cavity is not exposed.
5. Roof recover.
6. Air barriers shall not be required for roof recover and roof replacement where the alterations or renovations to the building do not include alterations, renovations or repairs to the remainder of the building envelope.

Reason: This revision makes it clear what portions of “the code for new construction” apply to Alterations, and specifically that C406 does not apply to Alterations. We believe that this is the original intent of the code and that this proposal fixes an editorial omission.

This change matches the approach already used in C502.1 for Additions. C502.1 does *not* require compliance with C406.

C406 Additional Efficiency Package Options cannot be required of Additions and Alterations. Most of the options only apply to the construction of new buildings and are not typically possible to achieve for Alteration or Addition projects.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal is an editorial clarification

Proposal # 4596

CE254-19

CE255-19 Part I

PART I — IECC: C202, C503.1

PART II — IECC: R202 (N1101.6) , R503.1.1 (IRC N1109.1.1)

Proponent: Bill McHugh, The McHugh Company, representing Chicago Roofing Contractors Association (bill@mc-hugh.us)

2018 International Energy Conservation Code

Add new definition as follows:

ROOF MEMBRANE PEEL AND REPLACEMENT. Where an existing roof membrane alone is removed, exposing insulation or sheathing, and only a new weather resisting roof membrane is installed.

Revise as follows:

C503.1 General. *Alterations to any building or structure shall comply with the requirements of Section C503 and the code for new construction. Alterations shall be such that the existing building or structure is not less conforming to the provisions of this code than the existing building or structure was prior to the alteration. Alterations to an existing building, building system or portion thereof shall conform to the provisions of this code as those provisions relate to new construction without requiring the unaltered portions of the existing building or building system to comply with this code. Alterations shall not create an unsafe or hazardous condition or overload existing building systems.*

Alterations complying with ANSI/ASHRAE/IESNA 90.1. need not comply with Sections C402, C403, C404 and C405.

Exception: The following *alterations* need not comply with the requirements for new construction, provided that the energy use of the building is not increased:

1. Storm windows installed over existing *fenestration*.
2. Surface-applied window film installed on existing single-pane *fenestration* assemblies reducing solar heat gain, provided that the code does not require the glazing or *fenestration* to be replaced.
3. Existing ceiling, wall or floor cavities exposed during construction, provided that these cavities are filled with insulation.
4. Construction where the existing roof, wall or floor cavity is not exposed.
5. *Roof recover*.
6. *Air barriers* shall not be required for *roof recover* and roof replacement where the *alterations* or renovations to the building do not include *alterations*, renovations or *repairs* to the remainder of the building envelope.
7. . Roof membrane peel and replacement.

Proposal # 5334

CE255-19 Part I

CE255-19 Part II

IECC: R202 (N1101.6) , R503.1.1 (IRC N1109.1.1)

Proponent: William McHugh, The McHugh Company, representing Chicago Roofing Contractors Association (billmchugh-jr@att.net)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Add new definition as follows:

ROOF MEMBRANE PEEL AND REPLACEMENT. *Where an existing roof membrane alone is removed, exposing insulation or sheathing, and only a new weather resisting roof membrane is installed.*

Revise as follows:

R503.1.1 (IRC N1109.1.1) Building envelope. Building envelope assemblies that are part of the alteration shall comply with Section R402.1.2 or R402.1.4, Sections R402.2.1 through R402.2.13, R402.3.1, R402.3.2, R402.4.3 and R402.4.5.

Exception: The following alterations shall not be required to comply with the requirements for new construction provided that the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.
2. Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation.
3. Construction where the existing roof, wall or floor cavity is not exposed.
4. Roof re-cover.
5. Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing.
6. Surface-applied window film installed on existing single pane fenestration assemblies to reduce solar heat gain provided that the code does not require the glazing or fenestration assembly to be replaced.
7. Roof membrane peel and replacement.

Reason: This new definition and accompanying technical requirement adds a subset of the Roof Recover operation to the International Energy Conservation Code. The operation means that the building owner and manager can re-use the existing insulation providing sustainability to the insulation products in place. The operation provides the building owner and manager with a code approved, economical option that does not increase the energy use of existing buildings, meeting the bolded intent of the 503.1 General Section of the IECC.

For convenience, the C503.1 General section is below, bolded for emphasis:

C503.1 General. Alterations to any building or structure shall comply with the requirements of Section C503 and the code for new construction. Alterations shall be such that the existing building or structure is not less conforming to the provisions of this code than the existing building or structure was prior to the alteration. Alterations to an existing building, building system or portion thereof shall conform to the provisions of this code as those provisions relate to new construction without requiring the unaltered portions of the existing building or

building system to comply with this code. Alterations shall not create an unsafe or hazardous condition or overload existing building systems.

Cost Impact: The code change proposal will decrease the cost of construction

The code change proposal will decrease the cost of construction. This type of re-roofing operation is where the roof covering membrane is peeled off, and a new roof covering membrane installed over a prepared surface. This operation is not currently allowed by the International Energy Conservation Code. If allowed, Roof Membrane Peel and Replacement will decrease the cost of construction because the operation does not trigger meeting the minimum R-30 c.i. insulation requirements for new construction, as it would today. The operation does not increase the energy usage of the building, consistent with Section C503.1 General's statements, of the IECC.

Proposal # 5363

CE255-19 Part II

CE256-19

IECC: C503.3.1

Proponent: Darren Meyers, P.E., IECC_LL_C representing the National Roofing Contractors Association, representing the National Roofing Contractors Association (dmeyers@ieccode.com)

2018 International Energy Conservation Code

Revise as follows:

C503.3.1 Roof replacement. Roof replacements shall comply with Section C402.1.3, C402.1.4, C402.1.5 or C407 where the existing roof assembly is part of the building thermal envelope and contains insulation entirely above the roof deck.

Exception: Where the required R-value cannot be provided due to above-deck thickness limitations presented by existing rooftop conditions, including an HVAC system or refrigeration equipment, skylight curbs, low door or glazing heights, weep holes, parapet or roof flashing heights, the maximum approved thickness of insulation compatible with the available space and existing uses shall be installed.

Reason: This proposal is CE287-16 resubmitted with the sole difference clarifying "above-deck" thickness and adding "approved." CE287-16 received a Committee recommendation of "Disapproval," a Public Comment recommendation of "As Modified by Public Comment" (AMPC), but ultimately did not receive the two-thirds necessary to prevail during the "Online Governmental Consensus Vote" (OGCV), leading to "Disapproval" as its Final Action.

Specifically, the newly proposed exception addresses the AMPC and the challenge of constructability when installing additional roof insulation in *reroofing* situations including *roof recover* and *roof replacement* where existing conditions do not allow for the full thickness of insulation required by Table C402.1.3 or Table C402.1.4. Consider the sheer square footage of buildings constructed before an adoption of the 2009 IECC, that now require *reroofing*, without adequate "clear space" to accommodate up to 5+ inches (R-25-ish) or 6+ inches (R-30-ish) of insulation as the IECC evolved thru 2012 to 2015 and now the 2018 Editions. The building stock now considered 10 to 20 to 30+ years old, is far more likely to avail itself of skylight and structural curb heights, scupper and sump depths, door and window access thresholds that would turn into ponds, if five to six inches of insulation were "retroactively" foisted upon building ownership.

Moreover, if the IECC CDC were to consult the premise to Section C505.1, that "... [neither] an increase in demand for either fossil fuel [nor] electrical energy shall comply with this code," so long as the current level of insulation in the roof is replaced with an equivalent thickness/level/R-value of NEW! insulation product, you'd likely conclude that the newly proposed Exception is a "do-no-harm" proposition.

The proposed exception is a pragmatic and constructible solution taken nearly word-for-word from the 2015 IgCC, Section 1003.2.7—Roof Replacement Insulation. We believe the proposal makes clear that the maximum thickness of insulation compatible within the technically-feasible limitations of available space is installed.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This change better positions the IECC to be clearer, more easily applied to *reroofing*, more competitive than the 90.1 Standard alternative on this issue; thereby no cost impact when compared with current provisions.

Proposal # 5296

CE256-19

CE257-19

IECC: SECTION C503, C503.3.1

Proponent: Wanda Edwards, Wanda Edwards Consulting, Inc., representing RCI, Inc. (wedwards@rci-online.org)

2018 International Energy Conservation Code

SECTION C503 ALTERATIONS

Revise as follows:

C503.3.1 Roof replacement. *Roof replacements* shall comply with Section C402.1.3, C402.1.4, C402.1.5 or C407 where the existing roof assembly is part of the *building thermal envelope* and contains insulation entirely above the roof deck.

Exception: Where approved by the code official, the required R-value cannot be provided because of the thickness limitations presented by existing rooftop conditions, including heating, ventilating and air conditioning equipment, low door or glazing heights, parapet heights and roof flashing heights, the maximum thickness of insulation compatible with the available space and existing uses shall be installed.

Reason: Occasionally, the installation of additional insulation can be technically infeasible. For instance, adding insulation can block windows on adjacent walls, entrances on and off the roof can have the height of the opening lessened by adding insulation. Take for an example an existing roof with internal drainage system. If the drains are 60 feet apart, the maximum depth of insulation with be 30 feet from the drain. If the insulation slopes at the minimum required slope of 1/4" inch per foot, the insulation depth with be 7.5 inches thirty feet from the drain. This proposal would require that the code official confirm that the addition of the insulation is technically infeasible to ensure this provision is utilized only when approved by the code official, and not when the contractor or designer determines it technically infeasible and ensure the provision is used properly.

Cost Impact: The code change proposal will decrease the cost of construction
This proposal would decrease the cost of construction when it is determined that it is technically infeasible to add insulation above the roof deck.

Proposal # 5591

CE257-19

CE258-19

IECC: C503.3.1

Proponent: David Renn, PE, SE, City and County of Denver, representing Code Change Committee of Colorado Chapter of ICC (david.renn@denvergov.org)

2018 International Energy Conservation Code

Revise as follows:

C503.3.1 Roof replacement. *Roof replacements* shall comply with Section C402.1.3, C402.1.4, C402.1.5 or C407 where the existing roof assembly is part of the *building thermal envelope* and contains insulation entirely above the roof deck. In no case shall the *R-value* of the roof insulation be reduced or the *U-factor* of the roof assembly be increased as part of the *roof replacement*.

Reason: Where roof replacements must comply with thermal envelope requirements of new construction, the code currently allows the use of one of 4 different compliance methods. Depending on the compliance method used, it may not be compatible with the original design of the building thermal envelope and may actually allow a reduction in roof insulation. For example, if a building was designed using the Total Building Performance method (C407), the roof insulation may have been increased to be above prescriptive requirements to allow less insulation in the walls. A roof replacement could then use the prescriptive requirements (C402.1.3 or C402.1.4) of the current code, which may require less insulation than the original design. To eliminate the potential of a reduction in performance of the entire thermal envelope, this proposal requires that the roof insulation not be reduced during a roof replacement, even if a different compliance path is used.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal fixes a potential loophole in the current code that rarely would occur, so cost of construction would typically not increase or decrease. There would be a cost of construction increase if the current loophole was used to reduce the amount of insulation that is provided in a roof replacement, but likelihood of this occurring is rare.

Proposal # 4154

CE258-19

CE259-19

IECC: C503.3.2, C401.2.1

Proponent: David Collins, SEHPCAC, representing SEHPCAC (SEHPCAC@iccsafe.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Energy Conservation Code

Revise as follows:

C503.3.2 Vertical fenestration. The addition of vertical fenestration that results in a total building fenestration area less than or equal to that specified in Section C402.4.1 shall comply with Section C402.1.5, C402.4.3 or C407. The addition of vertical fenestration that results in a total building fenestration area greater than Section C402.4.1 shall comply with Section C402.4.1.1 for the space adjacent to the new fenestration only. Alterations that result in a total building vertical fenestration area exceeding that specified in Section C402.4.1.1 shall comply with Section C402.1.5 or C407. Provided that the vertical fenestration area is not changed, using the same vertical fenestration area in the standard reference design as the building prior to alteration shall be an alternative to using the vertical fenestration area specified in Table C407.5.1(1).

~~C401.2.1~~ C503.3.2.1 Application to replacement Replacement fenestration products. Where some or all of an existing fenestration unit is replaced with a new fenestration product, including sash and glazing, the replacement fenestration unit shall meet the applicable requirements for *U*-factor and SHGC in Table C402.4.

Exception: An area-weighted average of the *U*-factor of replacement fenestration products being installed in the building for each fenestration product category listed in Table C402.4 shall be permitted to satisfy the *U*-factor requirements for each fenestration product category listed in Table C402.4. Individual fenestration products from different product categories listed in Table C402.4 shall not be combined in calculating the area-weighted average *U*-factor.

Reason: Moving fenestration replacement to Chapter 5 properly co-locates the provisions for fenestration changes in existing buildings.

This proposal is submitted by the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at:

<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>
(<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>)

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This change does not increase or decrease code provisions nor impact construction methods. It clarifies language and provisions already contained in the code.

Proposal # 4176

CE259-19

CE260-19

IECC: C503.4.2 (New), C503.5.1 (New), C503.6.1 (New)

Proponent: Eric Makela, New Buildings Institute, representing New Buildings Institute
(ericM@newbuildings.org)

2018 International Energy Conservation Code

Add new text as follows:

C503.4.2 Mechanical system acceptance testing. New mechanical systems that serve alterations shall comply with Sections C408.2.2, C408.2.3 and C408.2.5.

Exceptions:

1. Mechanical systems and service water heater systems in buildings where the total mechanical equipment capacity is less than 480,000 Btu/h (140.7 kW) cooling capacity and 600,000 Btu/h (175.8 kW) combined service water-heating and space-heating capacity.
2. Systems included in Section C403.5 that serve individual dwelling units and sleeping units

C503.5.1 Service hot water system acceptance testing. New service hot water systems that serve alterations shall comply with Sections C408.2.3 and C408.2.5.

Exceptions:

1. Service water heater systems in buildings where the total mechanical equipment capacity is less than 600,000 Btu/h (175.8 kW) combined service water-heating and space-heating capacity.
2. Systems included in Section C403.5 that serve individual dwelling units and sleeping units.

C503.6.1 Lighting acceptance testing. New lighting systems that serve *alterations* shall comply with Section C408.3.

Reason: Due to the way that the charging language in the IECC is structured, new mechanical, water heating and lighting systems in alterations do not need to meet the commissioning / acceptance testing requirements that the same systems in new construction would need to meet. This allows new systems in alterations to go without this vital installation step and leaves them vulnerable to poor performance from installation. This proposal closes that loophole.

The proposal includes specific references to the appropriate commissioning /acceptance testing requirements in section C408:

- The balancing (C408.2.2), functional testing (C408.2.3) and documentation (C408.2.5) requirements for HVAC systems.
- The functional testing (C408.2.3) and documentation (C408.2.5) requirements for water heating systems
- The functional testing, documentation and reporting requirements for lighting (C408.3).

It repeats the system-size thresholds in the charging language in C408. In this way, it has the same scope as the requirements for new construction. Since it references only new equipment in alterations, it avoids potentially requiring changes to the existing building systems. The proposal does not include references to the commissioning plan requirement (C408.2.1) for HVAC equipment.

Cost Impact: The code change proposal will increase the cost of construction. The proposal will increase the cost of construction. However, these requirements have already been found to be sufficiently cost effective to be included in the code for new construction.

Proposal # 5171

CE260-19

CE261-19

IECC: 202 (New), SECTION C505, C505.1, C505.1.1 (New), C505.1.2 (New), C505.2 (New), C505.2.1 (New), C505.2.2 (New), C505.2.3 (New), C505.2.4 (New), TABLE C505.2.2 (New), TABLE C505.2.3 (New), TABLE C505.2.4 (New)

Proponent: David Collins, representing SEHPCAC (sehpcac@iccsafe.org); Maureen Guttman, representing BCAP-IBTS (mguttph@aol.com); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Energy Conservation Code

Add new definition as follows:

ENERGY USE INTENSITY (EUI). The metric indicating the total amount of energy consumed by a building in one year divided by the total gross floor area of the building.

SECTION C505 CHANGE OF OCCUPANCY OR USE

C505.1 General. Spaces undergoing a change in occupancy that would result in an increase in demand for either fossil fuel or electrical energy shall comply with this code. Where the use in a space changes from one use in Table C405.3.2(1) or C405.3.2(2) to another use in Table C405.3.2(1) or C405.3.2(2), the installed lighting wattage shall comply with Section C405.3. Where the space undergoing a change in occupancy or use is in a building with a fenestration area that exceeds the limitations of Section C402.4.1, the space is exempt from Section C402.4.1 provided that there is not an increase in fenestration area.

Exceptions:

from F, H or U occupancy classification shall comply with Section C503. Buildings or portions of buildings undergoing a change of occupancy without alterations shall comply with Section C502.2

Exceptions:

1. Where the component performance alternative in Section C402.1.5 is used to comply with this section, the proposed UA shall be not greater than 110 percent of the target UA.
2. Where the total building performance option in Section C407 is used to comply with this section, the annual energy cost of the proposed design shall be not greater than 110 percent of the annual energy cost otherwise permitted by Section C407.3.

Add new text as follows:

C505.1.1 Alterations and change of occupancy Alterations made concurrently with any change of occupancy shall be in accordance with Section C503.

C505.1.2 Portions of buildings Where changes in occupancy and use are made to portions of an existing building, only those portions of the building shall comply with Section C505.2.

C505.2 Energy Use Intensities Building envelope, space heating, cooling, ventilation, lighting and service water heating shall comply with Sections C505.2.1 through C505.2.4.

Exceptions:

1. Where it is demonstrated by analysis approved by the code official that the change will not increase energy

use intensity.

2. Where the occupancy or use change is less than 5,000 square feet in area.

C505.2.1 Building Envelope Where a change of occupancy or use is made to a whole building that exceeds the maximum fenestration area allowed by Section C402.4.1, the building shall comply with Section C402.1.5, with a proposed UA that shall not be greater than 110 percent of the target UA.

Exception:

Where the change of occupancy or use is made to a portion of the building, the new occupancy is exempt from Section C402.4.1 provided that there is not an increase in fenestration area.

C505.2.2 Building Mechanical Systems Where a change of occupancy or use results in the same or increased energy use intensity rank as specified in Table C505.2.2, the systems serving the building or space undergoing the change shall comply with Section C403.

C505.2.3 Service Water Heating Where a change of occupancy or use results in the same or increased energy use intensity rank as specified in Table C505.2.3, the service water heating systems serving the building or space undergoing the change shall comply with Section C404.

C505.2.4 Lighting Where a change of occupancy or use results in the same or increased energy use intensity rank as specified in Table C505.2.4, the lighting systems serving the building or space undergoing the change shall comply with Section C405 except for Sections C405.2.6 and C405.4.

**TABLE C505.2.2
Building Mechanical Systems**

Energy Use Intensity Rank	International Building Code Occupancy Classification and Use
1. High	A-2, B-Laboratories, I-2
2. Medium	A-1, A-3 ^a , A-4, A-5, B ^b , E, I-1, I-3, I-4, M, R-4
3. Low	A-3-Places of Religious Worship, R-1, R-2, R-3 ^c , S-1, S-2

a. Excluding places of religious worship.

b. Excluding laboratories.

c. Buildings three stories or less in height above grade plane shall comply with Section R505.

**TABLE C505.2.3
Service Water Heating**

Energy Use Intensity Rank	International Building Code Occupancy Classification and Use
1. High	A-2, I-1, I-2, R-1
2. Low	All other occupancies and uses

**TABLE C505.2.4
Lighting**

Energy Use Intensity Rank	International Building Code Occupancy Classification and Use
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1. High	B-Laboratories, B-Outpatient Healthcare, I-2, M
2. Medium	A-2, A-3 Courtrooms, B ^a , I-1, I-3, I-4, R-1, R-2, R-3 ^b , R-4, S-1, S-2
3. Low	A-1, A-3 ^c , A-4, E

a. Excluding laboratories and outpatient healthcare.

b. Buildings three stories or less in height above grade plane shall comply with Section R505.

c. Excluding courtrooms.

Reason: The IECC 2018 change of occupancy requirement (C505.1) begins with this statement:

“Spaces undergoing a change in occupancy that would result in an increase in demand for either fossil fuel or electrical energy shall comply with this code.”

Field research and surveys of building officials demonstrate that this requirement is difficult to enforce (Clinton et al, 2016). One reason for this is that while it is a clear performance requirement, there is no simple compliance evaluation method other than energy modeling, which is beyond the capabilities of most change-of-occupancy permit applicants. As depicted in the referenced survey findings and community-based pilot research, building officials often require energy efficiency equipment upgrades, such as lighting or HVAC, in buildings undergoing a change of occupancy. This proposal seeks to provide clarity to that approach by providing a simple breakdown of energy use intensity (EUI) by building occupancy type and system type.

The proposed code change draws on a tradition of rehabilitation “smart codes” use-based lookup tables, is more consistent with the intent of the IECC, presents no cost increase, and incorporates extensive research and stakeholder input.

This proposal advances the Energy Use Intensity (EUI) as the metric for energy demand and the trigger for code compliance. Historic energy intensity per square foot is recorded for commercial buildings in the *Commercial Buildings Energy Consumption Survey* (CBECS). The CBECS data make it possible to rank building occupancies in the order of the energy intensities. Note that the ranking of occupancies to trigger specific code requirements has been a feature of the *International Existing Building Code* (IEBC) since its earliest editions (see IEBC 2009 Section 912, Change of Occupancy Classification, Tables 912.4, 912.5 and 912.6), and thus is familiar to building code officials.

Energy intensity data in CBECS is further broken down by various end uses (space conditioning, service water heating and lighting) which makes it possible to identify when it is appropriate to trigger code compliance of specific sections of the IECC. For each of these end uses, an increase in intensity triggers compliance with the correlating code provisions related to new construction in Chapter 4. Only an increase in energy intensities in all three of the end uses triggers full compliance with the code.

There are two exceptions that apply to all four end uses, indicated in Section C505.2:

1. Where it is demonstrated by analysis approved by the code official that the change will not increase energy use intensity.
2. Where the occupancy or use change is less than 5,000 square feet in area.

A matrix has been developed for each system end use that groups building occupancy classifications into HIGH, MEDIUM and LOW energy use intensities, measured in annual kBtu/sf. Data for this analysis came from the

U.S. Department of Energy's 2012 CBECS. When occupancy classification or use is being changed from one energy intensity rank to a higher energy use intensity rank (or remains within the same energy use intensity rank), this proposal requires that specific system end-use to comply with the code.

Change of Occupancy Scale - Space Heating, Cooling and Ventilation

EUI Rank	CBECS Building Type	EUI Range kBTU/sq.ft.	IBC Occupancy Classification
1. High	Food Service, Laboratories, Health Care (Inpatient)	> 55	A-2, B-Laboratories, I-2
2. Medium	Public Assembly, Public Order and Safety, Office, Service, Health Care (Outpatient), Education, Retail, Residential Care/Assisted Living	27 - 55	A-1, A-3, A-4, A-5, B, E, I-1, I-3, I-4, M, R-4
3. Low	Religious Worship, Apartments, Warehouse and Storage	<27	A-3 Places of Worship, R-1, R-2, R-3, S-1, S-2

Change of Occupancy Scale - Service Water Heating

EUI Rank	CBECS Building Type	EUI Range kBTU/sq.ft.	IBC Occupancy Classification
1. High	Food Service, Health Care (Inpatient), Residential Care/Assisted Living, Lodging	> 15	A-2, I-1, I-2, R-1
2. Low	All the rest	< 15	All the rest

Change of Occupancy Scale- Lighting

EUI Rank	CBECS Building Type	EUI Range kBTU/sq.ft.	IBC Occupancy Classification
1. High	Laboratories, Health Care (Outpatient), Health Care (Inpatient), Retail	> 11	B-Laboratories, B-Healthcare (Outpatient), I-2, M
2. Medium	Food Service, Office, Health Care (Outpatient), Service, Public Order and Safety, Residential Care/Assisted Living, Lodging, Apartments, Warehouse and Storage	6.5 - 11	A-2, A-3-Courtrooms, B, I-1, I-3, I-4, R-1, R-2, R-3, R-4, S-1, S-2
3. Low	Public Assembly, Religious Worship, Education	< 6.5	A-1, A-3, A-4, E

Occupancy classifications F, H and U are typically not designed primarily for occupant comfort, and are generally classified as low energy use intensity buildings. Thus any change from one of these groups to any other should be required to comply with the provisions under Section C503 Alterations, even if no physical alteration is planned.

Section C505.2.1 Building Envelope is included as a building system, although with different criteria than EUI Intensity. The requirement and exception exist in the 2018 language; they are simply relocated in this proposal.

This code change proposal has been developed with support from the Consortium for Building Energy Innovation (CBEI), a project of the U. S. Department of Energy, and research conducted by Rutgers University

Center for Green Building.

Bibliography: Clinton J. Andrews, David Hattis, David Listokin, Jennifer A. Senick, Gabriel B. Sherman & Jennifer Souder (2016): Energy –Efficient Reuse of Existing Commercial Buildings, *Journal of the American Planning Association*. doi.10.1080/01944363.2015.1134275

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The current code requirements trigger full compliance with the code when there is an increase in energy demand. The proposed code change offers the metric of energy use intensity per square foot per year for measuring energy demand by occupancy. It applies this metric separately to three energy end uses: space conditioning, lighting, and water heating. Therefore, compliance with the code is triggered only for the end uses for which energy intensity is increased.

In most cases, the proposed change triggers partial code compliance, and only rarely will it trigger full code compliance.

Proposal # 4719

CE261-19

CE262-19

IECC: CA103.6, CA103.7 (New), CA103.7

Proponent: jim edelson, representing New Buildings Institute (jim@newbuildings.org)

2018 International Energy Conservation Code

Revise as follows:

CA103.6 Interconnection pathway. Construction documents shall indicate pathways for routing of conduit or piping from the solar-ready zone to the electrical service panel and electrical energy storage system area, or service hot water system.

Add new text as follows:

CA103.7 Electrical energy storage system-ready area. The floor area of the electrical energy storage system-ready area shall be not less than 2 feet in one dimension and 4 feet in another dimension, and located in accordance with Section 1206.2.8 of the *International Fire Code*. The location and layout diagram of the electrical energy storage system-ready area shall be indicated on the construction documents.

Revise as follows:

~~CA103.7~~ **CA103.8 Electrical service reserved space.** The main electrical service panel shall have a reserved space to allow installation of a dual-pole circuit breaker for future solar electric installation and a dual-pole circuit breaker for future electrical energy storage system installation. These spaces shall be labeled "For Future Solar Electric and Storage." The reserved ~~space~~ spaces shall be positioned at the end of the panel that is opposite from the panel supply conductor connection.

Reason: Appendix CA in IECC-commercial and Appendix RB in IECC-residential have proven useful for jurisdictions seeking to add solar ready provisions to state or local codes. As many jurisdictions in which the appendices are being considered are also facing current or future constraints on electric grid capacity to accommodate existing and new distributed solar generation resources, policy objectives are emerging to support the storage of energy produced by solar panels and shift its temporal impact on the grid. This proposal modifies Appendix CA provisions to ensure that there is design and space consideration for a standard sized battery rack, and for the connections to the electrical panels. As with the rationale for solar-ready, it is generally much more cost-effective at the time of new construction to design for future installation of this equipment than it is to retrofit later in the building's life.

The proposed language also cites the IFC to ensure there is sufficient clearance around the battery rack to meet life/safety concerns. The IFC is already referenced in Chapter 6.

Cost Impact: The code change proposal will increase the cost of construction. The cost impacts are limited to additional design professional fees, to markings on the panels, and to additional construction costs only if there were not spare square footage available in the equipment or storage rooms where panels are generally located. In that case, it would be equal to the construction costs for an additional 8 square feet of storage space.

Proposal # 4965

CE262-19

CE263-19 Part I

PART I — IECC: Appendix CB (New)

PART II — IECC: Appendix RB (New)

PART III — IRC: Appendix U (New)

Proponent: Joseph H. Cain, Solar Energy Industries Association (SEIA), representing Solar Energy Industries Association (SEIA) (JoeCainPE@gmail.com)

THIS IS A 3 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY IECC-CE COMMITTEE. PARTS II and III WILL BE HEARD BY THE IECC-RE COMMITTEE. SEE THE TENTATIVE HEARING ORDERS FOR THESE COMMITTEES.

2018 International Energy Conservation Code

Add new text as follows:

Appendix CB SOLAR PHOTOVOLTAIC (PV) SYSTEM REQUIRED - COMMERCIAL

SECTION CB101 SCOPE

CB101.1 General. These provisions shall be applicable for newly constructed commercial buildings, or additions larger than 5,000 square feet of gross conditioned floor area to commercial buildings, where solar photovoltaic (PV) systems are required.

SECTION CB102 DEFINITIONS

Revise as follows:

CB102.1 General. The following words and terms shall, for the purposes of this appendix, have the meanings shown herein. Refer to Chapter 2 for general definitions.

Add new text as follows:

COMMUNITY SOLAR FACILITY. A facility that generates electrical energy with a solar photovoltaic system, is qualified as a community energy facility, and allocates bill credits to customers under state and local utility statutes and rules.

SECTION CB103 SOLAR PHOTOVOLTAIC (PV) SYSTEMS

CB103.1 Renewable energy systems. Newly constructed commercial buildings, or additions larger than 5,000 square feet of gross conditioned floor area to commercial buildings, shall have an on-site solar photovoltaic system installed. Photovoltaic (PV) systems shall comply with Sections CB103.2 through CB103.4. The code official is authorized to exempt a covered building from the on-site photovoltaic system requirement or allow an alternative means of compliance under any of the following conditions:

Exceptions:

1. Where the code official determines the building has satisfied the purpose and intent of this provision through the use of alternative on-site renewable energy systems such as wind energy systems.
2. Where the code official determines an on-site or off-site community solar facility is dedicated to the building with a legally binding and executed agreement, in conformance with Section CB103.3.

CB103.2 Photovoltaic (PV) system sizing requirement. Minimum installed capacity of PV systems shall be determined in accordance with this section. The PV system installed nameplate capacity (kW_{DC}) shall be not less than 0.25 times the conditioned floor area ($0.25 W_{DC}$ per square foot). The nameplate PV system size shall be calculated as the sum of each PV module's nameplate output (W_{DC}). For buildings 4 or more stories in height, the conditioned floor area for this calculation shall be based on the largest 3 above-grade stories in the building. Where the on-site renewable energy option in Section C406 is selected, the minimum installed capacity required in this section shall be in addition to that required by Section C406.

CB103.3. Community solar facility Where a community solar facility is used as an alternative to an on-site photovoltaic system, the community solar facility shall provide energy savings benefits directly to the building that would otherwise have been required to have an on-site photovoltaic system. The energy savings benefits shall be allocated from the total resource of the community solar facility in a manner demonstrated to be equivalent to the reductions in energy consumption that would have resulted from the on-site photovoltaic system that is otherwise required. The community solar facility shall provide the required energy savings benefits to the dedicated building for a period not less than twenty years. The energy savings benefits shall not be attributed to other purposes and shall not be transferred to other buildings or property.

CB103.4 Leases and power purchase agreements. On-site photovoltaic systems that are leased by the end-use customer (tenant or owner) or that supply electricity to the end-use customer through a power purchase agreement (PPA) shall be permitted to satisfy the requirement provided the system meets all other requirement criteria.

Proposal # 5658

CE263-19 Part I

CE263-19 Part II

IECC: Appendix RB (New)

Proponent: Joseph Cain, representing Solar Energy Industries Association (SEIA) (JoeCainPE@gmail.com)

2018 International Energy Conservation Code

Add new text as follows:

Appendix RB SOLAR PHOTOVOLTAIC (PV) SYSTEM REQUIRED

SECTION RB101 SCOPE

RB101.1 General. These provisions shall be applicable for newly constructed residential buildings where solar photovoltaic (PV) systems are required.

SECTION RB102 DEFINITIONS

RB102.1 General. The following words and terms shall, for the purposes of this appendix, have the meanings shown herein. Refer to Chapter 2 for general definitions.

Add new definition as follows:

COMMUNITY SOLAR FACILITY. A facility that generates electrical energy with a solar photovoltaic system, is qualified as a community energy facility, and allocates bill credits to customers, under state and local utility statutes and rules.

STEEP SLOPE. A roof slope greater than two units vertical in 12 units horizontal (17-percent slope).

Add new text as follows:

SECTION RB103 SOLAR PHOTOVOLTAIC SYSTEM

RB103.1 Renewable energy systems. Newly constructed residential buildings shall have an on-site solar photovoltaic (PV) system installed. Photovoltaic systems shall comply with Sections RB103.2 through RB103.6. The code official is authorized to exempt a covered building from the on-site photovoltaic system requirement or allow an alternative means of compliance under any of the following conditions:

Exceptions:

1. Where the code official determines there are practical challenges that cause satisfaction of the requirements to be infeasible. Practical challenges include, but are not limited to, building site location, limited rooftop availability, or shading from nearby structures, topography, or vegetation.
2. Where the code official determines the purpose and intent of this provision is satisfied through the use of alternative on-site renewable energy systems such as wind energy systems.

3. If the code official determines an on-site or off-site community solar facility is dedicated to the building with a legally binding and executed agreement, and is in conformance with Section RB103.5.

RB103.2 Photovoltaic (PV) system sizing requirement. Minimum installed capacity of PV systems shall be determined by using one of the two methods in this section, either prescriptive PV sizing in Section RB103.2.1 or performance PV sizing in Section RB103.2.2. Buildings with *conditioned floor area* of 4,500 square feet or greater shall use the performance PV sizing approach in Section RB103.2.2.

RB103.2.1 Prescriptive PV sizing method. For the prescriptive PV sizing method, the PV system installed nameplate capacity (kW_{DC}) shall be not less than 1.0 times the *conditioned floor area* (1.0 Watts per square foot). The nameplate PV system size shall be calculated as the sum of each PV module's nameplate output (W_{DC}).

RB103.2.2 Performance PV sizing method. For the performance PV sizing method, the PV system shall be sized to meet at least 75 percent of the building's total electrical energy use on an annual basis, including both conditioned and unconditioned space. The minimum PV system size requirement (kW_{DC}) shall be calculated using modeling software or other methods approved by the code official.

RB103.3 Photovoltaic system orientation. Fixed-orientation photovoltaic systems located on *steep sloped* roofs shall be oriented with azimuth of each array between 90 degrees and 300 degrees measured clockwise from true north.

Exception: Photovoltaic systems with one or more arrays oriented outside the prescribed azimuth range when the PV system is modeled using performance PV sizing method in Section RB103.2.2..

RB103.4 Shading. All PV systems shall be designed to meet minimal shading criterion in Section RB103.4.1 or the detailed geometries of PV arrays and obstructions shall be considered in the performance PV sizing method in conformance with Section RB103.4.2.

RB103.4.1 Minimal shading criterion. To comply with minimal shading criterion, a PV array shall be no closer to any shading obstruction than twice the height of the obstruction above the PV array. All obstructions that project above the point on the PV array that is closest to the obstruction shall meet this criterion for the array to be considered minimally shaded.

Exception: Any obstruction located north of all points on the array need not be considered as a shading obstruction...

RB103.4.2 Solar access verification. Where any PV array does not meet the minimal shading criterion of Section RB103.4.1, detailed geometries of the PV array and shading profiles from obstructions shall be considered in the performance PV sizing method. Shading profiles shall be measured with a solar assessment tool or determined from aerial satellite images or other automated resources approved by the code official.

RB103.5 Community solar facility, Where a *community solar facility* is used as an alternative to an on-site photovoltaic system, the *community solar facility* shall provide energy savings benefits directly to the building that would otherwise have been required to have an on-site photovoltaic system. The energy savings benefits shall be allocated from the total resource of the *community solar facility* in a manner demonstrated to be equivalent to the reductions in energy consumption that would have resulted from the on-site photovoltaic system that is otherwise required. The *community solar facility* shall provide the required energy savings benefits to the dedicated *building* for a period not less than twenty years. The energy savings benefits shall not be attributed to other purposes and shall not be transferred to other buildings or property.

SECTION RB104

LEASES AND PURCHASE AGREEMENTS

RB104.1 Leases and power purchase agreements. On-site photovoltaic systems that are leased by the end-use customer (tenant or owner) or that supply electricity to the end-use customer through a power purchase agreement (PPA) shall be permitted to satisfy the requirement provided the system meets all other requirement criteria.

Proposal # 5649

CE263-19 Part II

CE263-19 Part III

IRC: Appendix U (New)

Proponent: Joseph Cain, representing Solar Energy Industries Association (SEIA) (JoeCainPE@gmail.com)

2018 International Residential Code

Add new text as follows:

Appendix U SOLAR PHOTOVOLTAIC (PV) SYSTEM REQUIRED

SECTION AU101 SCOPE

AU101.1 General. These provisions shall be applicable for newly constructed residential buildings where solar photovoltaic (PV) systems are required.

SECTION AU102 DEFINITIONS

AU102.1 General. The following words and terms shall, for the purposes of this appendix, have the meanings shown herein. Refer to Chapter 2 for general definitions.

Add new definition as follows:

COMMUNITY SOLAR FACILITY. A facility that generates electrical energy with a solar photovoltaic system, is qualified as a community energy facility, and allocates bill credits to customers, under state and local utility statutes and rules.

STEEP SLOPE. A roof slope greater than two units vertical in 12 units horizontal (17-percent slope).

Add new text as follows:

SECTION AU103 SOLAR PHOTOVOLTAIC SYSTEM

RB103.1 Renewable energy systems. Newly constructed residential buildings shall have an on-site solar photovoltaic (PV) system installed. Photovoltaic systems shall comply with Sections AU103.2 through AU103.6. The code official is authorized to exempt a covered building from the on-site photovoltaic system requirement or allow an alternative means of compliance under any of the following conditions:

Exceptions:

1. Where the code official determines there are practical challenges that cause satisfaction of the requirements to be infeasible. Practical challenges include, but are not limited to, building site location, limited rooftop availability, or shading from nearby structures, topography, or vegetation.
2. Where the code official determines the purpose and intent of this provision is satisfied through the use of alternative on-site renewable energy systems such as wind energy systems.

3. If the code official determines an on-site or off-site community solar facility is dedicated to the building with a legally binding and executed agreement, and is in conformance with Section AU103.5.

AU103.2 Photovoltaic (PV) system sizing requirement. Minimum installed capacity of PV systems shall be determined by using one of the two methods in this section, either prescriptive PV sizing in Section AU103.2.1 or performance PV sizing in Section AU103.2.2. Buildings with *conditioned floor area* of 4,500 square feet or greater shall use the performance PV sizing approach in Section AU103.2.2.

AU103.2.1 Prescriptive PV sizing method. For the prescriptive PV sizing method, the PV system installed nameplate capacity (kW_{DC}) shall be not less than 1.0 times the *conditioned floor area* (1.0 Watts per square foot). The nameplate PV system size shall be calculated as the sum of each PV module's nameplate output (W_{DC}).

AU103.2.2 Performance PV sizing method. For the performance PV sizing method, the PV system shall be sized to meet at least 75 percent of the building's total electrical energy use on an annual basis, including both *conditioned and unconditioned space*. The minimum PV system size requirement (kW_{DC}) shall be calculated using modeling software or other methods approved by the code official.

AU103.3 Photovoltaic system orientation. Fixed-orientation photovoltaic systems located on *steep sloped roofs* shall be oriented with azimuth of each array between 90 degrees and 300 degrees measured clockwise from true north.

Exception: Photovoltaic systems with one or more arrays oriented outside the prescribed azimuth range when the PV system is modeled using performance PV sizing method in Section AU103.2.2.

AU103.4 Shading. All PV systems shall be designed to meet minimal shading criterion in Section AU103.4.1 or the detailed geometries of PV arrays and obstructions shall be considered in the performance PV sizing method in conformance with Section AU103.4.2.

AU103.4.1 Minimal shading criterion. To comply with minimal shading criterion, a PV array shall be no closer to any shading obstruction than twice the height of the obstruction above the PV array. All obstructions that project above the point on the PV array that is closest to the obstruction shall meet this criterion for the array to be considered minimally shaded.

Exception: Any obstruction located north of all points on the array need not be considered as a shading obstruction.

AU103.4.2 Solar access verification. Where any PV array does not meet the minimal shading criterion of Section AU103.4.1, detailed geometries of the PV array and shading profiles from obstructions shall be considered in the performance PV sizing method. Shading profiles shall be measured with a solar assessment tool or determined from aerial satellite images or other automated resources approved by the code official.

AU103.5 Community solar facility, Where a *community solar facility* is used as an alternative to an on-site photovoltaic system, the *community solar facility* shall provide energy savings benefits directly to the building that would otherwise have been required to have an on-site photovoltaic system. The energy savings benefits shall be allocated from the total resource of the *community solar facility* in a manner demonstrated to be equivalent to the reductions in energy consumption that would have resulted from the on-site photovoltaic system that is otherwise required. The *community solar facility* shall provide the required energy savings benefits to the dedicated *building* for a period not less than twenty years. The energy savings benefits shall not be attributed to other purposes and shall not be transferred to other buildings or property.

SECTION AU104

LEASES AND PURCHASE AGREEMENTS

AU104.1 Leases and power purchase agreements. On-site photovoltaic systems that are leased by the end-use customer (tenant or owner) or that supply electricity to the end-use customer through a power purchase agreement (PPA) shall be permitted to satisfy the requirement provided the system meets all other requirement criteria.

Reason: This proposal provides a new Appendix for the International Residential Code which would be available to jurisdictions wanting to adopt renewable energy requirements for new one- and two family dwellings and townhouse buildings; enabling direct opportunity to meet state RPS goals to incorporate renewable energy. This proposal continues to move renewable energy into mainstream practice for the design and construction industries which will diversify the state and jurisdictional energy portfolio amongst traditional energy resources and new renewable generation via utilities and distributed energy resources. The benefit to the homeowner is lower, more consistent energy bills. This language does not increase enforcement efforts because the review and inspection process for mechanical and renewable energy systems is currently standard practice. This proposal is modeled after the California Energy Commission (CEC) model ordinance language, which is useful to early adopters that want to require PV for new residential buildings in their communities, with a modification to allow jurisdictions flexibility to further customize.

Individual technical provisions of this appendix are also based on 2019 CA Building Energy Efficiency Standards (BEES):

Joint Appendix JA11 -- Qualification Requirements for Photovoltaic System, and

Section 10-115 -- Community Shared Solar Electric Generation System or Community Shared Battery Storage System Compliance Option for Onsite Solar Electric Generation or Battery Storage Requirements.

Cost Impact: The code change proposal will increase the cost of construction. This proposal will increase the first cost of construction for PV systems that are a cash purchase, but not for systems that are under lease agreements or power purchase agreements (PPA's). The installed cost of new PV systems retrofitted on existing homes is approximately \$2.50 per Watt. Greater cost savings can be realized owing to installations on new homes and the efficiencies of repetitive procedures.

Proposal # 5808

CE263-19 Part III

CE264-19

IECC: AX 100 (New), AX101 (New), AX102 (New), AX103 (New), AX104 (New), TABLE AX104.1 (New), AX104.1 (New), AX104.2 (New), AX104.2.1 (New), AX104.2.2 (New), AX104.2.3 (New), TABLE AX104.2 (New)

Proponent: David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Energy Conservation Code

Add new text as follows:

AX 100 ZERO CODE RENEWABLE ENERGY STANDARD

AX101 PURPOSE The purpose of the Zero Code Renewable Energy Appendix is to supplement the International Energy Conservation Code and require renewable energy systems of adequate capacity to achieve zero-net-carbon.

AX102 SCOPE This appendix applies to new buildings that are addressed by the International Energy Conservation Code.

Exceptions:

1. Single-family houses, multifamily structures of three stories or fewer above grade in height, manufactured homes (mobile homes), and manufactured houses (modular).
2. Buildings that use neither electricity nor fossil fuel.

AX103 Definitions The following definitions supplement or modify the definitions in the International Energy Conservation Code.

ADJUSTED OFF-SITE RENEWABLE ENERGY. The amount of energy production from off-site renewable energy systems that may be used to offset building energy.

BUILDING ENERGY. All energy consumed at the building site as measured at the site boundary. Contributions from on-site or off-site renewable energy systems shall not be considered when determining the building energy.

ENERGY UTILIZATION INTENSITY(EUI). The site energy for either the baseline building or the proposed building divided by the gross conditioned floor area plus any semi-heated floor area of the building. For the baseline building, the EUI can be divided between regulated energy use and unregulated energy use.

RENEWABLE ENERGY SYSTEM. Photovoltaic, solar thermal, geothermal energy, and wind systems used to generate energy.

ON-SITE RENEWABLE ENERGY SYSTEM. Renewable energy systems on the building project.

OFF-SITE RENEWABLE ENERGY SYSTEM. Renewable energy system not located on the building project.

ZERO ENERGY PERFORMANCE INDEX(zEPI_{PB,EE}). The ratio of the proposed building EUI without renewables to the baseline building EUI, expressed as a percentage.

SEMI-HEATED SPACE. An enclosed space within a building that is heated by a heating system whose output capacity is greater than or equal to 3.4 Btu/h*ft² of floor area but is not a conditioned space.

AX104 Minimum renewable energy On-site renewable energy systems shall be installed or off-site renewable energy shall be procured to offset the building energy.

$$RE_{onsite} + RE_{offsite} \geq \% \times E_{building}$$

where

RE_{onsite} = annual site energy production from on-site renewable energy systems (see Section AX104.2)

$RE_{offsite}$ = adjusted annual site energy production from off-site renewable energy systems that may be credited against building energy use (see Section AX104.3)

$E_{building}$ = building energy use without consideration of renewable energy systems.

When Section C401.2 (2) is used for compliance with the International Energy Conservation Code, building energy shall be determined by multiplying the gross conditioned floor area plus the gross semi-heated floor area of the proposed building by an EUI selected from Table AX104.1. Use a weighted average for mixed-use buildings.

When Section C401.2 (1) or C401.2 (3) is used for compliance with the International Energy Conservation Code, building energy shall be determined from energy simulations.

TABLE AX104.1 ENERGY UTILIZATION INTENSITY FOR BUILDING TYPES AND CLIMATES (kBtu/ft²-Y)

Building Area Type	Climate Zone																	
	0A/ 1A	0B/ 1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8	
kBtu/ft ² -y																		
Multifamily (R-2)	43	45	41	41	43	42	36	45	43	41	47	46	41	53	48	53	59	
Healthcare/hospital (I-2)	119	120	119	113	116	109	106	116	109	106	118	110	105	126	116	131	142	
Hotel/motel (R-1)	73	76	73	68	70	67	65	69	66	65	71	68	65	77	72	81	89	
Office (B)	31	32	30	29	29	28	25	28	27	25	29	28	25	33	30	32	36	
Restaurant (A-2)	389	426	411	408	444	420	395	483	437	457	531	484	484	589	538	644	750	
Retail (M)	46	50	45	46	44	44	37	48	44	44	52	50	46	60	52	64	77	
School (E)	42	46	42	40	40	39	36	39	40	40	39	43	37	44	40	45	54	
Warehouse (S)	9	12	9	11	12	11	10	17	13	14	23	17	15	32	23	32	32	
All others	55	58	54	53	53	51	48	54	52	51	57	54	50	63	57	65	73	

AX104.1 Calculation of On-Site Renewable Energy The annual energy production from on-site renewable energy systems shall be determined using the PVWatts software or other software approved by the code official.

AX104.2 Off-Site Renewable Energy Off-site energy shall comply with Sections AX104.2.1 and AX104.2.2

AX104.2.1 Qualifying off-site procurement methods. The following are considered qualifying off-site renewable energy procurement methods:

1. Community Renewables: an offsite renewable energy system for which the owner has purchased or leased renewable energy capacity along with other subscribers.
2. Renewable Energy Investment Fund: an entity that installs renewable energy capacity on behalf of the owner.
3. Virtual Power Purchase Agreement: a power purchase agreement for off-site renewable energy where the owner agrees to purchase renewable energy output at a fixed price schedule.
4. Direct Ownership: an offsite renewable energy system owned by the building project owner.
5. Direct Access to Wholesale Market: an agreement between the owner and a renewable energy developer to purchase renewable energy.
6. Green Retail Tariffs: a program by the retail electricity provider to provide 100 percent renewable energy to the owner.
7. Unbundled Renewable Energy Certificates (RECs): certificates purchased by the owner representing the environmental benefits of renewable energy generation that are sold separately from the electric power.

AX104.2.2 Requirements for all procurement methods. The following requirements shall apply to all *off-site renewable energy* procurement methods.

1. The building owner shall sign a legally binding contract to procure qualifying *off-site renewable energy*.
2. The procurement contract shall have duration of not less than 15 years and shall be structured to survive a partial or full transfer of ownership of the property.
3. RECs and other environmental attributes associated with the procured *off-site renewable energy* shall be assigned to the building project for the duration of the contract.
4. The *renewable energy* generating source shall be photovoltaic systems, solar thermal power plants, geothermal power plants, and/or wind turbines.
5. The generation source shall be located where the energy can be delivered to the building site by the same utility or distribution entity; the same ISO or RTO; or within integrated ISOs (electric coordination council).
6. The *off-site renewable energy* producer shall maintain transparent accounting that clearly assigns production to the building. Records on power sent to or purchased by the building shall be retained by the building owner and made available for inspection by the code official upon request.

AX104.2.3 Adjusted Off-Site Renewable Energy. The process for calculating the adjusted *off-site renewable energy* is shown in the following equation:

$$RE_{\text{offsite}} = \sum_{i=1}^n PF_i \hat{RE}_i = PF_1 \hat{RE}_1 + PF_2 \hat{RE}_2 + \dots + PF_n \hat{RE}_n$$

where

RE_{offsite} = Adjusted off-site renewable energy

PF_i = Procurement factor for the i^{th} renewable energy procurement method or class taken from Table AX104.2.

RE_i = Annual energy production for the i^{th} renewable energy procurement method or class

n = The number of renewable energy procurement options or classes considered

TABLE AX104.2 Default Off-Site Renewable Energy Procurement Methods, Classes, and Coefficients

Class	Procurement Factor (PF)	Procurement Options	Additional Requirements (see also Section AX104.2.2)
1	0.75	Community Solar	

REIFs	Entity must be managed to prevent fraud or misuse of funds.		
Virtual PPA			
Self-Owned Off-Site	Provisions shall prevent the generation from being sold separately from the building.		
2	0.55	Green Retail Tariffs	The offering shall not include the purchase of unbundled RECs.
Direct Access	The offering shall not include the purchase of unbundled RECs.		
3	0.20	Unbundled RECs	The vintage of the RECs shall align with building energy use.

Reason: The new appendix deals with renewable energy and creates a path to a Zero energy design approach, similar to the zEPI that is already found in the 2015 IgCC. It is designed to build on top of the IECC which already sets the minimum energy efficiency requirement. By putting this information in an appendix, jurisdictions will have the option of adoption of these provisions in order to establish Zero as the energy target they wish to achieve.

Cost Impact: The code change proposal will decrease the cost of construction. The overall cost of construction and operation of buildings constructed using the Zero Annex will be lower than other comparable buildings.

Proposal # 5356

CE264-19

CE265-19

IECC: (New), C406.1, C406.10 (New)

Proponent: Steven Rosenstock, Edison Electric Institute, representing Edison Electric Institute (srosenstock@eei.org)

2018 International Energy Conservation Code

Add new definition as follows:

ENERGY STORAGE SYSTEM (ESS). One or more devices, assembled together, capable of storing electrical, thermal, or mechanical energy in order to supply electrical energy at a future time.

Revise as follows:

C406.1 Requirements. Buildings shall comply with one or more of the following:

1. More efficient HVAC performance in accordance with Section C406.2.
2. Reduced lighting power in accordance with Section C406.3.
3. Enhanced lighting controls in accordance with Section C406.4.
4. On-site supply of renewable energy in accordance with Section C406.5.
5. Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with Section C406.6.
6. High-efficiency service water heating in accordance with Section C406.7.
7. Enhanced envelope performance in accordance with Section C406.8.
8. Reduced air infiltration in accordance with Section C406.9

9. On-site *energy storage system* installed in accordance with Section C406.10

Add new text as follows:

C406.10 On-site energy storage system (ESS). An on-site energy storage system with a storage capacity of at least 50 kWh that is not part of an emergency power system shall be installed. The system shall be capable of interacting with the electric grid or on-site renewable energy system or both.

Reason: According to the US Energy Information Administration (<https://www.eia.gov/analysis/studies/electricity/batterystorage/>), at the end of 2017, there were 708 MW and 867 MWh of large scale energy storage systems in operation in the United States. Several states have enacted policies that require large-scale installations of energy storage systems (over 1,000 MW) to support the growth of renewable electric generation systems on the grid and at buildings. In states with aggressive renewable portfolio standards, energy storage systems are needed to help balance the grid, especially in times of very high supply of renewable energy and low demand (e.g., "the duck curve").

Several utilities throughout the US are providing incentives to customers for installing energy storage systems, based on a minimum capacity. Typically, the minimum capacity requirement has been on the order of 50 kWh or 50 kW for a certain number of hours of discharge.

The definition is needed for clarity to support the for new language for Energy Storage Systems in Section C406.

This is the same definition that is used in the latest version of the *International Fire Code*.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This is one of several additional efficiency options that a building owner or designer can choose from in Section C406. Based on the data from the EIA report, the range of costs for an installed energy storage system ranges from \$500 to \$2500 per kWh, depending on the battery size, battery chemistry, and safety code requirements. Battery prices are declining, which will reduce these costs significantly over the next several years. In addition, state and utility incentives in parts of the US significantly reduce the initial costs.

Proposal # 4425

CE265-19

2019 GROUP B – PROPOSED CHANGES TO THE INTERNATIONAL ENERGY CONSERVATION CODE

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**TENTATIVE ORDER OF DISCUSSION
2019 PROPOSED CHANGES TO THE
INTERNATIONAL ENERGY CONSERVATION CODE –
RESIDENTIAL
AND
INTERNATIONAL RESIDENTIAL CODE - ENERGY**

The following is the tentative order in which the proposed changes to the code will be discussed at the public hearings. Proposed changes which impact the same subject have been grouped to permit consideration in consecutive changes.

Proposed change numbers that are indented are those which are being heard out of numerical order. Indentation does not necessarily indicate that one change is related to another. Proposed changes may be grouped for purposes of discussion at the hearing at the discretion of the chair. Note that some RE code change proposals may not be included on this list, as they are being heard by another committee. Note also that RE1 – RE12 are moved to later in the hearing order to allow grouping consideration of proposed changes to Chapters 1 and 3 near the beginning of the consideration of Chapters 1 and 3 of the IECC-Commercial Provisions.

RE15-19	RE42-19	RE71-19	RE100-19
RE16-19	RE43-19	RE72-19	RE101-19
RE17-19	RE44-19	RE73-19	RE102-19
CE42-19 Part II	RE45-19	RE74-19	CE103-19 Part II
CE51-19 Part II	RE46-19	RE75-19	RE103-19
CE54-19 Part II	RE47-19	RE76-19	RE104-19
RE18-19	RE48-19	RE77-19	CE93-19 Part II
RE19-19	RE49-19	RE78-19	RE105-19
RE20-19	CE62-19 Part II	RE79-19	RE106-19
RE21-19	RE50-19	RE80-19	RE8-19
RE22-19	RE51-19	RE81-19	RE107-19
RE23-19	RE52-19	RE82-19	CE151-19 Part II
RE24-19	RE53-19	RE83-19	CE115-19 Part II
RE25-19	RE54-19	RE84-19	CE116-19 Part II
RE26-19	RE55-19	RE85-19	RE108-19
RE27-19	RE56-19	RE226-19	RE109-19
RE28-19	RE57-19	RE87-19	RE110-19
RE29-19	RE58-19	RE88-19	RE111-19
RE30-19	RE59-19	RE89-19	RE112-19
RE31-19	CE78-19 Part II	RE90-19	RE113-19
RE32-19	RE60-19	RE91-19	RE114-19
RE33-19	RE61-19	RE92-19	RE115-19
RE34-19	RE62-19	RE93-19	RE116-19
RE35-19	RE63-19	RE94-19	RE117-19
RE36-19	RE64-19	RE43-19	RE118-19
RE37-19	RE65-19	RE10-19	RE119-19
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RE39-19	RE67-19	RE96-19	RE121-19
RE40-19	RE68-19	RE97-19	RE122-19
RE41-19	RE69-19	RE98-19	RE225-19 Part II
CE60-19 Part II	RE70-19	RE99-19	RE123-19

CE150-19 Part II	RE172-19	RE224-19 Part II
RE124-19	RE173-19	CE1-19 Part I
RE125-19	RE174-19	ADM9-19 Part III
CE159-19 Part II	RE175-19	ADM10-19 Part IV
RE126-19	RE176-19	ADM46 Part IV
RE127-19	RE177-19	CE3-19 Part II
RE128-19	RE178-19	CE4-19 Part I
P1-19	RE179-19	CE5-19 Part II
RE129-19	RE180-19	CE6-19 Part II
RE130-19	RE181-19	CE7-19 Part II
RE131-19	RE182-19	CE8-19 Part II
RE132-19 Part I	RE183-19	CE9 -19 Part II
RE132-19 Part II	RE184-19	CE10-19 Part II
RE133-19	RE185-19	RE1-19
RE134-19	RE186-19	CE11-19 Part II
RE135-19	RE187-19	CE12-19 Part II
RE136-19	RE188-19	CE13-19 Part II
RE137-19	RE189-19	CE15-19 Part II
RE138-19	RE190-19	RE2-19
RE139-19	RE191-19	ADM33-19 Part III
RE140-19	RE192-19	RE3-19
RE141-19	RE193-19	CE16-19 Part II
RE142-19	RE194-19	ADM31-19 Part III
RE143-19	RE195-19	CE17-19 Part II
CE160-19 Part II	RE196-19	ADM41-19 Part IV
RE144-19	RE197-19	ADM40-19 Part IV
RE145-19	RE198-19	CE18-19 Part II
RE7-19	RE199-19	CE20-19 Part II
RE146-19	RE200-19	CE19-19 Part II
RE147-19	RE201-19	RE4-19
CE217-19 Part II	RE202-19	CE23-19 Part II
RE148-19	RE203-19	CE22-19 Part II
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RE151-19	RE206-19	CE30-19 Part II
RE152-19	RE207-19	CE31-19 Part II
RE153-19	RE208-19	CE28-19 Part II
RE154-19	RE209-19	RE9-19 Part I
RE155-19	RE210-19	RE6-19
RE156-19	RE211-19	CE32-19 Part II
RE157-19	RE212-19	ADM5-19 Part III
RE158-19	RE213-19	CE34-19 Part II
RE159-19	RE214-19	CE36-19 Part II
RE160-19	RE215-19	CE37-19 Part II
RE161-19	RE216-19	RE12-19
CE248-19 Part II	RE217-19	RE11-19
RE162-19	CE251-19 Part II	CE40-19 Part II
RE163-19	CE253-19 Part II	RE13-19
RE164-19	RE218-19	RE14-19
RE165-19	RE219-19	
RE166-19	RE220-19	
RE167-19	RE221-19	
RE168-19	RE222-19	
RE169-19	ADM43-19 Part IV	
RE170-19	RE223-19	
RE171-19	CE259-19 Part II	

RE1-19

IECC: R102.1.1 (IRC N1101.4), Chapter 6RE (IRC Chapter 44)

Proponent: Craig Conner, representing self (craig.conner@mac.com)

2018 International Energy Conservation Code

Revise as follows:

R102.1.1 (IRC N1101.4) Above code programs. The *code official* or other authority having jurisdiction shall be permitted to deem a national, state or local energy-efficiency program to exceed the energy efficiency required by this code. *Buildings approved* in writing by such an energy-efficiency program shall be considered to be in compliance with this code. ~~The requirements identified as “mandatory” in Chapter 4 shall be met.~~ Buildings with written documentation of compliance with ICC 700 at the silver level or above shall be deemed to comply with this code.

Add new text as follows:

ICC

International Code Council, Inc.
500 New Jersey Avenue NW 6th Floor
Washington DC 20001

700-15: National Green Building Standard

Reason: This adds the specific option for ICC's above code green standard for residences, the National Green Building Standard. ICC 700 has its own “mandatory” items. Citing ICC 700 in code will mean code enforcement will not need to verify that this above code standard meets code.

Bibliography: <http://www.nahbclassic.org/form.aspx?formID=18173>

Cost Impact: The code change proposal will decrease the cost of construction

This is an option and therefore will not affect cost unless it is chosen. For some this may be a less expensive option, especially if they are choosing to be in compliance with ICC 700

Analysis: The referenced standard, ICC 700-2015, is currently referenced in other 2018 I-codes.

Proposal # 5505

RE1-19

RE2-19

IECC: R103.2.2 (IRC N1101.5.2) (New)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robb@nrglogic.com)

2018 International Energy Conservation Code

R103.2 (IRC N1101.5) Information on construction documents. Construction documents shall be drawn to scale on suitable material. Electronic media documents are permitted to be submitted where *approved* by the *code official*. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the *building*, systems and equipment as herein governed. Details shall include the following as applicable:

1. Insulation materials and their *R*-values.
2. Fenestration *U*-factors and *solar heat gain coefficients* (SHGC).
3. Area-weighted *U*-factor and *solar heat gain coefficients* (SHGC) calculations.
4. Mechanical system design criteria.
5. Mechanical and service water-heating systems and equipment types, sizes and efficiencies.
6. Equipment and system controls.
7. Duct sealing, duct and pipe insulation and location.
8. Air sealing details.

R103.2.1 (IRC N1101.5.1) Building thermal envelope depiction. The *building thermal envelope* shall be represented on the construction documents.

Add new text as follows:

R103.2.2 (IRC N1101.5.2) Vapor management declaration. A vapor management strategy shall be documented on the construction documents. The following shall be addressed:

1. Type and class of vapor retarder used throughout the building, or listed per assembly, to manage moisture migration via diffusion as required by Section R402.1.1.
2. Vapor retarder installation scope of work to ensure proper installation.
3. Whole house ventilation strategy to be used in accordance with Section R403.6 and Section M1505.3 of the *International Residential Code* to ensure background ventilation moisture control.
4. Spot/local exhaust ventilation strategy to be used in accordance with Section M1505.4.4 of the *International Residential Code* to manage/remove moisture as it is created
5. Flashing and weather resistant barrier type and installation details.

Reason: Currently the IRC allows one of three vapor retarder strategies to be used in a residential dwelling unit all of which require different levels of installation execution and coordination with the rest of the structure and systems that are built and the energy code features that are required by the IECC. In addition, the three strategies only address diffusion which is one of two means of moisture transport that is occurring in a dwelling unit. Moisture moves in a house by diffusion (which the vapor retarder addresses) but also with air. How we expect to control these two moisture transport mechanisms should be made prominent on the plan set to create more efficient and durable structures. This is especially true since more moisture flows into building assemblies through air transport than by the process of diffusion. This code change proposal promotes a subtle shift in our thinking to understand that moisture management is a combination of components and systems working together to protect the building from moisture related failures.

In the prescriptive section R402.1.1 Vapor retarders are required to be installed and the section refers you to the IRC and the IBC. Vapor Retarders discussed in these sections are an important part of gaining control and predictability of the moisture movement within a dwelling unit, but there is a choice that must be made as to which class of retarder will be installed. The installation of class 1 versus class 3 vapor retarder is significantly different and impacts the efficiency and durability of the structure differently.

This declaration will drive moisture management considerations into the design process resulting in assemblies that will be more moisture resistant and more efficient.

The scope of work requirement will better ensure that especially class 1 vapor retarders are installed to limit the ability of air and moisture from bypassing them and being trapped within assemblies. It should also create a better understanding of where a class 1 vapor retarder should or should not be installed in different climate zones. For example, in climate zone 5 along the front range in Colorado we often see unsealed class 1 vapor retarders (6 mil poly) installed behind drywall on exterior walls, but no vapor retarder installed in other parts of the exterior wall assembly such as rim joist or exterior walls in bathrooms. This declaration would elevate the inconsistency of placement of vapor retarders as their installation would be more clearly thought out on the plan set than it has ever been in the past.

Whole house and spot/local ventilation are another important part of the moisture management strategy. From a whole house ventilation perspective, the code gives three choices of strategies that can be used, some of which work better in certain climate zones than others. The vapor

management declaration, would bring the decision on systems that will be installed to the fore front for review by the plans examiner allowing for conversation prior to building the structure.

Cost Impact: The code change proposal will increase the cost of construction

There would be a small cost increase associated with this proposal as the proposal merely brings existing requirements together to be reported on the plan set. I estimate that this would require no more than 1 hour of time of the designer or architect. Approximately \$100 - \$200.

Proposal # 4536

RE2-19

RE3-19

IECC: R105.2.5

Proponent: Marilyn Williams, representing NEMA (mar_williams@nema.org)

2018 International Energy Conservation Code

Revise as follows:

R105.2.5 Final inspection. The *building* shall have a final inspection and shall not be occupied until *approved*. The final inspection shall include verification of the installation of all required *building* systems, equipment and controls and their proper operation and the required ~~number~~ efficacy of ~~high-efficacy lamps, luminaires and fixtures, lamps.~~

- Reason:**
1. Increase energy efficiency
 2. Reduce inconsistency and application confusion in compliance
 3. Increase code interpretation and usability
 4. Resolve compliance with application, approval and inspection

Another proposal has been submitted concerning Section R404.1 Lighting equipment (Mandatory)

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Today's cost to use the more efficient LED lamps and luminaires is now equal to or lower than the cost of CFL lamps.

Proposal # 4551

RE3-19

RE4-19

IECC: R202 (IRC N1101.6)(New)

Proponent: John Woestman, representing Extruded Polystyrene Foam Association (jwoestman@kellenccompany.com)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6)

GENERAL DEFINITIONS

Add new definition as follows:

CAVITY INSULATION. Insulating material located between framing members.

Reason: The purpose of this proposal is to coordinate with the definition in IECC-C by adding a definition to IECC-R for cavity insulation to complement the existing definition for continuous insulation. Cavity insulation and continuous insulation relate to the location of insulation materials, not specific material types. Adding this definition will help clarify the code in regard to terms used to explain where insulation components are located.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal only provides a new definition without any material change to the code or costs of compliance. There should be no cost implications.

Proposal # 5244

RE4-19

RE5-19

IECC: R202 (IRC N1101.6)(New)

Proponent: Amanda Hickman, The Hickman Group, representing Reflective Insulation Manufacturers Association International (amanda@thehickmangroup.com)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Add new definition as follows:

EMITTANCE. The ratio of the radiant heat flux emitted by a specimen to that emitted by a blackbody at the same temperature and under the same conditions.

Reason: This definition is needed because the term emittance is used in various sections of the code and in the definition for radiant barrier and reflective insulation. It is consistent with the definition found in the 2021 IBC, ASHRAE and ASTM standards.

The term emittance is used in numerous sections of this code including for: Building Envelope Requirements, Equipment Buildings, Roof Solar Reflectance and Thermal Emittance, Minimum Roof Reflectance and Emittance Options, Specifications for the Standard Reference and Proposed Designs, Roofs, and for Specifications for the Standard Reference and Proposed Designs, Walls above-grade.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

Adding a definition of EMITTANCE will neither increase or decrease construction costs. This is only a definition and is identical to the definition found in the 2021 IBC and existing ASHRAE and ASTM standards.

Proposal # 4106

RE5-19

RE6-19

IECC: R202 (IRC N1101.6)

Proponent: Jennifer Hatfield, representing American Architectural Manufacturers Association (jen@jhatfieldandassociates.com)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6)

GENERAL DEFINITIONS

Revise as follows:

FENESTRATION. Products classified as either *vertical fenestration* or *skylights*.

Skylights. Glass or other transparent or translucent glazing material installed at a slope of less than 60 degrees (1.05 rad) from horizontal, including unit skylights, tubular daylighting devices, and glazing materials in solariums, sunrooms, roofs and sloped walls.

Vertical fenestration. Windows that are fixed or operable, opaque doors, glazed doors, glazed block and combination opaque/glazed doors composed of glass or other transparent or translucent glazing materials and installed at a slope of not less than 60 degrees (1.05 rad) from horizontal.

Reason: This revision clarifies the types of products that are included in the category of "skylights" and brings the IECC Residential definition in alignment with what is in the 2018 IECC Commercial definition for "skylights" along with providing consistency with the second sentence found in the definition of "skylights and sloped glazing" in the IRC and IBC.

The intent of this change, which was accepted into the 2018 IECC Commercial, IBC and IRC definitions, was to clarify what constitutes skylights and sloped glazing, and to specifically clarify that tubular daylighting devices are to be included within that definition. This clarification is important because all fenestration, both vertical and skylights and sloped glazing, are required to be installed in such a manner as to preserve the integrity of the wall or roof.

Approval of this proposal will clarify that tubular daylighting devices are to be installed in such a manner as to preserve the weather resitant barrier of the roof in residential construction and ensure alignment with the other codebook definitions.

Bibliography: 2018 IECC, Section C202, Skylights; 2018 IBC, Section 202, [BS] Skylights and Sloped Glazing; and 2018 IRC, Section R202, [RB] Skylights and Sloped Glazing

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposal will not increase the cost of construction and simply clarifies which products fall under the category of "skylights" and by default, which do not. There will not be an impact to the cost of construction.

Proposal # 5246

RE6-19

RE7-19

IECC: R202 (IRC N1101.6), R404.1 (IRC N1104.1)

Proponent: Eric Makela, New Buildings Institute, representing New Buildings Institute (ericM@newbuildings.org)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Revise as follows:

HIGH-EFFICACY LAMPS. LIGHT SOURCES. Compact fluorescent lamps, light-emitting diode (LED) lamps, T-8 or smaller diameter linear fluorescent lamps, or other lamps with an efficacy of not less than ~~the following:~~ 65 lumens per watt, or luminaires with an efficacy of not less than 45 lumens per watt.

- ~~1. 1.60 lumens per watt for lamps over 40 watts.~~
- ~~2. 2.50 lumens per watt for lamps over 15 watts to 40 watts.~~
- ~~3. 3.40 lumens per watt for lamps 15 watts or less.~~

R404.1 (IRC N1104.1) Lighting equipment (Mandatory). Not less than 90 percent of the permanently installed lighting fixtures shall contain only ~~high-efficacy lamps.~~ lighting sources.

Reason: The lighting section includes a requirement for a minimum percentage of "high efficiency lamps." However, the definition of "high efficacy lamps" has not been updated to reflect the changes in the market due to increased federal minimums and greater availability/affordability of LED lighting. Because of this, the code is actually becoming less stringent as the baseline for lighting equipment is raised.

The proposal solves this problem by updating the definitions with lighting requirements that reflect what is actually "high-efficacy" in today's market. The proposal also simplifies the definition by reducing the number of wattage categories. The categories in the residential code are an artifact of incandescent and early compact fluorescent lamp wattages. As lamps have gotten more efficient, the higher wattage categories have become less meaningful. As lamps have gotten more efficient, the higher wattage categories have become less meaningful. Even a "100W equivalent" LED lamp and "60W equivalent" CFL lamps generally uses 15W or less, which is the lower category in the existing definition. As a result, the categories have become largely meaningless.

The proposal also accommodates high efficacy luminaires. Many luminaires on the market do not include lamps and include integrated LEDs instead. The way the current code language is written, these efficient lighting products cannot be used to meet the lighting efficiency requirements in the code. The proposal changes the term in the definition to be more inclusive, adds an efficacy requirement for integrated luminaires, and updates the code language to reflect this update.

Cost Impact: The code change proposal will increase the cost of construction

This change could potentially increase the cost of construction because it requires higher efficacy lighting (lamps and/or fixtures), which will likely eliminate some lower-end CFL options and/or push builders to newer LED technologies. However, the cost of LEDs has been steadily declining over the last several years and is expected to continue to decline. Based on an analysis by the U.S. Department of Energy's Building Energy Codes Program conducted during the 2018 IECC Code Development cycle, the estimated and projected prices for LEDs were \$4.84 per lamp compared to CFLs at \$3.10 per lamp. However, the rapid expansion of the LED lighting market has changed the economics. A spot check of Home Depot in early 2019 showed that a warm white, 60W equivalent A-lamp is as low as \$1.24 for both CFL and LED when purchased in packs. And, LEDs are actually cheaper than CFLs at some sources. At 1000bulbs.com, an online retailer, the same lamps are \$1.79/bulb for CFL and \$0.99 for LED. Therefore, this code change may actually reduce the cost of construction.

Proposal # 5184

RE7-19

RE8-19

IECC: R202 (IRC N1101.6), R105.2.4, R403.1.1 (IRC N1103.1.1)

Proponent: Sharon Bonesteel, representing Salt River Project (sharon.bonesteel@srpnet.com); John Umphress (john.umphress@austinenergy.com)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Add new definition as follows:

PROGRAMMABLE COMMUNICATING THERMOSTAT. A whole building or dwelling unit thermostat that can be monitored and controlled remotely.

SECTION R105 INSPECTIONS

Revise as follows:

R105.2.4 Mechanical rough-in inspection. Inspections at mechanical rough-in shall verify compliance as required by the code and *approved* plans and specifications as to installed HVAC equipment type and size, required controls, system insulation and corresponding *R*-value, system air leakage control, programmable communicating thermostats, dampers, whole-house ventilation, and minimum fan efficiency.

Exception: Systems serving multiple dwelling units shall be inspected in accordance with Section C105.2.4.

SECTION R403 (IRC N1103) SYSTEMS

R403.1.1 (IRC N1103.1.1) Programmable communicating thermostat. The thermostat controlling the primary heating or cooling system of the dwelling unit shall be capable of communicating with sources external to the HVAC system and function as a basic thermostat in the absence of communicating with external sources. ~~The thermostat shall be capable of~~ controlling the heating and cooling system on a daily schedule to maintain different temperature set points at different times of the day. ~~This~~ The thermostat shall include the capability to set back or temporarily operate the system and provide remote access to maintain *zone* temperatures of not less than 55° F (13° C) to not greater than 85° F (29° C). The thermostat shall be programmed initially by the manufacturer with a heating temperature setpoint of not greater than 70° F (21° C) and a cooling temperature setpoint of not less than 78° F (26° C).

Exception: Heating and cooling systems with proprietary internal thermostat communication functions.

Reason: Reason: This proposal adds a requirement for residential buildings to provide a communicating programmable thermostat. Communicating thermostats have become commonplace and are available from electronic stores to home improvement stores increasing brand awareness and large growth with installations in existing residential buildings.

The U.S. EPA Energy Star website lists a large number of connected and smart thermostats and product manufacturers continue to add more devices and improve the depth of price points for these thermostats.

As home automation has increased in homes new products have been released that allow for occupant comfort, ease of use, convenience, security and simplicity in use. Sales of home automation products and services are projected to continue exponential growth. The use of a connected thermostat can provide energy savings for the occupants and support utilities with their demand programs if the occupant chooses to participate.

Many studies have taken place across the U.S. on these newer thermostat devices and energy savings has been seen in the study results. If actual savings are only a fraction of the study savings, the payback period is very short.

This proposal also retains some requirements from the programmable thermostat requirements in the 2018 IECC. The term and definition "programmable communicating thermostat" is taken from ICC700- National Green Building Standard (NGBS).

The exception allows use of non-connected thermostats if heating or cooling system requires a proprietary control or don't support all of the functionality of the heating or cooling system.

This proposal is modeled after Austin, Texas energy code amendment for connected thermostats.

Potential savings opportunities:

The technical energy savings potential of these individual approaches ranges from 0.3 to 1.1 quads, or 1-5% of the total primary energy consumed by U.S. homes in 2015. Put another way, saving one quad per year is equivalent to the energy consumed by about 3 million people, the electricity produced by 250 coal fired power plants or 56 million metric tons (MMT) of CO2 emissions (DOE 2012) - Fraunhofer USA Center for Sustainable Energy Systems

The Florida PDR project showed average cooling energy savings of 9.6% (498 kWh/year), but with a very high degree of variation. Median savings were 6.3% (219 kWh/year). Particularly given the very short Florida winter heating season. Average savings were 9.5% (39kWh/year) although the median was higher, at 18.5% (35 kWh/year). Space heating savings from the Nest average savings were 9.5% (39kWh/year) although the median was higher, at 18.5% (35 kWh/year). – Florida Solar Energy Center

6% heating savings and 14% cooling savings - 2015 AESP Conference

Average annual gas savings per home as high at 6.0% - Energy Trust of Oregon

Bibliography: Bibliography:

1. Fraunhofer USA Center for Sustainable Energy Systems - "Energy Savings from Five Home Automation Technologies" April 2016, <https://bit.ly/2C9Jc2z>
2. Florida Solar Energy Center - 2016 ACEEE Summer Study on Energy Efficiency in Buildings - "Evaluation of the Space Heating and Cooling Energy Savings of Smart Thermostats in a Hot-Humid Climate using Long-term Data" <https://bit.ly/2Fmx0io>
3. AESP Conference February 2015 - Cadmus Presentation – C. Aarish – "Wi-Fi Connected Thermostats" show 6% heating savings and 14% cooling savings"
4. Nest Learning Thermostat Pilot Program Savings Assessment, Bonneville Power Administration & Franklin Public Utility District, November 2016, <https://bit.ly/2ADdN8Z>
5. Energy Trust of Oregon, Apex Analytics - Smart Thermostat Pilot Evaluation, March 2016, <https://bit.ly/2Ri6gGN>
6. CLEAResult - Smart Thermostats, June 2015, <https://bit.ly/2sk6Zbl>
7. Cadmus – NIPSCO Indiana pilot study, 2014, <https://bit.ly/2RkWq7e>

Cost Impact: The code change proposal will increase the cost of construction

Cost Impact: A builder entry communicating programmable thermostat can add \$50+ over the cost of a typical weekly programmable thermostat. Cost information available at many online retailers comparing weekly programmable thermostats to connected thermostats.

Proposal # 5480

RE8-19

RE9-19 Part I

PART I — IECC: Part I: R202 (IRC N1101.6)

IRC: Part II: R202

PART II — IRC: R202

Proponent: Donald Sivigny, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC- RESIDENTIAL COMMITTEE. PART II WILL BE HEARD BY THE IRC BUILDING COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Revise as follows:

ROOF RE-COVER, RECOVER. The process of installing an additional roof covering over ~~a prepared~~ an existing roof covering without removing the existing roof covering.

Proposal # 5367

RE9-19 Part I

RE9-19 Part II

IRC: R202

Proponent: Donald Sivigny, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Residential Code

Revise as follows:

[RB] ROOF RECOVER. The process of installing an additional *roof covering* over ~~a prepared~~ an existing roof covering without removing the existing roof covering.

Reason: This simply changing the language in the definition chapter of the IECC-R (and IRC Chapter 11) to be consistent with definition in IECC-C. This is in conjunction with another proposal to change the definition in IRC Chapter 2 in the same manner so that all are uniform for better code compliance and enforcement.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. As this is only aligning a definition across multiple codes, there is no change in technical requirements. Thus, there is no impact to construction costs.

Proposal # 5765

RE9-19 Part II

RE10-19

IECC: R202 (IRC N1101.6) (New)

Proponent: Hope Medina, representing Self (hmedina@coloradocode.net)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6)

GENERAL DEFINITIONS

Add new definition as follows:

SAMPLING. A process where fewer than 100 percent of a builder's dwellings, dwelling units, or sleeping units are randomly inspected and or tested to evaluate compliance with the requirements of this code.

Reason: This definition is to clarify that the practice of sampling includes more than just blower door testing. The approved third party would have the opportunity to sample any requirement of the code in a development or building. This is a concept that needs to be made apparent to everyone who uses the code.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
new definition

Proposal # 5507

RE10-19

RE11-19

IECC: R202 (IRC N1101.6)(New), R303.1.1 (IRC N1101.10.1)

Proponent: Amanda Hickman, The Hickman Group, representing Reflective Insulation Manufacturers Association International (amanda@thehickmangroup.com)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Add new definition as follows:

ENCLOSED REFLECTIVE AIR SPACE. An unventilated cavity with a low-emittance surface bounded on all sides by building components.

REFLECTIVE INSULATION. A material installed in an assembly consisting of one or more enclosed reflective air spaces with a surface emittance of 0.1 or less.

Revise as follows:

R303.1.1 (IRC N1101.10.1) Building thermal envelope insulation. An *R*-value identification mark shall be applied by the manufacturer to each piece of *building thermal envelope* insulation that is 12 inches (305 mm) or greater in width. Alternatively, the insulation installers shall provide a certification that indicates the type, manufacturer and *R*-value of insulation installed in each element of the *building thermal envelope*. For blown-in or sprayed fiberglass and cellulose insulation, the initial installed thickness, settled thickness, *R*-value, installed density, coverage area and number of bags installed shall be indicated on the certification. For sprayed polyurethane foam (SPF) insulation, the installed thickness of the areas covered and the *R*-value of the installed thickness shall be indicated on the certification. For reflective insulation, the number of reflective sheets, the number and thickness of the enclosed reflective air spaces and the *R*-value for the installed assembly, shall be listed on the certification. For insulated siding, the *R*-value shall be on a label on the product's package and shall be indicated on the certification. The insulation installer shall sign, date and post the certification in a conspicuous location on the job site.

Exception: For roof insulation installed above the deck, the *R*-value shall be labeled as required by the material standards specified in Table 1508.2 of the International Building Code or Table R906.2 of the International Residential Code, as applicable.

Reason: The section at present incorporates requirements that are specific to blown or sprayed fiberglass, cellulose insulation and sprayed polyurethane foam insulation together with general requirements for thermal envelope insulation materials. However, the code is silent on reflective insulations.

The proposal adds specific requirements similar to those for the other insulation materials (as well as appropriate definitions) for a type of material, (reflective insulation) that has been in the market place for over 25 years and has had nationwide distribution and installation. These products are well established and have two associated ASTM Standards, ASTM C727, Standard Practice for Installation and Use of Reflective Insulation in Building Constructions, and ASTM C1224, Standard Specification for Reflective Insulation for Building Applications.

The U.S. Department of Energy's website on weatherizing homes: <https://www.energy.gov/energysaver/weatherize/insulation/types-insulation> includes the advantages of reflective insulation systems. It states that reflective systems are most effective in preventing downward heat flow but that the effectiveness depends on spacing. This is the critical reason this code change is needed.

Many states and jurisdictional codes already include references on reflective insulation; the list follows:

IBC: 2018 – Section 720, Section 2614

Florida

2017 Florida Building Code, Energy Conservation, 6thEdition

- R303.1.1 Building thermal envelope insulation
- Table R303.2.1 Insulation Installation Standards
- R303.2.1.2 Substantial Contact

2017 Florida Building Code, Building, 6thEdition

- Section 2614 Reflective Plastic Core Insulation
- Section 720 Thermal and Sound-Insulating Materials

Minnesota

2015 Minnesota Building Code

- Section 720 Thermal and Sound-Insulating Materials
- Section 2613 Reflective Plastic Core Insulation
- Thermal Insulation Standards 2015, Section 7640.0130, Subpart 7

California

Title 24, 2016, Reference Residential Appendices

- RA4.3 Envelope Measures

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal will not increase the cost of construction because only information regarding reflective insulation is being added.

Proposal # 4105

RE11-19

RE12-19

IECC: R202 (1101.6) (New), R303.1.1.2 (N1101.10.1.1.2) (New), Chapter 6 (IRC Chapter 44)(New)

Proponent: Amanda Hickman, The Hickman Group, representing Reflective Insulation Manufacturers Association International (amanda@thehickmangroup.com)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Add new definition as follows:

RADIANT BARRIER. A material having a low emittance surface of 0.1 or less installed in building assemblies.

Add new text as follows:

R303.1.1.2 (IRC N1101.10.1.1.2) Radiant barrier. Where installed, radiant barriers shall comply with the requirements of ASTM C1313/C1313M and shall have an emittance of 0.1 or less.

Add new standard(s) as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428-2959

C1313/C1313M-13: Standard Specification for Sheet Radiant Barriers for Building Construction Applications

Reason: This proposal DOES NOT require the use of radiant barriers. But rather requires that WHEN radiant barriers are used, they comply with the appropriate ASTM standard. Furthermore this proposal provides important information to the code user and code enforcement community regarding radiant barriers.

Radiant barriers are typically installed in attics to reduce summer heat gains through the roof. According to the DOE's website: <https://www.energy.gov/energysaver/weatherize/insulation/radiant-barriers>, Radiant barriers help to reduce cooling costs by reducing radiant heat gain. To be effective, radiant barriers are very dependent of their installation because their reflective surface must face an air space.

Radiant barriers follow two ASTM Standards – ASTM C1313/C1313M, "Standard Specification for Sheet Radiant Barriers for Building Construction Applications," and ASTM C1743, "Standard Practice for Installation and Use of Radiant Barrier Systems (RBS) in Residential Building Construction".

The proposed language is being included in this section specifically because the American Society for Testing and Materials (ASTM) classifies radiant barriers as thermal insulation. The ASTM committee C16 on Thermal Insulation includes published standards for this product. Subcommittee C16.21 deals specifically with reflective products, which include reflective insulation, radiant barrier and interior radiation control coatings. C16.21 develops standards and practices for these reflective building material thermal insulating products.

The Federal Trade Commission includes radiant barrier products in "**CFR Part 460 Labeling and Advertising of Home Insulation: Trade Regulation Rule**".

Radiant barrier products include a surface with an emittance of 0.1 or less that is installed in roof assemblies or attics with the low-emittance surface facing an open or ventilated air space. The low emittance material can be bonded to plastic film, woven fabric, reinforced paper, OSB or plywood. The thermal performance of radiant barriers depends on emittance and location in the attic, wall or roof assembly. Radiant barriers are predominantly installed in attic spaces below the roof deck. The low-emittance surface of radiant barrier products dramatically reduces the heat gain by radiation into the structure and attic HVAC ducts. For this reason, radiant barriers are especially effective in warm sunny climates where they provide reduced use of air conditioning. Radiant barrier products that are available include single-sheet material, multi-layer assemblies and wood sheathing with attached aluminum film or foil. The single sheet material is installed in roof assemblies by attaching directly to the roof deck, in between the rafters or trusses or to the underside of the rafters or trusses. The foil-faced sheathing is installed with the low-emittance side of the sheathing or panel facing toward the attic space to create a radiant barrier. Attic radiant barriers are in extensive use. These products have been on the market for several decades and are used by 87 of the top 100 US Builders. They have an established history and have been accepted into several regional code requirements. Over one billion square feet of the product is being installed annually.

Many state and jurisdictional codes already include references on radiant barriers. These are the state and city codes that include radiant barrier:

IBC: 2018 Section 1509 Radiant Barriers Installed Above Deck

Hawaii - Chapter 181 of Title 3, 2015, Section 407.2, Table 407.1

Texas

- The Code of the City of Austin, Texas, Supplement 1342018, Chapter 25-12, Article 12, Section R402.6

Florida

2017 Florida Building Code, Energy Conservation, 6th Edition

- Section 405.7.1 Installation Criteria for homes claiming the radiant barrier option
- Figure R405.7.1 Acceptable attic radiant barrier configurations
- Table R303.2.1 Insulation Installation Standards

California

- Title 24, 2016, Part 6, Subchapter 1, Definition Radiant Barrier

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal will not increase the cost of construction because it only adds informational language regarding radiant barriers.

Analysis: A review of the standard proposed for inclusion in the code, ASTM C1313/C1313M-2013, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 4108

RE12-19

RE13-19

IECC: R303.1.3 (IRC N1101.10.3)

Proponent: Shaunna Mazingo, City of Westminster, representing Colorado Chapter of ICC Energy Code Development Committee (smozingo@cityofwestminster.us)

2018 International Energy Conservation Code

Revise as follows:

R303.1.3 (IRC N1101.10.3) Fenestration product rating. *U*-factors of fenestration products such as windows, doors and *skylights* shall be determined in accordance with NFRC 100.

Exception: Where required, garage door *U*-factors shall be determined in accordance with either NFRC 100 or ANSI/DASMA 105. *U*-factors shall be determined by an accredited, independent laboratory, and labeled and certified by the manufacturer.

Products lacking such a labeled *U*-factor shall be assigned the maximum U factor from Section R402.5. Opaque doors lacking a default U-factor from Table R303.1.3(1) or label shall be assigned a default U-factor from Table R303.1.3 (2). The *solar heat gain coefficient* (SHGC) and *visible transmittance* (VT) of glazed fenestration products such as windows, glazed doors and *skylights* shall be determined in accordance with NFRC 200 by an accredited, independent laboratory, and labeled and certified by the manufacturer. Products lacking such a labeled SHGC shall be assigned the maximum SHGC from Section R402.5.

Exception: For existing buildings complying with Chapter 5, products lacking a labeled *U*-factor, SHGC or VT shall be assigned a default *U*-factor, SHGC or VT from ~~Table~~ Tables R303.1.3 (1) through (3).

**TABLE R303.1.3(1) [IRC N1101.10.3(1)]
DEFAULT GLAZED WINDOW, GLASS DOOR AND SKYLIGHT *U*-FACTORS**

FRAME TYPE	WINDOW AND GLASS DOOR		SKYLIGHT	
	Singlepane	Doublepane	Single	Double
Metal	1.20	0.80	2.00	1.30
Metal with Thermal Break	1.10	0.65	1.90	1.10
Nonmetal or Metal Clad	0.95	0.55	1.75	1.05
Glazed Block	0.60			

**TABLE R303.1.3(2) [IRC N1101.10.3(2)]
DEFAULT OPAQUE DOOR *U*-FACTORS**

DOOR TYPE	OPAQUE <i>U</i> -FACTOR
Uninsulated Metal	1.20
Insulated Metal	0.60
Wood	0.50
Insulated, nonmetal edge, not exceeding 45% glazing, any glazing double pane	0.35

**TABLE R303.1.3(3) [IRC N1101.10.3(3)]
DEFAULT GLAZED FENESTRATION SHGC AND VT**

SINGLE GLAZED		DOUBLE GLAZED		GLAZED BLOCK
Clear	Tinted	Clear	Tinted	
SHGC	0.8	0.7	0.7	0.6
VT	0.6	0.3	0.6	0.3

Reason: Because of the mandatory wording of Section R402.5, you could never use the values that are in the residential default tables for new construction. This proposal makes the defaults for unlabeled fenestration that of the maximum mandatory requirements. However, in existing buildings there are times when you will not be able to determine existing *U* factors or SHGC and the newer mandatory requirements of the new R402.5 are unrealistic, therefore the tables have been saved for those existing buildings. Opaque doors have been left with the default tables and VT was struck from the maximum requirements for new construction because A) that section doesn't cover VT and B) VT is not a residential

requirement anyway.

The proposal changes the references to the tables, however the tables remain the same.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Because of the mandatory maximums set in R402.5 you could never use these default tables for new construction.

Staff Analysis: TABLE R303.1.3(1) [IRC N1101.10.3(1)] through R303.1.3(3) [IRC N1101.10.3(3)] remain unchanged.

Proposal # 5321

RE13-19

RE14-19

R303.2 (IRC N1101.11)

Proponent: Eric Makela, New Buildings Institute, representing Northwest Energy Codes Group (ericM@newbuildings.org)

2018 International Energy Conservation Code

Revise as follows:

R303.2 (IRC N1101.11) Installation. Materials, systems and equipment shall be installed in accordance with the ~~manufacturer's instructions~~ Grade I insulation installation requirements in RESNET/ICC 301 and the International Building Code or the International Residential Code, as applicable.

Reason: The quality of insulation installation has a significant impact on the performance of the building envelope. When insulation is not properly installed, the code does not achieve the energy savings intended by its insulation requirements. Poorly installed insulation can compromise home performance, resulting in higher energy bills for the builder's customers and increased customer call backs due to comfort issues. Based on a report by Energy Star Certified Homes, Version 3 (Rev. 08) there is a 5% savings for heating and cooling system consumption on properly installed insulation (Grade I) vs Grade II insulation that includes more gaps, voids and compressions.

The current IECC language requires that insulation be installed to manufacturer's instructions. This provision is difficult to enforce because installation instructions will vary based on manufacturer and type of installation (e.g. fiberglass batts versus blown fiber glass versus cellulose). Field inspectors normally don't have ready access to manufacturer's installation instructions when conducting an insulation inspection. Manufacturers require that their product be installed with minimal gaps, voids and compression which relates to Grade I Insulation installation but based on the U.S. DOE field study conducted in several states, less than 50% of the homes had insulation installed to Grade I insulation quality.

To address this issue, RESNET has created a new insulation installation standard that includes requirements for Grade I insulation installation for different types of insulation (e.g. fiberglass batts, blown fiber glass and cellulose). The standards language is included in latest version of RESNET/ICC Standard 301. The Grade I installation requirement will help standardize how insulation should be installed and can be used as a reference by both the insulation contractor and the building department reducing potential issues in the field over how products should be installed. This can also be used by the builder focused on quality assurance as they will know how the insulation product is require to be installed.

Grade I insulation allows very small gaps in the insulation. Voids are not allowed to extend from the interior to the exterior (i.e. the full width of a wall cavity). The product is required to be installed according to manufacturer's specification and cut to fit around electrical junction boxes and is split around wires and pipes. Compression or incomplete fill can amount to 2% or less, if the empty spaces are less than 30% of the intended fill thickness.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

There is no cost increase in this code change as the code currently requires insulation to be installed to manufacturers installation instruction which is consistent with Grade I insulation installation requirements.

Proposal # 5193

RE14-19

RE15-19

IECC: R401.2 (IRC N1101.13), R401.2.1 (IRC N1101.13.1), R401.2.1 (IRC N1101.13.1) (New), R401.2.2 (IRC N1101.13.2) (New), R401.2.3 (IRC N1101.13.3) (New), R401.2.4 (IRC N1101.13.4) (New), R407 (IRC N1107) (New), R407.1 (IRC N1107.1) (New)

Proponent: David Collins, SEHPCAC, representing SEHPCAC (SEHPCAC@iccsafe.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Energy Conservation Code

Revise as follows:

R401.2 (IRC N1101.13) Compliance Application. Projects ~~Residential buildings~~ shall comply with Section R401.2.1, R401.2.2, R401.2.3, or R401.2.4

~~one of the following:~~

- ~~1. Sections R401 through R404.~~
- ~~2. Section R405 and the provisions of Sections R401 through R404 indicated as "Mandatory."~~
- ~~3. The energy rating index (ERI) approach in Section R406.~~

Exception: Additions, alterations, repairs and changes of occupancy to existing buildings complying with Chapter 5.

Add new text as follows:

R401.2.1 (IRC N1101.13.1) Prescriptive Compliance The Prescriptive Compliance Option requires compliance with Sections R401 through R404.

R401.2.2 (IRC N1101.13.2) Total Building Performance The Total Building Performance Option requires compliance with Section R405, and the provisions of Sections R401 through R404 indicated as "Mandatory".

R401.2.3 (IRC N1101.13.3) Energy Rating Index. The Energy Rating Index (ERI) Option requires compliance with Section R406

R401.2.4 (IRC N1101.13.4) Tropical zones The Tropical Climate Zone alternative requires compliance with Section 407.

SECTION R407 (IRC N1107) **TROPICAL CLIMATE ZONE**

R407.1 (IRC N1107.1) Scope. This section establishes alternative criteria for *residential buildings* in the tropical zone at elevations less than 2,400 feet (731.5 m) above sea level.

Revise as follows:

~~**R401.2.1 (IRC N1101.13.1) R407.2 (IRC N1107.2) Tropical zone.** *Residential buildings* in the tropical zone at elevations less than 2,400 feet (731.5 m) above sea level shall be deemed to be in compliance with this chapter provided that the following conditions are met~~ Compliance with this sections requires the following:

1. Not more than one-half of the *occupied* space is air conditioned.
2. The *occupied* space is not heated.
3. Solar, wind or other renewable energy source supplies not less than 80 percent of the energy for service water heating.
4. Glazing in *conditioned* spaces has a *solar heat gain coefficient* of less than or equal to 0.40, or has an overhang with a projection factor equal to or greater than 0.30.
5. Permanently installed lighting is in accordance with Section R404.
6. The exterior roof surface complies with one of the options in Table C402.3 or the roof or ceiling has insulation with an *R-value* of R-15 or greater. Where attics are present, attics above the insulation are vented and attics below the insulation are unvented.
7. Roof surfaces have a slope of not less than one-fourth unit vertical in 12 units horizontal (21-percent slope). The finished roof does not have water accumulation areas.
8. Operable fenestration provides a ventilation area of not less than 14 percent of the floor area in each room. Alternatively, equivalent ventilation is provided by a ventilation fan.
9. Bedrooms with exterior walls facing two different directions have operable fenestration on exterior walls facing two directions.
10. Interior doors to bedrooms are capable of being secured in the open position.
11. A ceiling fan or ceiling fan rough-in is provided for bedrooms and the largest space that is not used as a bedroom.

Reason:

This proposal intends no technical changes. It will make the code clearer and easier to use, particularly if companion proposals to identify 'mandatory' provisions in tabular formats are approved.

This proposal reorganizes the general requirements of Chapter 4 of the IECC-R to:

- Retitle R401.2 as "Application" to be consistent with the title of the parallel section in the IECC-C;
- More clearly identify the optional compliance paths available to the designer by providing titles.;
- Retitle the R405 "Simulated Performance Alternative" performance option as "Total Building Performance" to be consistent with the title of the parallel section in the IECC-C;
- Relocate the specific technical requirements of the tropical zone alternative from the general section of the code to a standalone section; while providing a reference in the general section to the new tropical zone section;
- Provide a needed reference to the requirements for existing buildings in Chapter 5.

Consistent nomenclature would support training and education, ease of use and code administration.

A separate proposal has been made to relocate all of the 'mandatory' requirements of the performance option currently listed in Sec. R401.2(2) to a new table in Sec. R405. This is consistent with approach currently used in R406.2, (mandatory requirements for the ERI alternative) whereby all mandatory requirements are referenced from the section to which they apply. (Note that another separate proposal would move the 'mandatory' sections referenced in R406.2 to a new table within R406 to maintain consistency of approach between R405 and R406).

This proposal is submitted by the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx> (<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>)

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal restructures and simplifies existing information and simplicity, it does not create or eliminate requirements.

Proposal # 4456

RE15-19

RE16-19

IECC: R401.2 (IRC N1101.13)

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org)

2018 International Energy Conservation Code

Revise as follows:

R401.2 (IRC N1101.13) Compliance. Projects shall comply with all provisions of Chapter 3 as applicable; the provisions of Chapter 4 labeled "Mandatory;" and one of the following:

1. Sections R401 through R404.
2. Section R405 ~~and the provisions of Sections R401 through R404 indicated as "Mandatory."~~
3. ~~The energy rating index (ERI) approach in Section R406.~~

Reason: The purpose of this code change proposal is to simplify and clarify the applicability of the IECC's mandatory provisions across all compliance paths. The proposal will also clarify the applicability of Chapter 3 to all compliance paths, including the Energy Rating Index option of Section R406, something that may not be obvious to a code user who may be more familiar with other rating systems. This code change will not change any requirements of the code, but it will bring essential clarification to the applicability of certain measures to all compliance paths. This will improve compliance and enforcement.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal does not change any requirements, but merely clarifies the application of the code.

Proposal # 3998

RE16-19

RE17-19

IECC: R401.2 (IRC N1101.13), R407 (IRC N1107) (New)

Proponent: Stephen Kanipe, representing Colorado Chapter (stephen.kanipe@cityofaspen.com); Nick Thompson, City of Aspen, representing Colorado Chapter of ICC Energy Code Development Committee (nick.thompson@cityofaspen.com); Mike Suhrbier, representing Self (mikes@sgm-inc.com)

2018 International Energy Conservation Code

Revise as follows:

R401.2 (IRC N1101.13) Compliance. Projects shall comply with one of the following:

1. Sections R401 through R404.
2. Section R405 and the provisions of Sections R401 through R404 indicated as “Mandatory.”
3. The energy rating index (ERI) approach in Section R406.
4. The simplified equivalent compliance alternative approach in Section R407.

Add new text as follows:

R407 (IRC N1107) **SIMPLIFIED EQUIVALENT COMPLIANCE ALTERNATIVE**

R407.1 (IRC N1107.1) Scope. This section establishes criteria for compliance using heating and cooling load analysis.

R407.2 (IRC N1107.2) Requirements. Compliance with this section requires that the provisions identified in Sections R102.3, R403.5, R403.8, R403.9, R403.10, R403.11, and R404.1 be met.

R407.3 (IRC N1107.3) Equivalent HVAC building load. The ratio of the space cooling load and space heating load to *conditioned floor area* shall be less than or equal to the values in Table R407.3.

TABLE R407.3 (IRC N1107.3)
COOLING AND HEATING LOAD PER SQUARE FOOT

CLIMATE ZONE	COOLING LOAD PER SQUARE FOOT	HEATING LOAD PER SQUARE FOOT
0	10.1 Btuh	3.1 Btuh
1	8.9 Btuh	4.6 Btuh
2	11.6 Btuh	7.3 Btuh
3A and 3B	6.5 Btuh	8.5 Btuh
4A and 4B	7.6 Btuh	8.8 Btuh
3C	3.3 Btuh	5.8 Btuh
4C	6.0 Btuh	7.1 Btuh
5	7.0 Btuh	11.4 Btuh
6	5.5 Btuh	11.6 Btuh
7	4.9 Btuh	13.1 Btuh
8	4.0 Btuh	18.1 Btuh

R407.4 (IRC N1107.4) **TESTING**

R407.4.1 (IRC N1107.4.1) Air leakage. The *building* or dwelling unit shall be tested and verified as having an air leakage rate not exceeding the design infiltration rate in the load calculations. Testing shall be conducted in accordance with RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). Where required by the *code official*, testing shall be conducted by an *approved* third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*. Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope*.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other

infiltration control measures.

2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.
3. Interior doors, where installed at the time of the test, shall be open.
4. Exterior or interior terminations for continuous ventilation systems shall be sealed.
5. Heating and cooling systems, where installed at the time of the test, shall be turned off.
6. Supply and return registers, where installed at the time of the test, shall be fully open.

R407.4.1 (IRC N1107.4.1) Duct leakage. Ducts shall be tested in accordance with R403.3.3 and R403.3.4.

Reason: This is a refinement of previous code change proposal RE180-16. The committee recommended disapproval for the following reason: "This is a good concept that would be easy to use but the numbers need some refinement."

This proposal responds to the committee's comment on RE180-16 by providing specific compliance numbers for each climate zone. Weather data from representative cities of each climate zone as suggested by Pacific Northwest National Laboratory (PNNL) was entered in Wrightsoft Manual J software. Thermal envelope values (insulation, fenestration, air leakage) from the prescriptive 2018 IECC path for each climate zone was entered using the PNNL standard house design. This is consistent with PNNL protocol.

R407.2 includes requirements not addressed by heating and cooling load including service hot water, exterior energy use, and lighting. R102.3 is included to highlight the need for supporting mechanical system design documentation.

R407.4 requires testing to demonstrate the building is built as designed. A blower door test may not exceed the design infiltration rate in the load calculations. Ducts have the same testing requirements as the prescriptive path in R403.3.3 and R403.3.4.

The Simplified Equivalent Compliance Alternative provides the designer, engineer and builder team with another path to comply with climate zone equivalent energy performance targets. The peak heating and cooling loads are already calculated by the design team and drives the HVAC equipment size decision. This option rewards design work value that already exists.

This method is intended as an alternate method for complex residential buildings and HVAC system designs. Energy code compliance documentation at permit application will be greatly reduced as the compliance metric does not require volumes of paperwork.

This compliance path will shorten plan review time and reduce costs in both the public and private sectors.

The targets are fuel neutral.

Note 1- the climate zones are based on this table:

TABLE R301.3(2) INTERNATIONAL CLIMATE ZONE DEFINITIONS

ZONE NUMBER	THERMAL CRITERIA	
	IP Units	SI Units
0	10000 < CDD50°F	
1	9000 < CDD50°F	5000 < CDD10°C
2	6300 < CDD50°F £ 9000	3500 < CDD10°C £ 5000
3A and 3B	4500 < CDD50°F £ 6300 AND HDD65°F £ 5400	2500 < CDD10°C £ 3500 AND HDD18°C £ 3000
4A and 4B	CDD50°F £ 4500 AND HDD65°F £ 5400	CDD10°C £ 2500 AND HDD18°C £ 3000
3C	HDD65°F £ 3600	HDD18°C £ 2000
4C	3600 < HDD65°F £ 5400	2000 < HDD18°C £ 3000
5	5400 < HDD65°F £ 7200	3000 < HDD18°C £ 4000
6	7200 < HDD65°F £ 9000	4000 < HDD18°C £ 5000
7	9000 < HDD65°F £ 12600	5000 < HDD18°C £ 7000
8	12600 < HDD65°F	7000 < HDD18°C

For SI: °C = [(°F) - 32]/1.8.

Note 2 – We provided numbers for Climate Zone 0 using weather data from a CZ0 city (Dubai) but used thermal envelope R and U values and air leakage for CZ1 under the 2018 IECC.

WHAT TO LOOK FOR ON THE COMPLIANCE DOCUMENTS:

Following are example load calculations for climate zone 6 in Helena, MT. The heating load highlighted in the report is 27,725 Btuh; divided by the 2,400sqft conditioned floor area of this house gives a Btuh/sqft of 11.55. This is less than the value in table R407.3 and therefore complies. A similar calculation can be done for the cooling load. This house will need to pass a blower door test of 1080cfm at 50 Pa per the highlighted infiltration value in the report.

Design Information

Weather: Helena Regional, MT, US

Winter Design Conditions

Outside db	-7 °F
Inside db	68 °F
Design TD	75 °F

Summer Design Conditions

Outside db	90 °F
Inside db	75 °F
Design TD	15 °F
Daily range	H
Relative humidity	30 %
Moisture difference	1 gr/lb

Heating Summary

Structure	27725 Btuh
Ducts	0 Btuh
Central vent (0 cfm)	0 Btuh
(none)	
Humidification	0 Btuh
Piping	0 Btuh
Equipment load	27725 Btuh

Sensible Cooling Equipment Load Sizing

Structure	13980 Btuh
Ducts	0 Btuh
Central vent (0 cfm)	0 Btuh
(none)	
Blower	0 Btuh
Use manufacturer's data	n
Rate/swing multiplier	0.95
Equipment sensible load	13253 Btuh

Infiltration

Method	Blower door
Shielding / stories	3 (partial) / 2
Pressure / AVF	50 Pa / 1080 cfm

Latent Cooling Equipment Load Sizing

Structure	19 Btuh
Ducts	0 Btuh
Central vent (0 cfm)	0 Btuh
(none)	
Equipment latent load	19 Btuh

	Heating	Cooling
Area (ft ²)	2400	2400
Volume (ft ³)	21600	21600
Air changes/hour	0.31	0.15
Equiv. AVF (cfm)	113	53

Equipment Total Load (Sen+Lat)	13272 Btuh
Req. total capacity at 0.70 SHR	1.6 ton

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is an option that gives considerable freedom to the design team. Options and flexibility may lower construction cost.

Proposal # 5533

RE17-19

RE18-19

IECC: R401.3 (IRC N1101.14)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

R401.3 (IRC N1101.14) Certificate (Mandatory). A permanent certificate shall be completed by the builder or other *approved* party and posted on a wall in the space where the furnace is located, a utility room or an *approved* location inside the *building*. Where located on an electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label or other required labels. The certificate shall indicate the predominant *R*-values of insulation installed in or on ceilings, roofs, walls, foundation components such as slabs, *basement walls*, crawl space walls and floors and ducts outside *conditioned spaces*; *U*-factors of fenestration and the *solar heat gain coefficient* (SHGC) of fenestration, and the results from any required duct system and *building* envelope air leakage testing performed on the *building*. Where there is more than one value for each component, the certificate shall indicate the value covering the largest area. The certificate shall indicate the types and efficiencies of heating, cooling and service water heating equipment. Where a gas-fired unvented room heater, electric furnace or baseboard electric heater is installed in the residence, the certificate shall indicate "gas-fired unvented room heater," "electric furnace" or "baseboard electric heater," as appropriate. An efficiency shall not be indicated for gas-fired unvented room heaters, electric furnaces and electric baseboard heaters. Where onsite renewable systems have been installed, the array capacity kilowatt size, inverter efficacy, panel tilt and orientation shall be noted on the certificate.

Reason: Four reasons why this proposal should be supported:

1. The Code requires that the efficiency rating of every energy-related building component of the home be observable or documented. Insulation R-values, furnace AFUE and water heater EF ratings, Window U-value and SHGC, as well as blower door and duct leakage testing results to name a few. Onsite renewables systems are the one exception which this proposal is striving to address.
2. The homebuyer must have access to knowledge of the energy comments of their home. The label required in Section R401.3 provides it with the notable exception of onsite renewables.
3. Green appraisal addendums and energy efficient mortgages are becoming more common in the market and the ability to easily gather the energy component information from a home is especially needed after the first sale. The certificate is to be a permanent feature of the home to allow the value of the efficiency features of the home to be recognized and assessed as an impact on the cost of ownership.
4. Lastly, third-party Inspection agencies, especially those working within section R405 and R406, need this information in order to develop compliance and marketing documents. The inclusion of onsite renewables on this certificate will change the renewable industry by ensuring that the information is passed on to all owners in a timely manner that does not impact receiving the certificate of occupancy or the closing of the home.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal would not impact the cost of construction. It does not require the inclusion of onsite renewables only the reporting of it when it is installed.

Proposal # 4801

RE18-19

RE19-19

IECC: R401.3 (IRC N1101.14)

Proponent: donald sivigny, State of MN, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Energy Conservation Code

Revise as follows:

R401.3 (IRC N1101.14) Certificate (Mandatory). A permanent building certificate shall be completed by the builder or other approved party and posted on a wall in the space where the furnace is located, a utility room or an *approved* location inside the ~~building~~ building. Where located on an electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label, or other required labels. The certificate shall indicate ~~the predominant R-values~~ :

1. The date the certificate is installed;
2. The dwelling address;
3. Residential contractor name and contractor license number, or homeowner name, if acting as the general contractor;
4. The predominant installed R-values, their location, and type of insulation installed in or on ceilings, roofs, walls, rim/band joist, foundation components such as slabs, basement walls, crawl space walls and floors ~~and~~ ;
5. ducts outside conditioned spaces; ~~U-factors of~~
6. U-factors for fenestration and the solar heat gain coefficient (SHGC) of fenestration;
7. ~~and the results from~~ of any required duct system and building envelope air leakage testing done on the building.
8. The types, and efficiencies, input ratings, manufacturers, and model numbers and efficiencies of heating, cooling, and service water heating equipment.
9. The structure's calculated heat loss, calculated cooling load, and calculated heat gain.
10. The certificate shall list the mechanical ventilation system type, location, and capacity
11. The building's designated continuous and total ventilation rates.
12. The type, size, and location of any make-up air system installed and Combustion air as required for the building

~~performed on the building~~. Where there is more than one value for each component, the certificate shall ~~indicate~~ list the value covering the largest area.

~~The certificate shall indicate the types and efficiencies of heating, cooling and service water heating equipment.~~ Where a gas-fired unvented room heater, electric furnace or baseboard electric heater is installed in the residence, the certificate shall indicate "gas-fired unvented room heater," "electric furnace" or "baseboard electric heater," as appropriate.

An efficiency shall not be indicated for gas-fired unvented room heaters, electric furnaces ~~and or~~ electric baseboard heaters.

Reason: The language in section R401.3 is revised by replacing the word "permanent" in the first sentence with the word "building." This change is necessary because the term "permanent certificate" is not used in the industry while the term "building certificate" is, and building certificate is the correct term to be used, in that pertains to the document being referenced in this section. The term "permanent" is an ambiguous term in that one person's definition of permanent is very different than another person's definition of permanent. Using the term building certificate will add to consistency of the code because we do define the term "Building" in the code.

Additional required items are added to the IECC list of certificate requirements: the date the certificate is posted so that the building is complete and all the information needed can be added to the certificate; the contractor name and license number or the homeowner name and contact information (if acting as the general contractor)[1]; the insulation product and R-values in the Rim/Band joist area because the Rim/Band joist area is typically insulated with a different system or product than the rest of the home; information on the building's mechanical ventilation system because this system is an important component of the building's air quality and durability as required by other provisions of the code; and input rating, model numbers, and equipment efficiencies of all the heating and cooling equipment.

These requirements provide consistency with regard to building certificate requirements and a builder can now use the Certificate as a checklist for information that is required at permit application time. Without this information it is virtually impossible to do a complete and proper plan review and know how the building is being built. (See Example)

Cost Impact: The code change proposal will decrease the cost of construction

These items are already being calculated and done as part of the building's construction. All this change is doing is asking for the information at the time of permit application. It is important to design the building and then build to it instead of building it and then trying to make it work with the design. Providing this information up front assures that the building is designed properly and it the specs it will need to be built and inspected to.

Proposal # 5128

RE19-19

RE20-19

IECC: R401.3 (IRC N1101.14)

Proponent: Jason Vandever, representing Self (jvandever@eepartnership.org)

2018 International Energy Conservation Code

Revise as follows:

R401.3 (IRC N1101.14) Certificate (Mandatory). A permanent certificate shall be completed by the builder or other *approved* party and posted on a wall in the space where the furnace is located, a utility room or an *approved* location inside the *building*. Where located on an electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label or other required labels. The certificate shall indicate the predominant *R*-values of insulation installed in or on ceilings, roofs, walls, foundation components such as slabs, *basement walls*, crawl space walls and floors and ducts outside *conditioned spaces*; *U*-factors of fenestration and the *solar heat gain coefficient* (SHGC) of fenestration, and the results from any required duct system and *building* envelope air leakage testing performed on the *building*. Where there is more than one value for each component, the certificate shall indicate the value covering the largest area. The certificate shall indicate the types and efficiencies of heating, cooling and service water heating equipment. Where a gas-fired unvented room heater, electric furnace or baseboard electric heater is installed in the residence, the certificate shall indicate “gas-fired unvented room heater,” “electric furnace” or “baseboard electric heater,” as appropriate. An efficiency shall not be indicated for gas-fired unvented room heaters, electric furnaces and electric baseboard heaters. The certificate shall indicate the name of the builder who applied for the building permit, the code edition under which the structure was permitted and the compliance path used.

Reason: This is potentially valuable information to the homeowner or future contractor working on the home

Bibliography: N/A

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Adding a few items to a certification sheet doesn't cost anything. It is only documentation.

Proposal # 5566

RE20-19

RE21-19

IECC: R401.3 (IRC N1101.14)

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Harry Misuriello, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org)

2018 International Energy Conservation Code

Revise as follows:

R401.3 (IRC N1101.14) Certificate (Mandatory). A permanent certificate shall be completed by the builder or other *approved* party and posted on a wall in the space where the furnace is located, a utility room or an *approved* location inside the *building*. Where located on an electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label or other required labels. The certificate shall indicate the predominant *R*-values of insulation installed in or on ceilings, roofs, walls, foundation components such as slabs, *basement walls*, crawl space walls and floors and ducts outside *conditioned spaces*; *U*-factors of fenestration and the *solar heat gain coefficient* (SHGC) of fenestration, and the results from any required duct system and *building* envelope air leakage testing performed on the *building*. Where there is more than one value for ~~each~~ any component of the building envelope, the certificate shall indicate both the value covering the largest area and the area-weighted average value if available. The certificate shall indicate the types, sizes and efficiencies of heating, cooling and service water heating equipment. Where a gas-fired unvented room heater, electric furnace or baseboard electric heater is installed in the residence, the certificate shall indicate “gas-fired unvented room heater,” “electric furnace” or “baseboard electric heater,” as appropriate. An efficiency shall not be indicated for gas-fired unvented room heaters, electric furnaces and electric baseboard heaters. For buildings where an Energy Rating Index score is determined in accordance with Section R406, the Energy Rating Index score, both with and without any on-site generation, shall be listed on the certificate.

Reason: The purpose of this code change proposal is to make minor but important updates to the certificate that will reflect changes made to the IECC in recent code cycles and include other information that will be beneficial for compliance purposes and for future homeowners. Most importantly, for homes with an Energy Rating Index score, the certificate will be required to provide the actual ERI score achieved with and without on-site generation (since the compliance requirements are different under each option). This proposal would also require the certificate to provide additional detail on thermal envelope efficiency (where available) and HVAC equipment size. This information should all be readily available at construction, and it will take very little effort to transfer it onto the permanent certificate. However, this information may be difficult or impossible to recreate down the road and will be useful for maintenance and future replacement. These are all reasonable improvements to the certificate that will benefit all future owners of the home.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The information required by this proposal will already be available at construction. The only change is to require the information to be recorded on the permanent certificate. Over the useful life of the home, we expect that putting this information in one place could save a homeowner significant money and effort.

Proposal # 3976

RE21-19

RE22-19

IECC: R402.1 (IRC N1102.1)

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

R402.1 (IRC N1102.1) General (Prescriptive). The *building thermal envelope* shall comply with the requirements of Sections R402.1.1 through R402.1.5.

Exceptions:

1. The following low-energy buildings, or portions thereof, separated from the remainder of the building by *building thermal envelope* assemblies complying with this section shall be exempt from the *building thermal envelope* provisions of Section R402.
 - 1.1. Those with a peak design rate of energy usage less than 3.4 Btu/h · ft² (10.7 W/m²) or 1.0 watt/ft² of floor area for space-conditioning purposes.
 - 1.2. Those that do not contain *conditioned space*.
2. Log homes The prescriptive R-value requirement in Table R402.1.2 shall not apply to the opaque walls of log homes where the walls are constructed from logs at least 7 inches in diameter and the homes are designed in accordance with ICC 400.

Reason: The purpose of this code change proposal is to clarify, narrow and place reasonable limits on the log homes exception that was added to the 2018 IECC, which will help improve compliance and enforcement, save energy, and improve comfort. Specifically, the proposal will limit the exception to opaque wall R-values, where there are 7-inch or greater diameter logs, rather than permit an exception to all thermal envelope requirements for any log home.

Prior to the 2018 IECC, log homes were required to comply with the same requirements as all other homes. The current overly broad exception was added in 2018, which reduced the energy efficiency requirements for certain log homes and shifted part of compliance from the IECC to ICC 400. The exception, as currently contained in Section R402.1, may be seen as somewhat ambiguous as to which components of the log home are exempt from the IECC requirements. A strict reading of the actual language of Section R402.1 (which we believe is the correct reading) would only substitute the prescriptive component R-values and U-factors in ICC-400 for the values contained in Sections R402.1.1 through R402.1.5. The remaining requirements in the IECC – including air leakage testing, duct tightness and testing, equipment sizing, etc. -- would still apply. However, some have suggested that the current code language completely exempts log homes from all IECC thermal envelope requirements in favor of ICC-400 – a huge expansion of the exception that would permit these homes to waste substantially more energy than a home built to the IECC. Our proposal would resolve this issue.

In addition, although we can appreciate the difficulty of achieving code-compliant prescriptive wall R-values in solid log structures, we believe it is unnecessary to exempt these homes from all thermal envelope or any other efficiency requirements – particularly those unrelated to the log walls. By limiting the exception to the opaque walls, this proposal will retain reasonable IECC efficiency requirements for all other parts of the log home as they existed prior to establishing the exception.

This proposal uses 7-inch diameter logs as the cutoff for the exception to help ensure at least some minimum degree of efficiency in the walls. The R-value for wood ranges between 1.41 per inch for most softwoods and 0.71 for most hardwoods. See <https://www.energy.gov/energysaver/types-homes/energy-efficiency-log-homes> At a 7-inch diameter, the best possible U-factor for a log wall aligns with an R-13 wall (0.084). Depending on the type of wood, the insulating value of the 7-inch log wall could be much less. While these R-values are equal to or substantially less than even the least stringent wood frame wall R-values for climate zones 1 and 2 (R-13), we recognize that there is some additional benefit from log walls with regard to thermal mass. Only log walls thick enough to maintain a reasonable level of efficiency, however, should qualify for the exemption. We believe that the 7-inch proposed minimum diameter is a reasonable compromise.

It should be kept in mind that for log homes that do not fall within this exception, the IECC offers a range of additional compliance options, including the Total UA, performance path, or ERI option to provide ample trade-off flexibility without sacrificing any energy efficiency.

Bibliography: *Energy Efficiency in Log Homes*, Dep't of Energy, <https://www.energy.gov/energysaver/types-homes/energy-efficiency-log-homes> (last accessed Dec. 30, 2018).

Cost Impact: The code change proposal will increase the cost of construction

For those log homes that would utilize the exception but may no longer qualify, additional costs may be incurred to bring the home into compliance, although the cost would be no greater than before the exception was established in 2018. However, the proposal will reduce operating costs and improve comfort for actual log homeowners and other occupants who will benefit from lower energy costs over the 70 to 100 year expected useful lifetime of a well-built log home.

RE23-19

IECC: TABLE R402.1.2 (IRC N1102.1.2)

Proponent: Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.1.2 (IRC N1102.1.2)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a**

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{h, e}	CEILING VALUE	WOODFRAME WALL VALUE	MASS WALL VALUE ⁱ	FLOOR VALUE	BASEMENT ^g WALL VALUE	SLAB ^d R-VALUE & DEPTH	CRAWLSPACE ^g WALL VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.32	0.55	0.25	38	20 or 13+5 ^h	8/13	19	5ci/13 ^f	0	5ci/13
4 except Marine	0.32	0.55	0.40	49	20 or 13+5 ^h	8/13	19	10ci/13	10, 2 ft	10ci/13
5 and Marine 4	0.30	0.55	NR	49	20 or 13+5 ^h	13/17	30 ^g	15ci/19 or 13+5ci	10, 2 ft	15ci/19 or 13+5ci
6	0.30	0.55	NR	49	20+5 ^h or 13+10 ^h	15/20	30 ^g	15ci/19 or 13+5ci	10, 4 ft	15ci/19 or 13+5ci
7 and 8	0.30	0.55	NR	49	20+5 ^h or 13+10 ^h	19/21	38 ^g	15ci/19 or 13+5ci	10, 4 ft	15ci/19 or 13+5ci

NR = Not Required. For SI: 1 foot = 304.8 mm.

a. R-values are minimums. U-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed R-value of the insulation shall be not less than the R-value specified in the table.

b. The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

Exception: In Climate Zones 1 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

c. "10ci/13" means R-10 continuous insulation (ci) on the interior or exterior of the home wall or R-13 cavity insulation on the interior of the basement wall. "15-15ci/19" means R-15 continuous insulation on the interior or exterior surface of the home wall or R-19 cavity insulation at on the interior side of the basement wall. ~~Alternatively, compliance with "15/19" shall be wall.~~ "13+5ci" means R-13 cavity insulation on the interior side of the basement wall plus R-5 continuous insulation on the interior or exterior surface of the home wall.

d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation R-value for slabs as indicated in the table. The slab edge insulation for heated slabs shall not be required to extend below the slab.

e. There are no SHGC requirements in the Marine Zone.

f. Basement wall insulation is not required in warm-humid locations as defined by Figure R301.1 and Table R301.1.

g. Alternatively, insulation sufficient to fill the framing cavity and providing not less than an R-value of R-19.

h. The first value is cavity insulation, the second value is continuous insulation. Therefore, as an example, "13+5" means R-13 cavity insulation plus R-5 continuous insulation.

i. Mass walls shall be in accordance with Section R402.2.5. The second R-value applies where more than half of the insulation is on the interior of the mass wall.

Reason: This proposal does not change the stringency of requirements for basement and crawlspace walls. It does improve clarity and moves an alternative compliance option (13+5ci) from the footnote to the table. The clarification is made by adding a 'ci' designator for the continuous insulation components in the table. This is also carried through in the footnote 'c'. Footnote 'c' is further clarified by consistently referring to "wall" rather than in some cases basement and in other cases "home" with no mention of "crawlspace". The footnote applies to basement and crawlspace walls as noted in the heading of the table columns. Also, the word "surface" is added to clarify that where continuous insulation is used it should be applied to the surface of the foundation wall (and any additional cavity insulation applied to the interior side of the continuous insulation). This is necessary to avoid poor practice that can lead to moisture problems. Where foam sheathing is placed directly on the foundation wall surface it can help prevent moisture problems.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal is a non-technical clarification that does not change stringency of requirements.

Proposal # 4513

RE23-19

RE24-19

IECC: TABLE R402.1.2 (IRC N1102.1.2), TABLE R402.1.4 (IRC N1102.1.4)

Proponent: Lauren Urbanek, representing Natural Resources Defense Council (lurbanek@nrdc.org)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.1.2 (IRC N1102.1.2)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a**

Portions of table not shown remain unchanged.

CLIMATEZONE	FENESTRATIONU-FACTOR ^b
1	NR <u>0.40</u>
2	0.40
3	0.32 <u>0.30</u>
4 exceptMarine	0.32 <u>0.30</u>
5 andMarine 4	0.30 <u>0.27</u>
6	0.30 <u>0.27</u>
7 and 8	0.30 <u>0.27</u>

NR = Not Required. For SI: 1 foot = 304.8 mm.

- a. *R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.
- b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

Exception: In Climate Zones 1 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

**TABLE R402.1.4 (IRC N1102.1.4)
EQUIVALENT *U*-FACTORS^a**

Portions of table not shown remain unchanged.

CLIMATEZONE	FENESTRATIONU-FACTOR
1	0.50 <u>0.40</u>
2	0.40
3	0.32 <u>0.30</u>
4 except Marine	0.32 <u>0.30</u>
5 and Marine 4	0.30 <u>0.27</u>
6	0.30 <u>0.27</u>
7 and 8	0.30 <u>0.27</u>

- a. Nonfenestration *U*-factors shall be obtained from measurement, calculation or an approved source.

Reason: This proposed change to the fenestration *U*-factor aligns the IECC with the ENERGY STAR Version 6.0 specification. The ENERGY STAR specification for windows in climate zones 1-4 has been in place since January 1, 2015. The ENERGY STAR specification for windows in climate zones 5-8 has been in place since January 1, 2016. Products that meet the ENERGY STAR standard are widely available and have been for some time. In 2016 – the first year the ENERGY STAR Version 6.0 specification was in effect for all climate zones – ENERGY STAR windows already had an 83% market share.

Replacing old windows with ENERGY STAR certified windows lowers household energy bills by an average of 12 percent nationwide. The Environmental Protection Agency performed a cost-effectiveness analysis of Version 6.0 and found it to be cost-effective. That analysis can be found here: http://www.energystar.gov/sites/default/files/ESWDS-ReviewOfCost_EffectivenessAnalysis.pdf

EPA notes that manufacturers can meet the proposed specification for climate zones 5-8 using either double- or triple-pane windows. In general, EPA's data show that double-pane windows that meet the northern climate zone specification are cost effective for consumers. Feedback that EPA

has received from stakeholders confirms that new glass technologies, improvements in frame performance, and/or better spacer performance can help many product lines meet the proposed Northern Zone criteria with double-pane windows.

Bibliography: Environmental Protection Agency. Energy Star Windows Unit Shipment Data. 2016. Retrieved on December 15, 2018 from https://www.energystar.gov/ia/partners/downloads/unit_shipment_data/2016_USD_Summary_Report.pdf?8fd5-1967
Environmental Protection Agency. Energy Star Windows Version 6.0 Cost Effectiveness. Retrieved on December 15, 2018 from http://www.energystar.gov/sites/default/files/ESWDS-ReviewOfCost_EffectivenessAnalysis.pdf

Cost Impact: The code change proposal will increase the cost of construction

The code change proposal may increase the cost of construction. Given the level of market penetration of ENERGY STAR products, by the time the 2021 code is adopted many builders will already be meeting the improved requirements. In some limited cases, builders may incur increased costs. EPA estimates that there is a cost of \$20 per window to go from the 2009 code requirements to ENERGY STAR Version 6.0. However, the U-factor requirements in the 2018 code are already significantly more stringent than the 2009 code requirements, so we would expect the marginal cost per window to be less.

Proposal # 5551

RE24-19

RE25-19

IECC: TABLE R402.1.2 (IRC N1102.1.2)

Proponent: Garrett Tuck, Dehlsen Associates LLC., representing Dehlsen Associates LLC. (gtuck@ecomerittech.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.1.2 (IRC N1102.1.2)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a**

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b, e}	CEILING R-VALUE	WOODFRAME WALL R-VALUE	MASS WALL R-VALUE ^f	FLOOR R-VALUE	BASEMENT ^g WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWLSPACE ^g WALL R-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.32	0.55	0.25	38	20 or 13+5 ^h	8/13	19	5/13 ^f	0	5/13
4 except Marine	0.32	0.55	0.40	49	20 or 13+5 ^h	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.30	0.55	NR	49	20 or 13+5 ^h	13/17	30 ^g	15/19	10, 2 ft	15/19
6	0.30	0.55	NR	49	20+5 ^h or 13+10 ^h	15/20	30 ^g	15/19	10, 4 ft	15/19
7 and 8	0.30	0.55	NR	49	20+5 ^h or 13+10 ^h	19/21	38 ^g	15/19	10, 4 ft	15/19

NR = Not Required. For SI: 1 foot = 304.8 mm.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.

b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

Exception-Exceptions:

1. In Climate Zones 1 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.
2. In Climate Zones 1 through 8, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that one of the primary functions is solar thermal collection.

c. "10/13" means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation on the interior of the basement wall. "15/19" means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. Alternatively, compliance with "15/19" shall be R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home.

d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation *R*-value for slabs, as indicated in the table. The slab edge insulation for heated slabs shall not be required to extend below the slab.

e. There are no SHGC requirements in the Marine Zone.

f. Basement wall insulation is not required in warm-humid locations as defined by Figure R301.1 and Table R301.1.

- g. Alternatively, insulation sufficient to fill the framing cavity and providing not less than an *R*-value of R-19.
- h. The first value is cavity insulation, the second value is continuous insulation. Therefore, as an example, "13+5" means R-13 cavity insulation plus R-5 continuous insulation.
- i. Mass walls shall be in accordance with Section R402.2.5. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.

Reason: Exception: In Climate Zones 1 through 8, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that one of the primary functions is solar thermal collection.

1. Skylight/solar thermal collector combination units have two primary functions, collect thermal energy, and provide light. The amount of thermal energy collection and light transmittance is directly related to the amount of solar irradiance incident on the unit. As the solar irradiance incident on the unit increases, both the thermal energy collection and light transmittance increases. The thermal energy that is collected is transferred to an HTF (heat transfer fluid) and diverted away from the unit into a storage tank. During this process, G_{IPS} **the incident solar radiation on the inside pane of the skylight** is a function of the G_{TISR} **total incident solar radiation** and the G_{SRT} **solar radiation transmitted** ($G_{IPS} = G_{TISR} - G_{SRT}$). Unlike a normal skylight, skylight/solar thermal collector combination units have the ability to divert the total incident solar radiation away from the skylight and into an HTF where it can be stored and utilized for domestic hot water needs.

2. Currently, there is no test standard for skylight/solar thermal collector combination units to measure how the SHGC of the unit changes over time as a result of the collect.



Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal is merely an exemption and will not pose any construction cost implications.

Proposal # 5586

RE25-19

RE26-19

IECC: R402.1.4 (IRC N1102.1.4), TABLE R402.1.4 (IRC N1102.1.4), R402.1.5 (IRC N1102.1.5), R402.2.10 (IRC N1102.2.10)

Proponent: Craig Conner, representing self (craig.conner@mac.com)

2018 International Energy Conservation Code

Revise as follows:

R402.1.4 (IRC N1102.1.4) ~~U-factor alternative~~ or ~~F-factor alternative~~ An assembly with a U-factor or F-factor equal to or less than that specified in Table R402.1.4 shall be an alternative to the *R*-value in Table R402.1.2.

**TABLE R402.1.4 (IRC N1102.1.4)
EQUIVALENT U-FACTORS-FACTORS AND F-FACTORS^a**

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT U-FACTOR	CEILING U-FACTOR	FRAME WALL U-FACTOR	MASS WALL U-FACTOR ^b	FLOOR U-FACTOR	BASEMENT WALL U-FACTOR	UNHEATED SLAB F-FACTOR	HEATED SLAB ^d F-FACTOR	CRAWL SPACE WALL U-FACTOR
1	0.50	0.75	0.035	0.084	0.197	0.064	0.360	0.73	1.03	0.477
2	0.40	0.65	0.030	0.084	0.165	0.064	0.360	0.73	1.03	0.477
3	0.32	0.55	0.030	0.060	0.098	0.047	0.091 ^c	0.73	1.03	0.136
4 except Marine	0.32	0.55	0.026	0.060	0.098	0.047	0.059	0.54	0.68	0.065
5 and Marine 4	0.30	0.55	0.026	0.060	0.082	0.033	0.050	0.54	0.68	0.055
6	0.30	0.55	0.026	0.045	0.060	0.033	0.050	0.48	0.68	0.055
7 and 8	0.30	0.55	0.026	0.045	0.057	0.028	0.050	0.48	0.68	0.055

- a. Nonfenestration *U*-factors shall be obtained from measurement, calculation or an approved source.
- b. Mass walls shall be in accordance with Section R402.2.5. Where more than half the insulation is on the interior, the mass wall *U*-factors shall not exceed 0.17 in Climate Zone 1, 0.14 in Climate Zone 2, 0.12 in Climate Zone 3, 0.087 in Climate Zone 4 except Marine, 0.065 in Climate Zone 5 and Marine 4, and 0.057 in Climate Zones 6 through 8.
- c. In warm-humid locations as defined by Figure R301.1 and Table R301.1, the basement wall *U*-factor shall not exceed 0.360.
- d. *F*-factors for heated slabs correspond to the configuration described by footnote (d) of Table R402.1.2

R402.1.5 (IRC N1102.1.5) ~~Total UA Component performance alternative~~. Where the proposed total building thermal envelope UA, the sum of *U*-factor times assembly area, thermal conductance, is less than or equal to the total UA resulting from multiplying the U factors required total building thermal envelope thermal conductance using factors in Table R402.1.4 by the same assembly area as in the proposed building, the building shall be considered to be in compliance with Table R402.1.2. The UA calculation shall be performed total thermal conductance shall be shall be determined in accordance with Equation 4-1. Proposed *U*-factors and slab-on-grade *F*-factors shall be determined using a method consistent with the ASHRAE *Handbook of Fundamentals* and shall include the thermal bridging effects of framing materials. In addition to UA total thermal conductance compliance, the SHGC requirements shall be met.

$$(U_p A + F_p P) < (U_r A + F_r P) \text{ (Equation 4-1)}$$

where:

$U_p A$ = the sum of proposed *U*-factors times the assembly areas in the proposed building

$F_p P$ = the sum of proposed F- factors times the slab-on-grade perimeter lengths in the proposed building

$U_r A$ = the sum of U- factors in Table R402.1.4 times the same assembly areas as in the proposed building

$F_r P$ = the sum of F- factors in Table R402.1.4 times the slab-on-grade perimeter lengths as in the proposed building

R402.2.10 (IRC N1102.2.10) Slab-on-grade floors. Slab-on-grade floors in contact with the ground with a floor surface ~~less than 12~~ within 24 inches (305-600 mm) above or below grade shall be insulated in accordance with Table R402.1.2. The insulation shall extend downward from the top of the slab on the outside or inside of the foundation wall. Insulation located below grade shall be extended the distance provided in Table R402.1.2 by any combination of vertical insulation, insulation extending under the slab or insulation extending out from the ~~building-building~~. Insulation extending away from the building shall be protected by pavement or by not less than 10 inches (254 mm) of soil. The top edge of the insulation installed between the exterior wall and the edge of the interior slab shall be permitted to be cut at a 45-degree (0.79 rad) angle away from the exterior wall. Slab-edge insulation is not required in jurisdictions designated by the code official as having a very heavy termite infestation.

Reason: to clarify how slab-on-grade UA calculations are to be done and provide an approved source for F- factor data. Although standard calculation procedures (such as ASHRAE's) cover the incorporation of slab conductances, and existing tools (such as REScheck) support slab perimeter insulation tradeoffs in the UA alternative, the code currently gives little direction on slab-on-grade component performance calculations. This clarifies the slab calculation.

This is clarification only; there is no direct impact on energy use.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

There is no cost impact since there is no change in requirements. This just clarifies how insulation for slab on grade can be treated in the UA tradeoff calculation.

Proposal # 5667

RE26-19

RE27-19

IECC: TABLE R402.1.2 (IRC N1102.1.2)

Proponent: Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.1.2 (IRC N1102.1.2)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a**

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b, e}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ⁱ	FLOOR R-VALUE	BASEMENT ^g WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWL SPACE ^g WALL R-VALUE
1	NR	0.75	0.25	30	13 or 0+10 ^h	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13 or 0+10 ^h	4/6	13	0	0	0
3	0.32	0.55	0.25	38	20 or 13+5 ^h or 0+15 ^h	8/13	19	5/13 ^f	0	5/13
4 except Marine	0.32	0.55	0.40	49	20 or 13+5 ^h or 0+15 ^h	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.30	0.55	NR	49	20 or 13+5 ^h or 0+15 ^h	13/17	30 ^g	15/19	10, 2 ft	15/19
6	0.30	0.65	NR	49	30 or 20+5 ^h or 13+10 ^h or 0+20 ^h	15/20	30 ^g	15/19	10, 4 ft	15/19
7 and 8	0.30	0.55	NR	49	30 or 20+5 ^h or 13+10 ^h or 0+20 ^h	19/21	38 ^g	15/19	10, 4 ft	15/19

NR = Not Required. For SI: 1 foot = 304.8 mm.

- R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.
- The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.
Exception: In Climate Zones 1 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.
- "10/13" means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation on the interior of the basement wall. "15/19" means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. Alternatively, compliance with "15/19" shall be R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home.
- R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation *R*-value for slabs, as indicated in the table. The slab edge insulation for heated slabs shall not be required to extend below the slab.
- There are no SHGC requirements in the Marine Zone.
- Basement wall insulation is not required in warm-humid locations as defined by Figure R301.1 and Table R301.1.
- Alternatively, insulation sufficient to fill the framing cavity and providing not less than an *R*-value of R-19.

- h. The first value is cavity insulation, the second value is continuous insulation. Therefore, as an example, "13+5" means R-13 cavity insulation plus R-5 continuous insulation.
- i. Mass walls shall be in accordance with Section R402.2.5. The second R-value applies where more than half of the insulation is on the interior of the mass wall.

Reason: This proposal does not change the stringency of insulation requirements for wood frame walls. The intent of this proposal is to: (1) include an additional equivalent insulation option for cavity insulation (currently an equivalent cavity insulation only option is missing in Climate Zones 6-8) and (2) provide for equivalent continuous insulation only options which are also missing. With the addition of these options, the table provides a simple yet complete set of insulation options for location of insulation on wood frame wall assemblies for each climate zone. This is intended to improve the usefulness of prescriptive options and show the full range of equivalent insulation options (e.g., cavity only, hybrid cavity + continuous, and continuous only). It is also intended to address concerns that the prescriptive table favors certain options over others by excluding viable options in some climate zones. This approach also provides more flexibility to coordinate insulation options with vapor retarder provisions in the building code which vary by climate as well as insulation strategy. With this flexibility, users can more readily choose between insulation options that provide equivalent assembly U-factor (as a minimum requirement of the energy code) yet have different capabilities and functions with respect to comfort, air-tightness, moisture control, thermal bridging mitigation, and other factors that are important to an overall code-compliant wall assembly. The thermal equivalency of the proposed options is demonstrated in the assembly U-factor analysis tables that follow.

R0+10 option:

Climate Zone 1 and 2 U-Factor Calculation Spreadsheet

Wall Thermal Resistance by Component	2 x 4 Wall	
	R-0 + R8.5ci	
	R-value Cavity Path	R-value Stud Path
Wall - Outside Winter Air Film ^A	0.17	
Siding - Vinyl ^A	0.62	

Continuous Insulation	8.5	
OSB - 7/16" ^A	0.62	
SPF Stud/Cavity Insulation	0	4.375
1/2 Drywall ^A	0.45	
Inside Air Film ^A	0.68	
16" o.c. Framing Factor ^A	75%	25%
Total Wall R-Values	11.04	15.42
Assembly U-Factor	0.084	
^A 2009 ASHRAE Handbook of Fundamentals		

NOTE: R-0 + R8.5ci is rounded to R-0 + R10ci to align with current convention for continuous insulation R-values in Table R402.1.1

R0+15 option:

Climate Zone 3, 4 and 5 U-Factor Calculation Spreadsheet

Wall Thermal Resistance by Component	2 x 4 Wall	
	R-0 + R13.2ci	
	R-value Cavity Path	R-value Stud Path
Wall - Outside Winter Air Film ^A	0.17	
Siding - Vinyl ^A	0.62	
Continuous Insulation	13.2	
OSB - 7/16" ^A	0.62	
SPF Stud/Cavity Insulation	0	4.375
1/2 Drywall ^A	0.45	
Inside Air Film ^A	0.68	
16" o.c. Framing Factor ^A	75%	25%
Total Wall R-Values	15.74	20.12
Assembly U-Factor	0.060	
^A 2009 ASHRAE Handbook of Fundamentals		

NOTE: R-0 + R13.2ci is rounded to R-0 + R15ci to align with current convention for continuous insulation R-values in Table R402.1.1.

R30 option (cavity only):

Climate Zone 6, 7 and 8 U-Factor Calculation Spreadsheet

Wall Thermal Resistance by Component	2 x 8 Wall	
	R-30 + R0ci	
	R-value Cavity Path	R-value Stud Path
Wall - Outside Winter Air Film ^A	0.17	
Siding - Vinyl ^A	0.62	
Continuous Insulation	0	
OSB - 7/16" ^A	0.62	
SPF Stud/Cavity Insulation	30	9.0625
1/2 Drywall ^A	0.45	
Inside Air Film ^A	0.68	
16" o.c. Framing Factor ^A	75%	25%

Total Wall R-Values	32.54	11.60
Assembly U-Factor	0.045	
^A 2009 ASHRAE Handbook of Fundamentals		

NOTE: As shown in the calculation above, the R-30 cavity insulation only wall is dependent on thickness of framing (2x8) to satisfy the required maximum U-factor of 0.045. This is because the R-value of the studs (framing path) has an important effect on the overall effective R-value or U-factor of the assemblies with cavity insulation only. Where a 2x6 wall is used, R-38 insulation would be required because a 2x6 stud has a lower R-value than a 2x8 stud and, consequently, more cavity insulation R-value is needed to make up the difference (even though the cavity depth of a 2x6 wall is smaller). This is demonstrated in the table below. While R-38 insulation in a 2x6 wall cavity is possible, it can only be done with a limited selection of cavity insulation material with a 6.9 R/in or greater (i.e., closed cell spray foam). For this reason the proposal uses the R-30 (2x8) option which is more inclusive of various cavity insulation materials having an R-4.1/in or greater. Other options include combinations of cavity insulation materials that add up to R30 (e.g., flash and batt) or double-stud walls that can comply through the U-factor approach.

Climate Zone 6, 7 and 8 U-Factor Calculation Spreadsheet

Wall Thermal Resistance by Component	2 x 6 Wall R-38+0ci	
	R-value Cavity Path	R-value Stud Path
Wall - Outside Winter Air Film ^A	0.17	
Siding - Vinyl ^A	0.62	
Continuous Insulation	0	
OSB - 7/16" ^A	0.62	
SPF Stud/Cavity Insulation	38	6.875
1/2 Drywall ^A	0.45	
Inside Air Film ^A	0.68	
16" o.c. Framing Factor ^A	75%	25%
Total Wall R-Values	40.54	9.42
Assembly U-Factor	0.045	
^A 2009 ASHRAE Handbook of Fundamentals		

R0 + 20 option:

Climate Zone 6, 7 and 8 U-Factor Calculation Spreadsheet

Wall Thermal Resistance by Component	2 x 4 Wall	
	R-0 + R18.7ci	
	R-value Cavity Path	R-value Stud Path
Wall - Outside Winter Air Film ^A	0.17	
Siding - Vinyl ^A	0.62	
Continuous Insulation	18.7	
OSB - 7/16" ^A	0.62	
SPF Stud/Cavity Insulation	0	4.375
1/2 Drywall ^A	0.45	
Inside Air Film ^A	0.68	
16" o.c. Framing Factor ^A	75%	25%
Total Wall R-Values	21.24	25.62
Assembly U-Factor	0.045	
^A 2009 ASHRAE Handbook of Fundamentals		

NOTE: R-0 + R18.7ci is rounded to R-0 + R20ci to align with current convention for continuous insulation R-values in Table R402.1.1.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposal merely provides additional equivalent options for compliance to ensure no one approach or insulation material or its location on or in an assembly is preferentially treated over another in any of the climate zones.

Proposal # 4509

RE27-19

RE28-19

IECC: TABLE R402.1.2 (IRC N1102.1.2)

Proponent: John Woestman, representing Extruded Polystyrene Foam Association (jwoestman@kellencorpany.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.1.2 (IRC N1102.1.2)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a**

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b, e}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ^f	FLOOR R-VALUE	BASEMENT ^g WALL R-VALUE	SLAB ^h R-VALUE & DEPTH	CRAWLSPACE ^g WALL R-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.32	0.55	0.25	38	20 or 43+5 ^h 13&5ci ^b	8/13	19	5/43 ^f 5ci or 13 ^f	0	5/43 5ci or 13 ^f
4 except Marine	0.32	0.55	0.40	49	20 or 43+5 ^h 13&5ci	8/13	19	40/43 10ci or 13	10ci, 2 ft	40/43 10ci or 13
5 and Marine 4	0.30	0.55	NR	49	20 or 43+5 ^h 13&5ci	13/17	30 ^g	45/49 15ci or 19	10ci, 2 ft	45/49 15ci or 19
6	0.30	0.55	NR	49	20+5 ^h or 43+40 ^h 20&5ci or 13&10ci	15/20	30 ^g	45/49 15ci or 19	10ci, 4 ft	45/49 15ci or 19
7 and 8	0.30	0.55	NR	49	20+5 ^h or 43+40 ^h 20&5ci or 13&10ci	19/21	38 ^g	45/49 15ci or 19	10ci, 4 ft	45/49 15ci or 19

NR = Not Required. For SI: 1 foot = 304.8 mm.

a. R-values are minimums. U-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed R-value of the insulation shall be not less than the R-value specified in the table.

b. The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

Exception: In Climate Zones 1 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

c. "40/5ci or 13" means R-40 R-5 continuous insulation (ci) on the interior or exterior of the home wall or R-13 cavity insulation on the interior of the basement wall /49" wall. "15ci or 19" means R-15 continuous insulation (ci) on the interior or exterior surface of the home wall or R-19 cavity insulation at the interior of the basement wall. Alternatively, compliance with "45/49" "15ci or 19" shall be R-13 cavity insulation on the interior of the basement wall plus in addition to R-5 continuous insulation on the interior or exterior of the home wall.

d. R-5 continuous insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation R-value for slabs, as indicated in the table. The slab edge insulation for heated slabs shall not be required to extend below the slab.

e. There are no SHGC requirements in the Marine Zone.

- f. Basement wall insulation and crawl space wall insulation is not required in warm-humid locations as defined by Figure R301.1 and Table R301.1.
- g. Alternatively, insulation sufficient to fill the framing cavity and providing not less than an *R*-value of R-19.
- h. The first value is cavity insulation, the second value is continuous insulation. ~~Therefore, as an example, "13+5" insulation (ci), so "13&5ci" means R-13 cavity insulation plus R-5 continuous insulation, in addition to R-5 continuous insulation (ci) and "13&10ci" means R-13 cavity insulation in addition to R-10 continuous insulation (ci).~~
- i. Mass walls shall be in accordance with Section R402.2.5. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.
- j. "10ci" means R-10 continuous insulation (ci).

Reason: This proposal is a clarification of insulation requirements in relation to cavity and continuous insulation applications. This proposal is intended to clarify compliance with Section R402.1.3.

In Table R402.1.2, "ci" is inserted wherever continuous insulation is a prescriptive requirement and / or option. Also, the "+" in several cells is replaced with "&" to more appropriately indicate the continuous insulation (ci), along with the cavity insulation, are both required where the CZ requires both. In footnote "c" replacing "and" with "in addition to" to clearly communicate in these situations both cavity insulation and continuous insulation are required.

In the basement and crawl space wall columns, the "/" is replace with "or" to clearly communicate either is acceptable (ci or cavity insulation).

Also, suggesting a bit of cleanup in footnote "c". Footnote "c" is used for Basement Wall R-value and for Crawl Space Wall R-value. Use of "basement" in the footnote is not quite accurate since this footnote applies equally to basement or crawlspace walls. And, use of "home" is too broad. It seems the use of "wall" is better than the current text. And, in footnote "c" replacing "and" with "in addition to" to clearly communicate in these situations both cavity insulation and continuous insulation are required.

In the crawl space wall column, inserting footnote "f" similar to where footnote "f" is placed in the basement wall column, and modifying footnote "f" to include crawl space walls. It seems logical that crawl space wall insulation would be required – or not required – per the same criteria as basement walls.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
There should be no cost implications as no technical changes are intended.

However, if adding footnote "f" to the crawl space wall column is a technical change, this proposal would decrease the cost of construction.

RE29-19

IECC: TABLE R402.1.2 (IRC N1102.1.2), TABLE R402.1.4 (IRC N1102.1.4)

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.1.2 (IRC N1102.1.2)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a**

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b, e}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ^f	FLOOR R-VALUE	BASEMENT WALL R-VALUE ^c	SLAB ^d R-VALUE & DEPTH	CRAWLSPACE ^g WALL R-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.32	0.55	0.25	38	20 or 13+5 ^h	8/13	19	5/13 ^f	0	5/13
4 except Marine	0.32	0.55	0.40	49	20 or 13+5 20+5 or 13+10 ^h	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.30	0.55	NR	49	20 or 13+5 20+5 or 13+10 ^h	13/17	30 ^g	15/19	10, 2 ft	15/19
6	0.30	0.55	NR	49	20+5 ^h or 13+10 ^h	15/20	30 ^g	15/19	10, 4 ft	15/19
7 and 8	0.30	0.55	NR	49	20+5 ^h or 13+10 ^h	19/21	38 ^g	15/19	10, 4 ft	15/19

NR = Not Required. For SI: 1 foot = 304.8 mm.

- R*-values are minimums. U-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.
- The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration.
Exception: In Climate Zones 1 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.
- "10/13" means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation on the interior of the basement wall. "15/19" means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. Alternatively, compliance with "15/19" shall be R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home.
- R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation *R*-value for slabs, as indicated in the table. The slab edge insulation for heated slabs shall not be required to extend below the slab.
- There are no SHGC requirements in the Marine Zone.
- Basement wall insulation is not required in warm-humid locations as defined by Figure R301.1 and Table R301.1.
- Alternatively, insulation sufficient to fill the framing cavity and providing not less than an *R*-value of R-19.
- The first value is cavity insulation, the second value is continuous insulation. Therefore, as an example, "13+5" means R-13 cavity insulation plus R-5 continuous insulation.
- Mass walls shall be in accordance with Section R402.2.5. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.

**TABLE R402.1.4 (IRC N1102.1.4)
EQUIVALENT U-FACTORS^a**

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT U-FACTOR	CEILING U-FACTOR	FRAME WALL U-FACTOR	MASS WALL U-FACTOR ^b	FLOOR U-FACTOR	BASEMENT WALL U-FACTOR	CRAWLSPACE WALL U-FACTOR
1	0.50	0.75	0.035	0.084	0.197	0.064	0.360	0.477
2	0.40	0.65	0.030	0.084	0.165	0.064	0.360	0.477
3	0.32	0.55	0.030	0.060	0.098	0.047	0.091 ^c	0.136
4 except Marine	0.32	0.55	0.026	0.060 0.045	0.098	0.047	0.059	0.065

5 and Marine 4	0.30	0.55	0.026	0.066 0.045	0.082	0.033	0.050	0.055
6	0.30	0.55	0.026	0.045	0.060	0.033	0.050	0.055
7 and 8	0.30	0.55	0.026	0.045	0.057	0.028	0.050	0.055

- a. Nonfenestration *U*-factors shall be obtained from measurement, calculation or an approved source.
- b. Mass walls shall be in accordance with Section R402.2.5. Where more than half the insulation is on the interior, the mass wall *U*-factors shall not exceed 0.17 in Climate Zone 1, 0.14 in Climate Zone 2, 0.12 in Climate Zone 3, 0.087 in Climate Zone 4 except Marine, 0.065 in Climate Zone 5 and Marine 4, and 0.057 in Climate Zones 6 through 8.
- c. In warm-humid locations as defined by Figure R301.1 and Table R301.1, the basement wall *U*-factor shall not exceed 0.360.

Reason: The purpose of this code change proposal is to upgrade and strengthen the requirements for wall insulation in climate zones 4 and 5 by making the requirements equal to the current requirements in climate zone 6. This will make homes more comfortable for occupants and reduce energy costs over the life of the building.

Because wall insulation is most cost-effectively installed during construction, walls should be insulated to the maximum cost-effective levels at that time, rather than expecting homeowners to upgrade them at some later date. This approach is consistent with the intent of the IECC (R101.3) to “regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building.”

The proposed improvements represent the next step in commonly-available products and construction practices. Using DOE’s cost-effectiveness methodology, we found these R-values to offer substantial net life cycle savings and be clearly cost-effective for the homeowner/consumer in both climate zones:

Climate Zone	Annual Energy Cost Savings	Present Value Life Cycle Benefit
4	5.7%	\$1,605
5	4.3%	\$1,152

Bibliography: U.S. Dep’t of Energy, Methodology for Evaluating Cost-Effectiveness of Residential Energy Code Changes (Aug. 2015), available at <https://www.energycodes.gov/residential-energy-and-cost-analysis-methodology>.

Cost Impact: The code change proposal will increase the cost of construction. Requiring more insulation will increase the cost of construction, but the resulting energy and cost savings will recoup the initial costs and will continue to benefit consumers over the useful life of the home.

RE30-19

IECC: TABLE R402.1.2 (IRC N1102.1.2)

Proponent: Ben Edwards, representing Mathis Consulting Co. (ben@mathisconsulting.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.1.2 (IRC N1102.1.2)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a**

Portions of table not shown remain unchanged.

CLIMATEZONE	GLAZEDFENESTRATION SHGC ^{b, e}
4 exceptMarine	0.40 0.35

NR = Not Required. For SI: 1 foot = 304.8 mm.

- a. *R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.
- b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.
Exception: In Climate Zones 1 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.
- c. "10/13" means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation on the interior of the basement wall. "15/19" means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. Alternatively, compliance with "15/19" shall be R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home.
- d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation *R*-value for slabs, as indicated in the table. The slab edge insulation for heated slabs shall not be required to extend below the slab.
- e. There are no SHGC requirements in the Marine Zone.
- f. Basement wall insulation is not required in warm-humid locations as defined by Figure R301.1 and Table R301.1.
- g. Alternatively, insulation sufficient to fill the framing cavity and providing not less than an *R*-value of R-19.
- h. The first value is cavity insulation, the second value is continuous insulation. Therefore, as an example, "13+5" means R-13 cavity insulation plus R-5 continuous insulation.
- i. Mass walls shall be in accordance with Section R402.2.5. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.

Reason: In 2017 the US Environmental Protection Agency (EPA) reevaluated their methodology for determining what fenestration products are available to consumers in a Window Technology Pathways white paper (see bibliography). Components from the National Fenestration Rating Council Certified Product Directory were categorized, and prevalence of performance technologies were reported. Of concern for this proposal, SHGC performance was placed into 4 bins:

"To understand the distribution of SHGC at different *U*-factors, EPA grouped products into four SHGC bins that correspond to the Version 6.0 ENERGY STAR criteria: **High** SHGC (>0.40), **Medium** SHGC (0.26 – 0.40), **Low** SHGC (0.20 – 0.25), and **Very Low** SHGC (<0.20). The SHGC bins provide another dimension to analyze the performance of different pathways." -EPA pg.6 (PDF pg.8, emphasis added)

In the Windows Pathway Analysis Workbook the summarized data show that, for a *U*-factor range of 0.28 - 0.32 (i.e., the typical market windows used to comply with the IECC-2018 climate zone 4 requirement of *U*=0.32) about 56% of the products are less than SHGC=0.25, 92% are less than SHGC=0.40, and only 8% would be considered "High SHGC" (SHGC > 0.40). Again, these are all of the window options in NFRC's CPD, including niche/specialized function windows, which never would be used for prescriptive compliance. Further, the DOE-Field-Study-SHGC-snapshot.JPG.jpeg (from the DOE Field Study, an investigation into actual construction practices, see bibliography), surveyed states and found that windows, almost exclusively, were under the SHGC=0.35 proposed value. It is important to note that all states surveyed (other than NC, using the NCECC2012; and MD, using the IECC2012) had no SHGC requirement in climate zone 4.

The Workbook is found at:

<https://www.energystar.gov/sites/default/files/asset/document/Window%20Technology%20Pathways%20Analysis%202.15.17.xlsx>

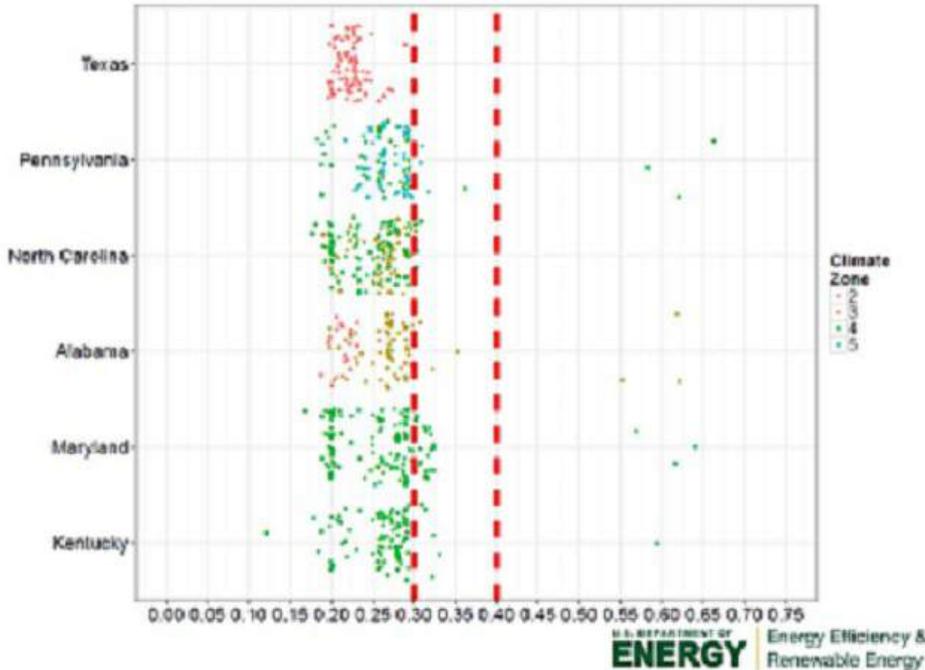
At

https://www.energystar.gov/products/building_products/residential_windows_doors_and_skylights/partners

The relevant information is on the "Summary Tables" tab.

To be clear: Even in jurisdictions with no SHGC requirement, almost no windows performed worse than this proposed value, which is the almost exclusive majority of readily available windows. The prescriptive compliance path in the new, 2021 IECC should, at least, represent the standard practice of installed window performance, with an SHGC requirement at 0.35. Because meeting this minimal requirement already is standard practice, this proposal should not be considered to increase the cost of construction.

Window SHGC



Bibliography: - US Environmental Protection Agency. 2017. Window Technology Pathways: Methodology for Analyzing Certified Product Data ENERGY STAR Windows, Doors and Skylights. D Anderson, B Booher, P Chavda.

<https://www.energystar.gov/sites/default/files/asset/document/Window%20Technology%20Pathways%20Methodology%20White%20Paper.pdf>

- US Department of Energy, Building Energy Codes Program. 2015. Single Family Residential Energy Code Field Study. J Williams (DOE), R Bartlett (PNNL). https://www.energycodes.gov/sites/default/files/documents/Field_Study_120715_Final.pdf

- Pacific Northwest National Laboratory. 2015. 2015 IECC: Energy Savings Analysis. V Mendon, Z Taylor, S Rao, Y Xie.

https://www.energycodes.gov/sites/default/files/documents/2015_IECC_FinalDeterminationAnalysis.pdf

Cost Impact: The code change proposal will increase the cost of construction

The selection of "increase the cost of construction" is a technicality. Please see reason statement.

Proposal # 5142

RE30-19

RE31-19

IECC: TABLE R402.1.2 (IRC N1102.1.2), R402.2.1 (IRC N1102.1.1), R402.2.2 (IRC N1102.2.2)

Proponent: Matthew Brown, APA-The Engineered Wood Association, representing APA-The Engineered Wood Association (matthew.brown@apawood.org); Loren Ross, American Wood Council, representing American Wood Council (LRoss@awc.org)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.1.2
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT***

Portions of table not shown remain unchanged.

CLIMATEZONE	FENESTRATIONU-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZEDFENESTRATION SHGC ^{b, e}	CEILINGR-VALUE	WOODFRAME WALLR-VALUE	MASSWALLR-VALUE ^f	FLOORR-VALUE	BASEMENT ^g WALLR-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWLSPACE ^g WALLR-VALUE
6	0.30	0.55	NR	49	23 ^l or 20+5 ^h or 13+10 ^h	15/20	30 ^g	15/19	10, 4 ft	15/19
7 and 8	0.30	0.55	NR	49	23 ^l or 20+5 ^h or 13+10 ^h	19/21	38 ^g	15/19	10, 4 ft	15/19

NR = Not Required. For SI: 1 foot = 304.8 mm.

- a. *R*-values are minimums. U-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.
- b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

Exception: In Climate Zones 1 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

- c. "10/13" means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation on the interior of the basement wall. "15/19" means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. Alternatively, compliance with "15/19" shall be R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home.
- d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation *R*-value for slabs, as indicated in the table. The slab edge insulation for heated slabs shall not be required to extend below the slab.
- e. There are no SHGC requirements in the Marine Zone.
- f. Basement wall insulation is not required in warm-humid locations as defined by Figure R301.1 and Table R301.1.
- g. Alternatively, insulation sufficient to fill the framing cavity and providing not less than an *R*-value of R-19.
- h. The first value is cavity insulation, the second value is continuous insulation. Therefore, as an example, "13+5" means R-13 cavity insulation plus R-5 continuous insulation.

- i. Mass walls shall be in accordance with Section R402.2.5. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.
- j. For this option, the fenestration *U*-factor is required to be 0.28 and the ceiling *R*-value is required to be R-60.

R402.2.1 (IRC N1102.1.1) Ceilings with attic spaces. Where Section R402.1.2 requires R-38 insulation in the ceiling, installing R-30 over 100 percent of the ceiling area requiring insulation shall satisfy the requirement for R-38 wherever the full height of uncompressed R-30 insulation extends over the wall top plate at the eaves. Where Section R402.1.2 requires R-49 insulation in the ceiling, installing R-38 over 100 percent of the ceiling area requiring insulation shall satisfy the requirement for R-49 insulation wherever the full height of uncompressed R-38 insulation extends over the wall top plate at the eaves. Where Section R402.1.2 requires R-60 insulation in the ceiling, installing R-49 over 100 percent of the ceiling area requiring insulation shall satisfy the requirement for R-60 insulation wherever the full height of uncompressed R-49 insulation extends over the top plate at the eaves. This reduction shall not apply to the *U*-factor alternative approach in Section R402.1.4 and the Total UA alternative in Section R402.1.5.

R402.2.2 (IRC N1102.2.2) Ceilings without attic spaces. Where Section R402.1.2 requires insulation *R*-values greater than R-30 but less than or equal to R-49 in the ceiling and the design of the roof/ceiling assembly does not allow sufficient space for the required insulation, the minimum required insulation *R*-value for such roof/ceiling assemblies shall be R-30. Where Section R402.1.2 requires insulation greater than R49 in the ceiling and the design of the roof/ceiling assembly does not allow sufficient space for the required insulation, the required insulation *R*-value for such roof/ceiling assemblies shall be R-38. Insulation shall extend over the top of the wall plate to the outer edge of such plate and shall not be compressed. This reduction of insulation from the requirements of Section R402.1.2 shall be limited to 500 square feet (46 m²) or 20 percent of the total insulated ceiling area, whichever is less. This reduction shall not apply to the *U*-factor alternative approach in Section R402.1.4 and the Total UA alternative in Section R402.1.5.

Reason: This proposal provides a necessary prescriptive cavity-only wall insulation option for builders and building officials in Climate Zones 6-8. It combines a minimum R-23 wood frame wall *R*-value with better performing windows (*U*=0.28) and increased ceiling insulation (R-60), such that equivalent energy performance is achieved. It also modifies Sec. R402.2.1 (Ceilings with attic spaces) and Sec. R402.2.2 (Ceilings without attic spaces) to address framing considerations where R-60 ceiling insulation is required.

The proposed R-23 wall cavity insulation level is compatible with 2x6 framing using a variety of cavity insulation types, including several types of batt insulation products and blown-in insulation systems. Note that this proposal does not modify the two existing continuous insulation assemblies

already listed in Table R402.1.2, nor does it affect the U-factors in Table R402.1.4.

The proposed change provides better energy efficiency performance than the 2018 IECC as shown by both an energy simulation analysis and a Total UA analysis. Both analyses used the U.S. Department of Energy Single Family Prototype for Determining the Cost Effectiveness of the 2018 IECC for house characteristics and square footage. The simulated performance analysis also used the U-factors and modeling guidelines in Sections R405.5.2(1) and R405.5.2(2) of the 2018 IECC for modeling the base or reference home.

1. Table R402.1.2 - Simulated Energy Performance Analysis

Option:	Description:	MMBTU/YR ¹	Energy Cost YR ²	% Better
Base	Base 2018 IECC ³	87.4	\$1309.00	0.0%
Option 2 ⁴	R-23 wood frame wall, U-.28 vertical fenestration, R-60 attic	85.9	\$1292.00	0.3%

1. Whole Home MMBTU/YR

2. Whole Home Energy Cost/YR

3. Square footages and attributes taken from the US DOE Single Family Prototype for Determining the Cost Effectiveness of the 2018 IECC and modeling guidelines in R405.5.2(1) and R405.5.2(2) of the 2018 IECC.

4. Component U-factors calculated in accordance with the 2015 ASHRAE Handbook of Fundamentals.

2. Table R402.1.2 - Total Building UA Analysis

Option:	Description:	Overall U-Factor	% Better
Base	Base 2018 IECC ¹	313	0.0%
Option 2 ²	R-23 wood frame wall, U-.28 vertical fenestration, R-60 attic	309	1.3%

1. Square footages and attributes taken from the US DOE Single Family Prototype for Determining the Cost Effectiveness of the 2018 IECC.

2. Component U-factors calculated in accordance with the 2015 ASHRAE Handbook of Fundamentals.

New footnote j requires R60 ceiling insulation. This means that Section R402.2.2.1 and R402.2.2.2, which address ceiling insulation to accommodate framing geometry, also need to be modified for consistency.

For R402.2.1, (Ceilings with attic spaces), calculations show that where R-49 insulation covers 100 percent of the ceiling area, including exterior wall plates, at full, uncompressed depth, it provides equivalent performance to R-60 with typical eave edge compression. This proposed change was modeled using both a Total UA analysis and Performance based energy modeling. Both models demonstrate energy savings compared to a home built to the base prescriptive path in Tables R402.1.2 and R402.1.4.

R402.2.1 - Total Building UA Analysis (REScheck):

Option:	Description:	Overall U-Factor	% Better
Base	Base 2018 IECC ^{1,2} . Code Home: (Includes R-49 attic with Standard trusses, R-20+5 (U-0.45) wood frame walls, and U-0.30 fenestration.)	293	0.0%
R402.2.1- Raised Heel Trusses (RHT)	Base 2018 IECC ^{1,3} code home using: R-49 ceiling with RHT, R-23 wood frame wall, U-.28 fenestration.	290	1.0%

1. Building square footages and characteristics from the U.S department of energy's single family prototype home for determining the cost effectiveness of the 2018 IECC were used for energy modeling.

2. Component U-Factors used for energy modeling taken from table R402.1.4 of the 2018 IECC.

3. All components not listed, U-factors for energy modeling were taken from table R402.1.4 of the 2018 IECC.

R402.2.1 - Simulated Energy Performance Analysis:

Option:	Description:	MMBTU/YR ¹	Energy Cost YR ²	% Better
Base	Base 2018 IECC ^{3,4} - Code Home: (Includes R-49 attic with Standard trusses, R-20+5 (U-0.45) wood frame walls, and U-0.30 fenestration.)	87.4	\$1309.00	0.0%
R402.2.1- Raised Heel Truss (RHT)	Base 2018 IECC ^{3,5} Code home using: R-49 ceiling with RHT, R-23 wood frame wall, U-.28 fenestration.	83.0	\$1302.00	0.5%

1. Whole Home MMBTU/YR

2. Whole Home Energy Cost/YR

3. Square footages and attributes taken from the US DOE Single Family Prototype for Determining the Cost Effectiveness of the 2018 IECC and modeling guidelines in R405.5.2(1) and R405.5.2(2) of the 2018 IECC.

4. Component U-Factors used for energy modeling taken from table R402.1.4 of the 2018 IECC.

5. All components not listed, U-factors for energy modeling were taken from table R402.1.4 of the 2018 IECC.

Proposed Section R402.2.2 extends the code's existing recognition of a limited area of reduced insulation to accommodate structural limitations, it also increases the required stringency of the area of reduced insulation where the Section R402.1.2 base ceiling insulation requirement exceeds R-49.

Currently the code permits R-49 required ceiling insulation, for 20 percent of the ceiling area, to be reduced by R-19 to R-30. As proposed, R-60 insulation, for 20 percent of the ceiling area, would be permitted to be reduced by R-22 to R-38. This is effectively an equivalent reduction in allowable stringency.

The proposed changes were modeled using both a Total UA analysis and Performance based energy modeling. Both models demonstrate energy savings when compared to a home built to the base prescriptive path in Tables R402.1.2 and R402.1.4.

R402.2.2 - Simulated Energy Performance Analysis:

Option:	Description:	MMBTU/YR ¹	Energy Cost YR ²	% Better
Base	Base 2018 IECC ³	87.4	\$1309.00	0.0%
R402.2.2- Vaulted Clg.	R-23 wood framed wall, U-.28 fenestration, R-38 vaulted ceiling-20% attic area.	84.8	\$1305.00	0.3%

¹Whole Home MMBTU/YR

²Whole Home Energy Cost/YR

³Square footages and attributes taken from the US DOE Single Family Prototype for Determining the Cost Effectiveness of the 2018 IECC and modeling guidelines in R405.5.2(1) and R405.5.2(2) of the 2018 IECC.

R402.2.2 - Total Building UA Analysis (REScheck):

Option:	Description:	Overall U-Factor	% Better
Base	Base 2018 IECC ¹	293	0.0%
R402.2.2- Vaulted Clg.	R-23 wood framed wall, U-.28 fenestration, R-38 vaulted ceiling-20% attic area.	287	2.0%

¹Square footages and attributes taken from the US DOE Single Family Prototype for Determining the Cost Effectiveness of the 2018 IECC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

While it has the potential to decrease the cost of construction, the proposal cannot increase construction costs since it merely adds another prescriptive option for builders.

Proposal # 5185

RE31-19

RE32-19

IECC: TABLE R402.1.2 (IRC N1102.1.2)

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.1.2 (IRC N1102.1.2)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT***

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b, e}	CEILING R-VALUE	WOODFRAME WALL R-VALUE	MASS WALL R-VALUE ⁱ	FLOOR R-VALUE	BASEMENT ^c WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWLSPACE ^e WALL R-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.32	0.55	0.25	38	20 or 13+5 ^h	8/13	19	5/13 ^f	⊕ 10.2 ft	5/13
4 except Marine	0.32	0.55	0.40	49	20 or 13+5 ^h	8/13	19	10/13	10.2 ± 4 ft	10/13
5 and Marine 4	0.30	0.55	NR	49	20 or 13+5 ^h	13/17	30 ^g	15/19	10.2 ± 4 ft	15/19
6	0.30	0.55	NR	49	20+5 ^h or 13+10 ^h	15/20	30 ^g	15/19	10.4 ft	15/19
7 and 8	0.30	0.55	NR	49	20+5 ^h or 13+10 ^h	19/21	38 ^g	15/19	10.4 ft	15/19

NR = Not Required. For SI: 1 foot = 304.8 mm.

- a. R-values are minimums. U-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed R-value of the insulation shall be not less than the R-value specified in the table.
- b. The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration.
Exception: In Climate Zones 1 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.
- c. "10/13" means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation on the interior of the basement wall. "15/19" means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. Alternatively, compliance with "15/19" shall be R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home.
- d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation R-value for slabs, as indicated in the table. The slab edge insulation for heated slabs shall not be required to extend below the slab.
- e. There are no SHGC requirements in the Marine Zone.
- f. Basement wall insulation is not required in warm-humid locations as defined by Figure R301.1 and Table R301.1.
- g. Alternatively, insulation sufficient to fill the framing cavity and providing not less than an R-value of R-19.
- h. The first value is cavity insulation, the second value is continuous insulation. Therefore, as an example, "13+5" means R-13 cavity insulation plus R-5 continuous insulation.
- i. Mass walls shall be in accordance with Section R402.2.5. The second R-value applies where more than half of the insulation is on the interior of the mass wall.

Reason: The purpose of this code change proposal is to increase energy savings and improve comfort by upgrading and improving slab insulation requirements for climate zones 3-5. Although most other components of the building thermal envelope have improved in recent years, the slab R-value requirements have not improved in any climate zone since at least 2006.

The improved values would produce substantial energy cost savings and life cycle cost benefits in all three climate zones:

Climate Zone	Annual Energy Cost Savings	Present Value Life Cycle Benefit
3	6.8%	\$3,132
4	2.5%	\$1,000
5	2.2%	\$1,076

Insulation can last for many decades and possibly the full useful life of the building, providing consistent comfort and energy saving benefits over that period, so it is particularly important to capture as much cost-effective energy efficiency as possible at construction. This is consistent with the intent of the IECC (R101.3), which is to “regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building.”

Cost Impact: The code change proposal will increase the cost of construction

The additional insulation required will add to construction costs. However, our analysis shows that the improved efficiency will produce a clear life cycle benefit to the homeowner.

Proposal # 4109

RE32-19

RE33-19

IECC: TABLE R402.1.2 (IRC N1102.1.2), TABLE R402.1.4 (IRC N1102.1.4)

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.1.2 (IRC N1102.1.2)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a**

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b, e}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ^f	FLOOR R-VALUE	BASEMENT WALL R-VALUE ^c	SLAB ^d R-VALUE & DEPTH	CRAWLSPACE ^e WALL R-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38 49	13	4/6	13	0	0	0
3	0.32	0.55	0.25	38 49	20 or 13+5 ^h	8/13	19	5/13 ^f	0	5/13
4 except Marine	0.32	0.55	0.40	49	20 or 13+5 ^h	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.30	0.55	NR	49	20 or 13+5 ^h	13/17	30 ^g	15/19	10, 2 ft	15/19
6	0.30	0.55	NR	49	20+5 ^h or 13+10 ^h	15/20	30 ^g	15/19	10, 4 ft	15/19
7 and 8	0.30	0.55	NR	49	20+5 ^h or 13+10 ^h	19/21	38 ^g	15/19	10, 4 ft	15/19

NR = Not Required. For SI: 1 foot = 304.8 mm.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.

b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

Exception: In Climate Zones 1 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

c. "10/13" means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation on the interior of the basement wall. "15/19" means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. Alternatively, compliance with "15/19" shall be R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home.

d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation *R*-value for slabs, as indicated in the table. The slab edge insulation for heated slabs shall not be required to extend below the slab.

e. There are no SHGC requirements in the Marine Zone.

f. Basement wall insulation is not required in warm-humid locations as defined by Figure R301.1 and Table R301.1.

g. Alternatively, insulation sufficient to fill the framing cavity and providing not less than an *R*-value of R-19.

h. The first value is cavity insulation, the second value is continuous insulation. Therefore, as an example, "13+5" means R-13 cavity insulation plus R-5 continuous insulation.

i. Mass walls shall be in accordance with Section R402.2.5. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.

**TABLE R402.1.4 (IRC N1102.1.4)
EQUIVALENT *U*-FACTORS^a**

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT U-FACTOR	CEILING U-FACTOR	FRAME WALL U-FACTOR	MASS WALL U-FACTOR ^b	FLOOR U-FACTOR	BASEMENT WALL U-FACTOR	CRAWLSPACE WALL U-FACTOR
1	0.50	0.75	0.035	0.084	0.197	0.064	0.360	0.477
2	0.40	0.65	0.030 0.026	0.084	0.165	0.064	0.360	0.477
3	0.32	0.55	0.030 0.026	0.060	0.098	0.047	0.091 ^c	0.136
4 except Marine	0.32	0.55	0.026	0.060	0.098	0.047	0.059	0.065

5 and Marine 4	0.30	0.55	0.026	0.060	0.082	0.033	0.050	0.055
6	0.30	0.55	0.026	0.045	0.060	0.033	0.050	0.055
7 and 8	0.30	0.55	0.026	0.045	0.057	0.028	0.050	0.055

- a. Nonfenestration *U*-factors shall be obtained from measurement, calculation or an approved source.
- b. Mass walls shall be in accordance with Section R402.2.5. Where more than half the insulation is on the interior, the mass wall *U*-factors shall not exceed 0.17 in Climate Zone 1, 0.14 in Climate Zone 2, 0.12 in Climate Zone 3, 0.087 in Climate Zone 4 except Marine, 0.065 in Climate Zone 5 and Marine 4, and 0.057 in Climate Zones 6 through 8.
- c. In warm-humid locations as defined by Figure R301.1 and Table R301.1, the basement wall *U*-factor shall not exceed 0.360.

Reason: The purpose of this code change proposal is to upgrade and strengthen ceiling insulation requirements in climate zones 2 and 3 by making the prescriptive values equal to current insulation requirements in climate zone 4 and higher. The proposal will make homes more comfortable and reduce costs for homeowners over the life of the building consistent with the objective of the IECC.

Small improvements to the thermal envelope have a significant impact, particularly in light of the long expected useful life of the home and the thermal envelope improvements. Insulation in particular may be undisturbed for many decades and possibly the full useful life of the building, providing consistent comfort and energy saving benefits over that period, so it is particularly important to capture as much cost-effective energy efficiency as possible at construction. After all, the intent of the IECC (R101.3) is to “regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building.”

Using DOE’s cost-effectiveness methodology, we found these R-value improvements to be cost-effective to the homeowner/consumer with a positive present value life cycle benefit:

Climate Zone	Annual Energy Cost Savings	Present Value Life Cycle Benefit
2	0.7%	\$42
3	0.9%	\$126

These proposed changes are also well within the range specified by the U.S. DOE’s insulation guidelines for climate zones 2 and 3 of R30 to R60. <https://www.energy.gov/energysaver/weatherize/insulation>

Bibliography: *Insulation*, Dep’t of Energy, <https://www.energy.gov/energysaver/weatherize/insulation> (last accessed Dec. 30, 2018). U.S. Dep’t of Energy, Methodology for Evaluating Cost-Effectiveness of Residential Energy Code Changes (Aug. 2015), available at <https://www.energycodes.gov/residential-energy-and-cost-analysis-methodology>.

Cost Impact: The code change proposal will increase the cost of construction. Requiring more insulation will increase the cost of construction, but the resulting energy and cost savings will recoup the initial costs and will continue to benefit consumers over the useful life of the home.

RE34-19

IECC: TABLE R402.1.2 (IRC N1102.1.2)

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.1.2
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a**

CLIMATEZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZEDFENESTRATION SHGC ^{b, g}	CEILINGR-VALUE	WOODFRAME WALL R-VALUE	MASSWALL R-VALUE ^{1, 2}	FLOORR-VALUE	BASEMENT ^c WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWLSPACE ^e WALLR-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.32	0.55	0.25	38	20 or 13+5 ^{h, g}	8/13	19	5/13 ^f	0	5/13
4 except Marine	0.32	0.55	0.40	49	20 or 13+5 ^{h, g}	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.30	0.55	NR	49	20 or 13+5 ^{h, g}	13/17	30 ^g	15/19	10, 2 ft	15/19
6	0.30	0.55	NR	49	20+5 ^{h, g} or 13+10 ^{h, g}	15/20	30 ^g	15/19	10, 4 ft	15/19
7 and 8	0.30	0.55	NR	49	20+5 ^{h, g} or 13+10 ^{h, g}	19/21	38 ^g	15/19	10, 4 ft	15/19

NR = Not Required. For SI: 1 foot = 304.8 mm.

a. *R*-values are minimums. U-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.

b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

Exception: In Climate Zones 1 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

c. "10/13" means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation on the interior of the basement wall. "15/19" means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. Alternatively, compliance with "15/19" shall be R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home.

d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation *R*-value for slabs, as indicated in the table. The slab edge insulation for heated slabs shall not be required to extend below the slab.

e. There are no SHGC requirements in the Marine Zone.

f. Basement wall insulation is not required in warm-humid locations as defined by Figure R301.1 and Table R301.1.

~~g. Alternatively, insulation sufficient to fill the framing cavity and providing not less than an *R*-value of R-19.~~

h. The first value is cavity insulation, the second value is continuous insulation. Therefore, as an example, "13+5" means R-13 cavity insulation plus R-5 continuous insulation.

i. Mass walls shall be in accordance with Section R402.2.5. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.

Reason: The purpose of this code change proposal is to improve the efficiency of homes in the coldest climate zones by removing an exception that allows weaker floor insulation R-values with no corresponding improvements elsewhere in the building. The current footnote “g” to Table R402.1.2 is a loophole that permits builders to reduce floor insulation (which will lead to a less comfortable home and increased energy costs), simply because of design choices made by the builder. Indeed, this exception allows builders in climate zones 7 and 8 to install *half* the insulation required by code.

The proposal above does not prohibit a builder from continuing to build floors with any specific floor joist thickness. However, if adequate insulation cannot be installed in the floor cavity, the energy efficiency losses must be accounted for elsewhere in the thermal envelope through a trade-off.

Cost Impact: The code change proposal will increase the cost of construction

However, the proposal will only increase construction costs for homes that might have taken advantage of this exception in the prescriptive path because it will require the installation of insulation sufficient to meet the R-value requirement in Table R402.1.2. However, this change will not increase costs for homes built to all other compliance paths in the IECC, since the footnote exception already does not apply to those homes. We believe the elimination of this exception will provide homeowners with the superior comfort and energy and cost-savings they expect from a code-compliant home.

Proposal # 4015

RE34-19

RE35-19

IECC: TABLE R402.1.2 (IRC N1102.1.2), TABLE R402.1.4 (IRC N1102.1.4)

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.1.2 (IRC N1102.1.2)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT***

CLIMATEZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZEDFENESTRATION SHGC ^{b, e}	CEILINGR-VALUE	WOODFRAME WALL R-VALUE	MASSWALL R-VALUE ^f	FLOORR-VALUE	BASEMENT ^c WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWLSPACE ^c WALLR-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40 0.35	0.65	0.25	38	13	4/6	13	0	0	0
3	0.32 0.30 ^j	0.55	0.25	38	20 or 13+5 ^h	8/13	19	5/13 ^f	0	5/13
4 except Marine	0.32 0.30 ^j	0.55	0.40	49	20 or 13+5 ^h	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.30 ^j	0.55	NR	49	20 or 13+5 ^h	13/17	30 ^g	15/19	10, 2 ft	15/19
6	0.30 ^j	0.55	NR	49	20+5 ^h or 13+10 ^h	15/20	30 ^g	15/19	10, 4 ft	15/19
7 and 8	0.30 ^j	0.55	NR	49	20+5 ^h or 13+10 ^h	19/21	38 ^g	15/19	10, 4 ft	15/19

NR = Not Required. For SI: 1 foot = 304.8 mm.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.

b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

Exception: In Climate Zones 1 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

c. "10/13" means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation on the interior of the basement wall. "15/19" means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. Alternatively, compliance with "15/19" shall be R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home.

d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation *R*-value for slabs, as indicated in the table. The slab edge insulation for heated slabs shall not be required to extend below the slab.

e. There are no SHGC requirements in the Marine Zone.

f. Basement wall insulation is not required in warm-humid locations as defined by Figure R301.1 and Table R301.1.

g. Alternatively, insulation sufficient to fill the framing cavity and providing not less than an *R*-value of R-19.

h. The first value is cavity insulation, the second value is continuous insulation. Therefore, as an example, "13+5" means R-13 cavity insulation plus R-5 continuous insulation.

i. Mass walls shall be in accordance with Section R402.2.5. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.

j. A maximum *U*-factor of 0.32 shall apply in Climate Zones 3 through 8 to vertical fenestration products installed in buildings located either:

1. Above 4000 feet in elevation above sea level, or
2. In windborne debris regions where protection of openings is required by Section R301.2.1.2 of the International Residential Code.

**TABLE R402.1.4 (IRC N1102.1.4)
EQUIVALENT *U*-FACTORS^a**

CLIMATEZONE	FENESTRATIONU-FACTOR	SKYLIGHTU-FACTOR	CEILINGU-FACTOR	FRAMEWALL U-FACTOR	MASS WALL U-FACTOR ^b	FLOORU-FACTOR	BASEMENTWALL U-FACTOR	CRAWLSPACE WALL U-FACTOR
1	0.50	0.75	0.035	0.084	0.197	0.064	0.360	0.477
2	0.40 0.35	0.65	0.030	0.084	0.165	0.064	0.360	0.477
3	0.32 0.30	0.55	0.030	0.060	0.098	0.047	0.091 ^c	0.136
4 except Marine	0.32 0.30	0.55	0.026	0.060	0.098	0.047	0.059	0.065
5 and Marine 4	0.30	0.55	0.026	0.060	0.082	0.033	0.050	0.055
6	0.30	0.55	0.026	0.045	0.060	0.033	0.050	0.055
7 and 8	0.30	0.55	0.026	0.045	0.057	0.028	0.050	0.055

- a. Nonfenestration *U*-factors shall be obtained from measurement, calculation or an approved source.
- b. Mass walls shall be in accordance with Section R402.2.5. Where more than half the insulation is on the interior, the mass wall *U*-factors shall not exceed 0.17 in Climate Zone 1, 0.14 in Climate Zone 2, 0.12 in Climate Zone 3, 0.087 in Climate Zone 4 except Marine, 0.065 in Climate Zone 5 and Marine 4, and 0.057 in Climate Zones 6 through 8.
- c. In warm-humid locations as defined by Figure R301.1 and Table R301.1, the basement wall *U*-factor shall not exceed 0.360.

Reason: The purpose of this code change proposal is to improve occupant comfort and save energy by upgrading and strengthening fenestration

U-factors in climate zones 2 – 4 (by lowering them consistent with modest step improvements in previous code cycles). Fenestration that meets these requirements is cost-effective and will return substantial life cycle savings to homeowners, is already widely available, and is routinely installed in new and existing residential buildings in these climate zones. This proposal also adds a footnote to establish an exception to prescriptive U-factors for fenestration installed at high altitudes (above 4000 feet in elevation) and in regions that require fenestration to be resistant to windborne debris in climate zones 3 - 8. A similar footnote exception was proposed in the last code development cycle and was widely supported by building code officials in these specific regions. Overall, this proposal will improve energy efficiency across much of the nation while allowing reasonable options for fenestration in high-altitude and wind-borne debris regions.

Energy Savings and Cost-Effectiveness - Our analysis, based on the DOE cost-effectiveness methodology, shows the improvements in U-factor to be cost-effective to the consumer with a substantial life cycle benefit:

Climate Zone	Annual Energy Cost Savings	Present Value Life Cycle Benefit
2	0.9%	\$275
3	1.0%	\$312
4	1.1%	\$523

Although we believe that the upgrade in the standards will result in no cost increase in most cases, because the new specification is consistent with the standard product already used in the marketplace (as discussed below), for purposes of the life cycle cost analysis above, we used a marginal upgrade cost to be conservative. Even with this approach, the life cycle benefit is robust.

Availability of Compliant Products and Adoption – A 0.30 U-factor requirement is a natural technology level/breakpoint representing a reasonably efficient, double pane, low-e with argon wood or vinyl window. As a result, a number of national and state programs have promoted fenestration U-factors in the range of 0.30 for several years, making these products widely available and already being installed throughout most of the country:

- For example, the American Recovery and Reinvestment Act of 2009 (ARRA) provided a federal income tax credit for fenestration with a U-factor of 0.30 or lower.
- Energy Star has required 0.30 U-factors (or less) for fenestration installed in all but the southernmost climate zones since January 1, 2015. See https://www.energystar.gov/sites/default/files/ES_Final_V6_Residential_WDS_Spec.pdf
- A recent EnergyStar market penetration report estimated that the share of total window products in the market already meeting the EnergyStar standard in 2016 was about 83%. (https://www.energystar.gov/ia/partners/downloads/unit_shipment_data/2016_USD_Summary_Report.pdf?8fd5-1967).
- These findings were reinforced through the U.S. DOE Residential Field Studies, which found that even in states in climate zones 2 – 4, with weaker code U-factor requirements, builders were routinely installing fenestration with U-factors around 0.30. See https://www.energycodes.gov/sites/default/files/documents/Field_Study_120715_Final.pdf.
- The state of California has recently upgraded its U-factor requirements for vertical fenestration statewide from 0.32 to 0.30, finding the lower U-factor cost-effective in all of its climate zones (California contains climate zones 2 – 6). See Codes and Standards Enhancement (CASE) Initiative, 2019 California Building Energy Efficiency Standards, *Residential High Performance Windows and Doors – Final Report* (Aug. 2017).

Because of these national trends toward 0.30 U-factor or better fenestration, compliance will not be an issue and in most cases will not even result in an increase in construction costs.

Proposed Exception for Special Circumstances - We believe that the proposed exception is warranted due to the special measures that are taken by glass and/or fenestration manufacturers to address higher altitudes and windborne debris due to high winds.

For example, high altitude products may incorporate breather or capillary tubes in the insulating glass unit to allow pressure equalization for products that will be transported to higher elevations for installation. The pressure equalization can help avoid IG unit failures. However, the capillary tubes eliminate the ability to use certain gas fills commonly used to achieve higher levels of thermal performance. The limited exception proposed above recognizes that circumstance and provides some flexibility for builders in these regions.

Likewise, fenestration designed to withstand windborne debris usually requires special glass which (because of its increased thickness) reduces the gap width in the insulating glass unit. This will affect the thermal performance of the window. To provide some additional flexibility in zones where such fenestration is required, this proposal permits a fenestration U-factor of 0.32 for climate zones 3-8.

In sum, we believe this proposal will implement meaningful energy and cost savings and improved occupant comfort through improved fenestration U-factors that are already available and are routinely being installed by homebuilders.

Bibliography: ENERGY STAR® Product Specification Residential Windows, Doors, and Skylights Eligibility Criteria Version 6.0, Energy Star, available at https://www.energystar.gov/sites/default/files/ES_Final_V6_Residential_WDS_Spec.pdf. ENERGY STAR® Unit Shipment and Market Penetration Report Calendar Year 2016 Summary, Energy Star, available at https://www.energystar.gov/ia/partners/downloads/unit_shipment_data/2016_USD_Summary_Report.pdf?8fd5-1967.

Single Family Residential Energy Code Field Study, Building Energy Codes Program, available at https://www.energycodes.gov/sites/default/files/documents/Field_Study_120715_Final.pdf.

Codes and Standards Enhancement (CASE) Initiative, 2019 California Building Energy Efficiency Standards, *Residential High Performance Windows and Doors – Final Report* (Aug. 2017).

U.S. Dep't of Energy, Methodology for Evaluating Cost-Effectiveness of Residential Energy Code Changes (Aug. 2015), *available at <https://www.energycodes.gov/residential-energy-and-cost-analysis-methodology>.*

Cost Impact: The code change proposal will increase the cost of construction

It is possible that requiring more efficient fenestration may, in some cases, increase the cost of construction (and, as a result, we used an upgrade cost in our life cycle cost/benefit analysis), but in any event, the resulting energy and cost savings will overwhelmingly recoup the initial costs and will continue to benefit consumers over the useful life of the home. Moreover, it should also be noted that we would expect that the U-factor reduction will not increase costs in most cases, since the standard market products, with very high market penetration, already typically hit the proposed improved U-factor levels. We also note that for builders in high-altitude or wind-borne debris regions, the new footnote will provide additional flexibility and will likely serve to reduce costs.

Proposal # 3986

RE35-19

RE36-19

IECC: TABLE R402.1.2 (IRC N1102.1.2), TABLE R402.1.4 (IRC N1102.1.4), R402.2.1 (IRC N1102.2.1)

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.1.2 (IRC N1102.1.2)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT***

CLIMATEZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZEDFENESTRATION SHGC ^{b, e}	CEILINGR-VALUE	WOODFRAME WALL R-VALUE	MASSWALL R-VALUE ⁱ	FLOORR-VALUE	BASEMENT ^c WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWLSPACE ^e WALL R-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.32	0.55	0.25	38	20 or 13+5 ^h	8/13	19	5/13 ^f	0	5/13
4 except Marine	0.32	0.55	0.40	49 60	20 or 13+5 ^h	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.30	0.55	NR	49 60	20 or 13+5 ^h	13/17	30 ^g	15/19	10, 2 ft	15/19
6	0.30	0.55	NR	49 60	20+5 ^h or 13+10 ^h	15/20	30 ^g	15/19	10, 4 ft	15/19
7 and 8	0.30	0.55	NR	49 60	20+5 ^h or 13+10 ^h	19/21	38 ^g	15/19	10, 4 ft	15/19

NR = Not Required. For SI: 1 foot = 304.8 mm.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.

b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

Exception: In Climate Zones 1 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

c. "10/13" means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation on the interior of the basement wall. "15/19" means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. Alternatively, compliance with "15/19" shall be R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home.

d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation *R*-value for slabs, as indicated in the table. The slab edge insulation for heated slabs shall not be required to extend below the slab.

e. There are no SHGC requirements in the Marine Zone.

f. Basement wall insulation is not required in warm-humid locations as defined by Figure R301.1 and Table R301.1.

g. Alternatively, insulation sufficient to fill the framing cavity and providing not less than an *R*-value of R-19.

h. The first value is cavity insulation, the second value is continuous insulation. Therefore, as an example, "13+5" means R-13 cavity insulation plus R-5 continuous insulation.

i. Mass walls shall be in accordance with Section R402.2.5. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.

**TABLE R402.1.4 (IRC N1102.1.4)
EQUIVALENT *U*-FACTORS^a**

CLIMATEZONE	FENESTRATION U-FACTOR	SKYLIGHT U-FACTOR	CEILING U-FACTOR	FRAME WALL U-FACTOR	MASS WALL U-FACTOR ^b	FLOOR U-FACTOR	BASEMENT WALL U-FACTOR	CRAWLSPACE WALL U-FACTOR
1	0.50	0.75	0.035	0.084	0.197	0.064	0.360	0.477
2	0.40	0.65	0.030	0.084	0.165	0.064	0.360	0.477
3	0.32	0.55	0.030	0.060	0.098	0.047	0.091 ^c	0.136
4 except Marine	0.32	0.55	0.026 0.024	0.060	0.098	0.047	0.059	0.065

5 and Marine 4	0.30	0.55	0.026 0.024	0.060	0.082	0.033	0.050	0.055
6	0.30	0.55	0.026 0.024	0.045	0.060	0.033	0.050	0.055
7 and 8	0.30	0.55	0.026 0.024	0.045	0.057	0.028	0.050	0.055

- a. Nonfenestration *U*-factors shall be obtained from measurement, calculation or an approved source.
- b. Mass walls shall be in accordance with Section R402.2.5. Where more than half the insulation is on the interior, the mass wall *U*-factors shall not exceed 0.17 in Climate Zone 1, 0.14 in Climate Zone 2, 0.12 in Climate Zone 3, 0.087 in Climate Zone 4 except Marine, 0.065 in Climate Zone 5 and Marine 4, and 0.057 in Climate Zones 6 through 8.
- c. In warm-humid locations as defined by Figure R301.1 and Table R301.1, the basement wall *U*-factor shall not exceed 0.360.

R402.2.1 (IRC N1102.2.1) Ceilings with attic spaces. Where Section R402.1.2 requires R-38 insulation in the ceiling, installing R-30 over 100 percent of the ceiling area requiring insulation shall satisfy the requirement for R-38 wherever the full height of uncompressed R-30 insulation extends over the wall top plate at the eaves. Where Section R402.1.2 requires R-49 insulation in the ceiling, installing R-38 over 100 percent of the ceiling area requiring insulation shall satisfy the requirement for R-49 insulation wherever the full height of uncompressed R-38 insulation extends over the wall top plate at the eaves. Where Section R402.1.2 requires R-60 insulation in the ceiling, installing R-49 over 100 percent of the ceiling area requiring insulation shall satisfy the requirement for R-60 insulation wherever the full height of uncompressed R-49 insulation extends over the wall top plate at the eaves. This reduction shall not apply to the *U*-factor alternative approach in Section R402.1.4 and the Total UA alternative in Section R402.1.5.

Reason: The purpose of this code change proposal is to improve comfort and save energy for homeowners in climate zones 4 - 8 by upgrading and increasing ceiling insulation requirements from R-49 to R-60. Small improvements to the thermal envelope can have a significant beneficial impact, particularly in light of a home's long expected useful life. Insulation in particular may not be changed for many decades and may last for the full useful life of the building, providing consistent comfort and energy saving benefits over that period. Making long-lived, life cycle cost beneficial improvements is consistent with the intent of the IECC (R101.3), which is to "regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building." Using DOE's cost-effectiveness methodology, we found these R-value improvements would provide substantial life cycle cost benefits:

Climate Zone	Annual Energy Cost Savings
4	0.6%
5	0.7%
6	0.6%
7	0.5%
8	0.4%

These proposed changes are also within the range specified by the U.S. DOE's insulation guidelines for these climate zones. <https://www.energy.gov/energysaver/weatherize/insulation> A home with adequate insulation will maintain more consistent interior temperatures during both heating and cooling seasons and will be more resilient and livable in the event of extreme weather events and power outages.

Bibliography: *Insulation*, U.S. Dep't of Energy, <https://www.energy.gov/energysaver/weatherize/insulation> (last accessed Dec. 30, 2018). U.S. Dep't of Energy, Methodology for Evaluating Cost-Effectiveness of Residential Energy Code Changes (Aug. 2015), available at <https://www.enr.com/resources/documents/2015/08/01/methodology-for-evaluating-cost-effectiveness-of-residential-energy-code-changes>.

Cost Impact: The code change proposal will increase the cost of construction. Requiring more insulation will increase the cost of construction, but the resulting energy and cost savings will recoup the initial costs and will continue to benefit consumers over the useful life of the home.

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IECC: TABLE R402.1.2 (IRC N1102.1.2)

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.1.2 (IRC N1102.1.2)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT***

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b, e}	CEILING R-VALUE	WOODFRAME WALL R-VALUE	MASS WALL R-VALUE ^e	FLOOR R-VALUE	BASEMENT ^c WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWLSPACE ^e WALL R-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.32	0.55	0.25	38	20 or 13+5 ^h	8/13	19	5/13 ^f	0	5/13
4 except Marine	0.32	0.55	0.40	49	20 or 13+5 ^h	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.30	0.55	NR 0.40	49	20 or 13+5 ^h	13/17	30 ^g	15/19	10, 2 ft	15/19
6	0.30	0.55	NR	49	20+5 ^h or 13+10 ^h	15/20	30 ^g	15/19	10, 4 ft	15/19
7 and 8	0.30	0.55	NR	49	20+5 ^h or 13+10 ^h	19/21	38 ^g	15/19	10, 4 ft	15/19

NR = Not Required. For SI: 1 foot = 304.8 mm.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.

b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

Exception: In Climate Zones 1 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

c. "10/13" means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation on the interior of the basement wall. "15/19" means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. Alternatively, compliance with "15/19" shall be R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home.

d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation *R*-value for slabs, as indicated in the table. The slab edge insulation for heated slabs shall not be required to extend below the slab.

e. There are no SHGC requirements in the Marine Zone.

f. Basement wall insulation is not required in warm-humid locations as defined by Figure R301.1 and Table R301.1.

g. Alternatively, insulation sufficient to fill the framing cavity and providing not less than an *R*-value of R-19.

h. The first value is cavity insulation, the second value is continuous insulation. Therefore, as an example, "13+5" means R-13 cavity insulation plus R-5 continuous insulation.

i. Mass walls shall be in accordance with Section R402.2.5. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.

Reason: The purpose of this code change proposal is to improve occupant comfort, reduce peak demand and HVAC sizing, and reduce costs for homeowners by establishing a moderate SHGC requirement for fenestration in climate zone 5. While we believe that the vast majority of fenestration installed in climate zone 5 already meets or exceeds this level of efficiency, and the performance path already assumes this same level (a 0.40 SHGC) for climate zone 5, this proposal will encourage the use of fenestration with proven efficiency and comfort benefits.

Comfort – A window that combines both a low *U*-factor (which is already required for climate zone 5) with a low SHGC will help reduce the volatility of interior temperature swings and better maintain reasonable occupant comfort. According to the Efficient Windows Collaborative, based on an analysis completed by Lawrence Berkeley National Laboratory, windows with lower SHGCs reduce the amount of solar radiation passing through the glass, which will reduce the likelihood of discomfort of occupants. See <https://www.efficientwindows.org/comfort.php>. An uncomfortable occupant due to excessive solar gain through windows is more likely to adjust the thermostat to a cooler temperature over the course of the day in response, thereby increasing peak demand and energy use.

Although energy modeling software does not typically capture the likelihood of occupant response to discomfort, anyone who has lived or worked in

a building with excessive solar gain through fenestration, knows that this can lead occupants to adjust the thermostat. The energy impact of adjusting the thermostat is substantial. The following table shows the increased energy use that results from adjusting the thermostat down a single degree in a code-compliant house in each climate zone:

Increased Energy Use Resulting from Downward Thermostat Adjustment									
Measure	Weighted	1	2	3	4	5	6	7	8
-1 Degree Cooling	3.0%	7.8%	5.3%	3.9%	2.6%	1.8%	1.4%	0.7%	0.4%

Obviously, if an uncomfortable occupant adjusts the thermostat 2 or 3 degrees, the impact will be far higher.

Peak Demand and HVAC Sizing Savings – Low-SHGC fenestration helps reduce both the home and utility peak electric demand, providing a range of benefits for homeowners and communities. Low-SHGC fenestration helps reduce the need for air conditioning during peak hours when electricity is more scarce and more expensive. Reduced cooling needs can allow for the installation of smaller cooling equipment, benefitting the homeowner by lowering costs at construction and every time the air conditioning unit is replaced. Reduced peak electric demand for each home will also help curb the overall increases in utility peak electric demand, reducing costs and negative environmental impacts associated with installing and operating peak electric generation. See U.S. Department of Energy, *Measure Guideline: Energy Efficient Window Performance and Selection*, at 49, available at <https://www.nrel.gov/docs/fy13osti/55444.pdf>.

Market Availability - Given the U-factor requirement in climate zone 5 (currently 0.30), the overwhelming majority of products being installed in this climate are already well under a 0.40 SHGC. Indeed, according to a 2015 U.S. DOE field study of homes in Pennsylvania (which had no SHGC requirement), 100% of the observed fenestration SHGC was below 0.40. In fact, the highest SHGC observed was 0.32. See <https://www.energycodes.gov/compliance/energy-code-field-studies>. While this study was limited to one state and a limited sample, we have seen no evidence that the circumstances are different in other climate zone 5 states. Given the ubiquity of low-SHGC fenestration in climate zone 5, we believe that this proposal will not significantly change, but merely recognize practices already implemented by homebuilders.

Bibliography: U.S. Department of Energy, *Measure Guideline: Energy Efficient Window Performance and Selection*, available at <https://www.nrel.gov/docs/fy13osti/55444.pdf>.
 Energy Code Field Studies, U.S. Dep’t of Energy, available at <https://www.energycodes.gov/compliance/energy-code-field-studies>.

Efficient Windows Collaborative, *Benefits: Improved Comfort*, available at <https://www.efficientwindows.org/comfort.php>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. We believe that the vast majority of windows being installed in climate zone 5 already meet this SHGC level, and for any that do not, there are many standard products in the market that will meet it for no additional cost (the vast majority of windows that meet the U-factors specified for climate zone 5 already have a lower SHGC than 0.40; the lower SHGC typically comes with the lower U-factor). A lower SHGC may also provide the opportunity to reduce the size of the HVAC system, thereby reducing construction cost. As a result, any increased or decreased cost impact is dependent on specific circumstances and is uncertain.

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IECC: R402.1.2 (IRC N1102.1.2), TABLE R402.1.2 (IRC N1102.1.2), R402.1.3 (IRC N1102.1.3)(New), TABLE R402.1.4 (IRC N1102.1.4) , R402.1.3 (IRC N1102.1.3), R402.1.4 (IRC N1102.1.4), R402.1.5 (IRC N1102.1.5)

Proponent: David Collins, representing The American Institute of Architects (dcollins@preview-group.com); Jay Crandell, representing Foam Sheathing Committee of the American Chemistry Council (jcrandell@aresconsulting.biz); Maureen Guttman, representing BCAP-IBTS (mguttph@aol.com)

2018 International Energy Conservation Code

Revise as follows:

R402.1.2 (IRC N1102.1.2) Insulation and fenestration criteria. The *building thermal envelope* shall meet the requirements of Table R402.1.2, based on the *climate zone* specified in Chapter 3. Assemblies shall have a U-factor equal to or less than that specified in Table R402.1.2. Fenestration shall have a U-factor and glazed fenestration SHGC equal to or less than specified in Table R402.1.2.

Add new text as follows:

R402.1.3 (IRC N1102.1.3) R-value alternative. Assemblies with R-value of insulation materials equal to or greater than that specified in Table R402.1.3 shall be an alternative to the U-factor in Table R402.1.2.

Revise as follows:

TABLE R402.1.4 (IRC N1102.1.4) R402.1.2 (IRC N1102.1.2)
EQUIVALENT MAXIMUM ASSEMBLY U-FACTORS AND FENESTRATION REQUIREMENTS^a

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT U-FACTOR	GLAZED FENESTRATION SHGC ^{d,e}	CEILING U-FACTOR	FRAME WALL U-FACTOR	MASS WALL U-FACTOR ^b	FLOOR U-FACTOR	BASEMENT WALL U-FACTOR	CRAWLSPACE WALL U-FACTOR
1	0.50	0.75	0.25	0.035	0.084	0.197	0.064	0.360	0.477
2	0.40	0.65	0.25	0.030	0.084	0.165	0.064	0.360	0.477
3	0.32	0.55	0.25	0.030	0.060	0.098	0.047	0.091 ^c	0.136
4 except Marine	0.32	0.55	0.40	0.026	0.060	0.098	0.047	0.059	0.065
5 and Marine 4	0.30	0.55	NR	0.026	0.060	0.082	0.033	0.050	0.055
6	0.30	0.55	NR	0.026	0.045	0.060	0.033	0.050	0.055
7 and 8	0.30	0.55	NR	0.026	0.045	0.057	0.028	0.050	0.055

a. Nonfenestration U-factors shall be obtained from measurement, calculation or an approved source.

b. Mass walls shall be in accordance with Section R402.2.5. Where more than half the insulation is on the interior, the mass wall U-factors shall not exceed 0.17 in Climate Zone 1, 0.14 in Climate Zone 2, 0.12 in Climate Zone 3, 0.087 in Climate Zone 4 except Marine, 0.065 in Climate Zone 5 and Marine 4, and 0.057 in Climate Zones 6 through 8.

c. In warm-humid locations as defined by Figure R301.1 and Table R301.1, the basement wall U-factor shall not exceed 0.360.

d. The SHGC column applies to all glazed fenestration.

Exception: In Climate Zones 1 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

e. There are no SHGC requirements in the Marine Zone.

TABLE R402.1.2 (IRC N1102.1.2) R402.1.3 (IRC N1102.1.3)
INSULATION MINIMUM R-VALUE AND FENESTRATION REQUIREMENTS BY COMPONENT^a

Portions of table not shown remain unchanged.

R402.1.3 (IRC N1102.1.3) R402.1.4 (IRC N1102.1.4) R-value computation. Insulation material used in layers, such as framing *cavity insulation* or continuous insulation, shall be summed to compute the corresponding component *R*-value. The manufacturer's settled *R*-value shall be used for blown-in insulation. Computed *R*-values shall not include an *R*-value for other building materials or air films. Where insulated siding is used for the purpose of complying with the continuous insulation requirements of Table ~~R402.1.2~~ R402.1.3, the manufacturer's labeled *R*-value for the insulated siding shall be reduced by R-0.6.

R402.1.4 (IRC N1102.1.4) U-factor alternative. An assembly with a *U*-factor equal to or less than that specified in Table R402.1.4 shall be an alternative to the *R*-value in Table R402.1.2.

R402.1.5 (IRC N1102.1.5) Total UA alternative. Where the total *building thermal envelope* UA, the sum of *U*-factor times assembly area, is less than or equal to the total UA resulting from multiplying the *U*-factors in Table ~~R402.1.4~~ R402.1.2 by the same assembly area as in the proposed *building*, the *building* shall be considered to be in compliance with Table R402.1.2. The UA calculation shall be performed using a method consistent with the ASHRAE *Handbook of Fundamentals* and shall include the thermal bridging effects of framing materials. In addition to UA compliance, the SHGC requirements shall be met.

Reason: This proposal does not change the stringency of the R-value and U-factor requirements. This proposal organizes the envelope thermal requirements such that the basis of performance (and any other means of compliance) is founded on U-factors which completely define an assembly's performance. The R-value approach is kept to provide pre-determined solutions (easy to look up) and it is based on the U-factor requirements as it should be (and the same would apply to any other equivalent R-value solution that one might propose as an alternative for compliance). This approach does not change the prescriptive R-value approach or the ability to use it for simple solutions. Instead, it better ensures that the R-values used are a derivative of the intended performance levels that are non-material specific and represented by the assembly U-factors. Also, fenestration and SHGC requirements are included in the U-factor table because they are currently omitted. The SHGC values (and footnotes) are consistent with those in the current R-value table.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal does not change the stringency of R-value and U-factor requirements, but it will ensure that alternate R-value solutions are appropriately based on the U-factor requirements, including those that are predetermined in the R-value table which is kept to maintain a simple means of compliance.

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RE39-19

IECC: TABLE R402.1.2 (IRC N1102.1.2), R402.2.1 (IRC N1102.2.1), R402.2.2 (IRC N1102.2.2)

Proponent: Greg Johnson, Johnson & Associates Consulting Services, representing Coalition for Fair Energy Codes (gjohnsonconsulting@gmail.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.1.2 (IRC N1102.1.2)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a**

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b, e}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ⁱ	FLOOR R-VALUE	BASEMENT ^c WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWL SPACE ^c WALL R-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.32	0.55	0.25	36	20 or 13+5 ^h	8/13	19	5/13 ^f	0	5/13
4 except Marine	0.32	0.55	0.40	49	20 or 13+5 ^h	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.30	0.55	NR	49	20 or 13+5 ^h	13/17	30 ^g	15/19	10, 2 ft	15/19
6	0.30	0.55	NR	49	20+5 ^h or 13+10 ^h	15/20	30 ^g	15/19	10, 4 ft	15/19
Option 1										
6	0.28	0.55	NR	60	23 ^j	15/20	30 ^g	15/19	10, 4 ft	15/19
Option 2										
7 and 8	0.30	0.55	NR	49	20+5 ^h or 13+10 ^h	19/21	38 ^g	15/19	10, 4 ft	15/19
Option 1										
7 and 8	0.28	0.55	NR	60	23 ^j	19/21	38 ^g	15/19	10, 4 ft	15/19
Option 2										

NR = Not Required. For SI: 1 foot = 304.8 mm.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.

b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

Exception: In Climate Zones 1 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

c. "10/13" means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation on the interior of the basement wall. "15/19" means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the

interior of the basement wall. Alternatively, compliance with "15/19" shall be R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home.

d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation *R*-value for slabs, as indicated in the table. The slab edge insulation for heated slabs shall not be required to extend below the slab.

e. There are no SHGC requirements in the Marine Zone.

f. Basement wall insulation is not required in warm-humid locations as defined by Figure R301.1 and Table R301.1.

g. Alternatively, insulation sufficient to fill the framing cavity and providing not less than an *R*-value of R-19.

h. The first value is cavity insulation, the second value is continuous insulation. Therefore, as an example, "13+5" means R-13 cavity insulation plus R-5 continuous insulation.

i. Mass walls shall be in accordance with Section R402.2.5. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.

j. Permitted only where the fenestration U-factor is 0.28 and the ceiling R-value is 60.

R402.2.1 (IRC N1102.2.1) Ceilings with attic spaces. Where Section R402.1.2 requires R-38 insulation in the ceiling, installing R-30 over 100 percent of the ceiling area requiring insulation shall satisfy the requirement for R-38 wherever the full height of uncompressed R-30 insulation extends over the wall top plate at the eaves. Where Section R402.1.2 requires R-49 insulation in the ceiling, installing R-38 over 100 percent of the ceiling area requiring insulation shall satisfy the requirement for R-49 insulation wherever the full height of uncompressed R-38 insulation extends over the wall top plate at the eaves. Where Section R402.1.2 requires R-60 insulation in the ceiling, installing R-49 over 100 percent of the ceiling area requiring insulation shall satisfy the requirement for R-60 insulation wherever the full height of uncompressed R-49 insulation extends over the top plate at the eaves. This reduction shall not apply to the *U*-factor alternative approach in Section R402.1.4 and the Total UA alternative in Section R402.1.5.

R402.2.2 (IRC N1102.2.2) Ceilings without attic spaces. Where Section R402.1.2 requires insulation *R*-values greater than R-30 in the ceiling and the design of the roof/ceiling assembly does not allow sufficient space for the required insulation, the minimum required insulation *R*-value for such roof/ceiling assemblies shall be R-30. Where Section R402.1.2 requires insulation greater than R49 in the ceiling and the design of the roof/ceiling assembly does not allow sufficient space for the required insulation, the required insulation R-value for such roof/ceiling assemblies shall be R38. Insulation shall extend over the top of the wall plate to the outer edge of such plate and shall not be compressed. This reduction of insulation from the requirements of Section R402.1.2 shall be limited to 500 square feet (46 m²) or 20 percent of the total insulated ceiling area, whichever is less. This reduction shall not apply to the *U*-factor alternative approach in Section R402.1.4 and the Total UA alternative in Section R402.1.5.

Reason: This proposal will save energy by providing a critically needed prescriptive cavity-only wall insulation option for Climate Zones 6-8 for the many builders and building officials that rely on the prescriptive table.

This new option provides equivalent energy performance by combining a minimum R23 wood frame wall R-value with better performing windows (U=0.28) and increased ceiling insulation (R60), such that equivalent energy performance is achieved.

The proposed R23 wall cavity insulation level is compatible with 2x6 framing using a variety of cavity insulation types, including several types of batt insulation products and blown-in insulation systems.

Verifying compliance in the field is easily done by checking the fenestration labels and insulation certificates and markers required by Sec. R303.

Note that this proposal does not modify the two existing continuous insulation assemblies already listed in Table R402.1.2, nor does it affect the U-factors in Table R402.1.4.

The proposed formatting of Table R402.1.2 in this proposal is identical to that of RE28-16 PC1 which was passed overwhelmingly by the assembly at the public comment hearings in Kansas City in 2016 before failing to achieve the supermajority by a single vote in online voting <https://www.iccsafe.org/wp-content/uploads/2016-GroupB-Final-Action-Results-OGCV.pdf>.

The energy efficiency of the proposed change was shown to provide better performance than the 2018 IECC using both an energy simulation analysis and a Total UA, REScheck analysis. Both analyses demonstrated better performance than the 2018 IECC. Both analyses used the U.S. Department of Energy Single Family Prototype for Determining the Cost Effectiveness of the 2018 IECC for house characteristics and square footage, in addition the simulated performance analysis uses U-factors and modeling guidelines in Sections R405.5.2(1) and R405.5.2(2) of the 2018 IECC for modeling the base or reference home.

1. Table R402.1.2 - Simulated Energy Performance Analysis:

Option:	Description:	MMBTU/YR ¹	Energy Cost YR ²	% Better
Base	Base 2018 IECC ³	87.4	\$1309.00	0.0%
Option 2 ⁴	R-23 wood frame wall, U-.28 vertical fenestration, R-60 attic	85.9	\$1292.00	0.3%

1. Whole Home MMBTU/YR

2. Whole Home Energy Cost/YR

3. Square footages and attributes taken from the US DOE Single Family Prototype for Determining the Cost Effectiveness of the 2018 IECC and modeling guidelines in R405.5.2(1) and R405.5.2(2) of the 2018 IECC.

4. Component U-factors calculated in accordance with the 2015 ASHRAE Handbook of Fundamentals.

2. Table R402.1.2 - Total Building UA Analysis (REScheck):

Option:	Description:	Overall U-Factor	% Better
Base	Base 2018 IECC ¹	313	0.0%
Option 2 ²	R-23 wood frame wall, U-0.28 vertical fenestration, R-60 attic	309	1.3%

1. Square footages and attributes taken from the US DOE Single Family Prototype for Determining the Cost Effectiveness of the 2018 IECC.

2. Component U-factors calculated in accordance with the 2015 ASHRAE Handbook of Fundamentals.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal offers an optional path for prescriptive envelope compliance. Because it is optional it cannot raise the cost of construction; a builder will choose whatever option they believe provides the greatest benefit for the cost.

RE40-19

IECC: TABLE R402.1.2 (IRC N1102.1.2)

Proponent: Joel Martell, representing National Association of Home Builders (jmartell@nahb.org)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.1.2 (IRC N1102.1.2)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a**

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b, e}	CEILING R-VALUE	WOODFRAME WALL R-VALUE	MASS WALL R-VALUE ⁱ	FLOOR R-VALUE	BASEMENT ^c WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWL SPACE ^c WALL R-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.32	0.55	0.25	38	20 ^j or 13+5 ^h	8/13	19	5/13 ^f	0	5/13
4 except Marine	0.32	0.55	0.40	49	20 ^j or 13+5 ^h	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.30	0.55	NR	49	20 ^j or 13+5 ^h	13/17	30 ^g	15/19	10, 2 ft	15/19
6	0.30	0.55	NR	49	20 ^j +5 ^h or 13+10 ^h	15/20	30 ^g	15/19	10, 4 ft	15/19
7 and 8	0.30	0.55	NR	49	20 ^j +5 ^h or 13+10 ^h	19/21	38 ^g	15/19	10, 4 ft	15/19

NR = Not Required. For SI: 1 foot = 304.8 mm.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.

b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

Exception: In Climate Zones 1 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

c. "10/13" means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation on the interior of the basement wall. "15/19" means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. Alternatively, compliance with "15/19" shall be R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home.

d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation *R*-value for slabs, as indicated in the table. The slab edge insulation for heated slabs shall not be required to extend below the slab.

e. There are no SHGC requirements in the Marine Zone.

f. Basement wall insulation is not required in warm-humid locations as defined by Figure R301.1 and Table R301.1.

g. Alternatively, insulation sufficient to fill the framing cavity and providing not less than an *R*-value of R-19.

h. The first value is cavity insulation, the second value is continuous insulation. Therefore, as an example, "13+5" means R-13 cavity insulation plus R-5 continuous insulation.

- i. Mass walls shall be in accordance with Section R402.2.5. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.
- j. R-18 insulation shall be permitted in place of the R-20 requirement provided that the wall framing factor is 20% or less of exterior walls having 24 inch on center nominal vertical stud spacing.

Reason: This proposal is an energy neutral change based on calculations from ASHRAE. Insulation that is R-19 that is compressed in a 2 x 6 wall with stud spacing at 24 o.c. performs like R-18. The ASHRAE Handbook of Fundamentals and ASHRAE Transaction 1995 Volume 101, Part 2 assumes that wood framed walls have a framing factor of 25%. Meaning 25 percent of the wall area consists of structural framing members and the remainder of the wall is a cavity suitable for installing insulation. When calculating the U-factor for a wall assembly, a high framing factor increases the overall assembly U-Factor. Reducing the framing factor will also provide an increase in the thermal performance of the wall. This proposal provides an option for a thermally equivalent tradeoff for 2x6 wall assemblies which have reduced framing factors and insulation performing like a R-18 insulator.

Below are the calculations showing equal U-Factors for both assemblies (0.060).

Wall Thermal Resistance by Component	2x6 Wall R-20 25%FF (16" o.c.)			2x6 Wall R-18 20% FF		
	R-Value Studs	R-Value Cavity	Assembly U-Factor	R-Value Studs	R-Value Cavity	Assembly U-Factor
Wall - Outside Winter Air Film ^A	0.17			0.17		
Siding - Vinyl ^A	0.62			0.62		
Continuous Insulation	0			0		
OSB - 7/16 ^A	0.62			0.62		
SPF Stud/Cavity Insulation	6.875	20		6.875	18	
1/2" Drywall ^A	0.45			0.45		
Inside Air Film ^A	0.68			0.68		
Studs at 16" o.c. ^A	25%	75%		20%	80%	
Total Wall R-Values	9.42	22.54		9.42	20.54	
Total Wall U-Factor	0.106	0.044	0.060	0.106	0.049	0.060

^A2009 ASHRAE Handbook of Fundamentals

Enemodal, 2001. Characterization of Framing Factors for Low-Rise Residential Building Envelopes (904-RP). Final Report prepared for ASHRAE, Atlanta, GA (USA)

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal will offer an optional way for compliance, by allowing a framing and insulation alternative to what is currently in the code without reducing the overall efficiency.

Proposal # 4290

RE40-19

RE41-19

IECC: TABLE R402.1.2 (IRC N1102.1.2), TABLE R402.1.4 (IRC N1102.1.4)

Proponent: Jeff Inks, Window & Door Manufacturers Association, representing Window and Door Manufacturers Association (jinks@wdma.com); Jennifer Hatfield, representing American Architectural Manufacturers Association (jen@jhatfieldandassociates.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.1.2 (IRC N1102.1.2)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT***

CLIMATEZONE	FENESTRATIONU-FACTOR ^{b,j}	SKYLIGHT ^b U-FACTOR	GLAZEDFENESTRATION SHGC ^{b, e}	CEILINGR-VALUE	WOODFRAME WALLR-VALUE	MASSWALLR-VALUE ⁱ	FLOORR-VALUE	BASEMENT ^c WALLR-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWLSPACE ^e WALLR-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.32	0.55	0.25	38	20 or 13+5 ^h	8/13	19	5/13 ^f	0	5/13
4 except Marine	0.32	0.55	0.40	49	20 or 13+5 ^h	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.30	0.55	NR	49	20 or 13+5 ^h	13/17	30 ^g	15/19	10, 2 ft	15/19
6	0.30	0.55	NR	49	20+5 ^h or 13+10 ^h	15/20	30 ^g	15/19	10, 4 ft	15/19
7 and 8	0.30	0.55	NR	49	20+5 ^h or 13+10 ^h	19/21	38 ^g	15/19	10, 4 ft	15/19

NR = Not Required. For SI: 1 foot = 304.8 mm.

a. *R*-values are minimums. U-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.

b. The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

Exception: In Climate Zones 1 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

c. "10/13" means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation on the interior of the basement wall. "15/19" means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. Alternatively, compliance with "15/19" shall be R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home.

d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation *R*-value for slabs, as indicated in the table. The slab edge insulation for heated slabs shall not be required to extend below the slab.

e. There are no SHGC requirements in the Marine Zone.

f. Basement wall insulation is not required in warm-humid locations as defined by Figure R301.1 and Table R301.1.

g. Alternatively, insulation sufficient to fill the framing cavity and providing not less than an *R*-value of R-19.

h. The first value is cavity insulation, the second value is continuous insulation. Therefore, as an example, "13+5" means R-13 cavity insulation plus R-5 continuous insulation.

i. Mass walls shall be in accordance with Section R402.2.5. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.

j. A maximum U-factor of 0.32 shall apply in Climate Zone Marine 4 and Climate Zones 5 through 8 to vertical fenestration products installed in buildings located:

1. Above 4000 feet in elevation above sea level, or

2. In windborne debris regions where protection of openings is required under Section R301.2.1.2 of the International Residential Code.

**TABLE R402.1.4 (IRC N1102.1.4)
EQUIVALENT *U*-FACTORS^a**

CLIMATEZONE	FENESTRATIONU-FACTOR ^d	SKYLIGHTU-FACTOR	CEILINGU-FACTOR	FRAMEWALLU-FACTOR	MASS WALLU-FACTOR ^b	FLOORU-FACTOR	BASEMENTWALLU-FACTOR	CRAWLSPACE WALLU-FACTOR
1	0.50	0.75	0.035	0.084	0.197	0.064	0.360	0.477
2	0.40	0.65	0.030	0.084	0.165	0.064	0.360	0.477
3	0.32	0.55	0.030	0.060	0.098	0.047	0.091 ^c	0.136
4 except Marine	0.32	0.55	0.026	0.060	0.098	0.047	0.059	0.065
5 and Marine 4	0.30	0.55	0.026	0.060	0.082	0.033	0.050	0.055
6	0.30	0.55	0.026	0.045	0.060	0.033	0.050	0.055
7 and 8	0.30	0.55	0.026	0.045	0.057	0.028	0.050	0.055

a. Nonfenestration *U*-factors shall be obtained from measurement, calculation or an approved source.

b. Mass walls shall be in accordance with Section R402.2.5. Where more than half the insulation is on the interior, the mass wall *U*-factors shall not exceed 0.17 in Climate Zone 1, 0.14 in Climate Zone 2, 0.12 in Climate Zone 3, 0.087 in Climate Zone 4 except Marine, 0.065 in Climate Zone 5 and Marine 4, and 0.057 in Climate Zones 6 through 8.

c. In warm-humid locations as defined by Figure R301.1 and Table R301.1, the basement wall *U*-factor shall not exceed 0.360.

d. A maximum U-factor of 0.32 shall apply in Climate Zone Marine 4 and Climate Zones 5 through 8 to vertical fenestration products installed in buildings located:

1. Above 4000 feet in elevation above sea level, or
2. In windborne debris regions where protection of openings is required under Section R301.2.1.2 of the International Residential Code.

Reason: High altitude products generally require breather or capillary tubes in the insulating glass unit to allow pressure equalization when the products are transported to higher elevations for installation. The pressure equalization is necessary to avoid breakage. However, the tubes eliminate the ability to use gas fills commonly used to achieve higher levels of thermal performance. Meanwhile, windborne debris protection requirements for fenestration are typically met by the use of laminated glass which reduces the gap width in the insulating glass unit and thus the thermal performance. This footnote provides a reasonably limited and needed exception for products installed above 4000 ft above sea level in climate zones Marine4 zones 5-8, and for products that must meet windborne debris protection requirements.

Cost Impact: The code change proposal will decrease the cost of construction

This will avoid the need for costly redesign of products, e.g., larger frame sizes for impact resistant fenestration, or the need for fenestration products to be installed above 4000 ft to be manufactured in a location above 4000 ft.

Proposal # 5382

RE41-19

RE42-19

IECC: R402.2.1 (IRC N1102.2.1), R402.2.2 (IRC N1102.2.2)

Proponent: Darren Meyers, P.E., IECC_LLCC representing the National Roofing Contractors Association, representing the National Roofing Contractors Association (dmeyers@ieccode.com)

2018 International Energy Conservation Code

Revise as follows:

R402.2.1 (IRC N1102.2.1) Ceilings with attic spaces. Where Section R402.1.2 requires R-38 insulation in the ~~ceiling attic~~, installing R-30 over 100 percent of the ~~ceiling attic~~ area requiring insulation shall satisfy the requirement for R-38 wherever the full height of uncompressed R-30 insulation extends over the wall top plate at the eaves. Where Section R402.1.2 requires R-49 insulation in the ~~ceiling attic~~, installing R-38 over 100 percent of the ~~ceiling attic~~ area requiring insulation shall satisfy the requirement for R-49 insulation wherever the full height of uncompressed R-38 insulation extends over the wall top plate at the eaves. This reduction shall not apply to the *U*-factor alternative approach in Section R402.1.4 and the Total UA alternative in Section R402.1.5.

R402.2.2 (IRC N1102.2.2) Ceilings without ~~attics~~ attic spaces. Where Section R402.1.2 requires insulation *R*-values greater than R-30 in the ~~ceiling~~ interstitial space above a ceiling and below the structural roof deck and the design of the roof/ceiling assembly does not allow sufficient space for the required insulation, the minimum required insulation *R*-value for such roof/ceiling assemblies shall be R-30. Insulation shall extend over the top of the wall plate to the outer edge of such plate and shall not be compressed. This reduction of insulation from the requirements of Section R402.1.2 shall be limited to 500 square feet (46 m²) or 20 percent of the total insulated ceiling area, whichever is less. This reduction shall not apply to the *U*-factor alternative approach in Section R402.1.4 and the Total UA alternative in Section R402.1.5.

Reason: This code change proposal is intended to provide clarity consistent with roofing terminology used every day by roofing industry- and design-professionals across the country.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. There is no cost implication aligned with this proposal. Rather, it is an exercise steeped in clarification and consistency across the ICC Family of International Codes.

Proposal # 5274

RE42-19

RE43-19

IECC: R103.2 (IRC N1101.5), R202 (IRC N1101.6), R401.2.2 (IRC N1101.13.2) (New), R401.2.2.1 (N1101.13.2.2.1) (New), R405.4.2 (IRC N1105.4.2)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

R103.2 (IRC N1101.5) Information on construction documents. Construction documents shall be drawn to scale on suitable material. Electronic media documents are permitted to be submitted where *approved* by the *code official*. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the *building*, systems and equipment as herein governed. Details shall include the following as applicable:

1. Insulation materials and their *R*-values.
2. Fenestration *U*-factors and *solar heat gain coefficients* (SHGC).
3. Area-weighted *U*-factor and *solar heat gain coefficients* (SHGC) calculations.
4. Mechanical system design criteria.
5. Mechanical and service water-heating systems and equipment types, sizes and efficiencies.
6. Equipment and system controls.
7. Duct sealing, duct and pipe insulation and location.
8. Air sealing details.
9. Batch sampling plan (where applicable)

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Add new definition as follows:

BATCH SAMPLING. Verification of energy code requirements when fewer than 100 percent of every dwelling or dwelling unit, within a sampled project are inspected, tested, or modeled for compliance.

Add new text as follows:

R401.2.2 (IRC N1101.13.2) Batch sampling. Batch sampling to determine energy code compliance shall only be allowed for stacked multiple-family dwelling unit projects within the same subdivision or community.

Exceptions:

1. Where sampling of energy compliance items for other than sections R402.4 and R403.3.3, an approved sampling plan shall be included in the construction documents and approved by the code official.
2. Where sampling is proposed for other than stacked multiple-family dwelling unit projects, an approved sampling plan shall be included in the construction documents and approved by the code official.

R401.2.2.1 (N1101.13.2.2.1) Sampling process. The sampling process shall follow these steps.

1. After five consecutive dwellings or dwelling units demonstrate compliance with the code without an incidence of failure, then only one dwelling or dwelling unit in subsequent batches of five dwelling units is required to demonstrate compliance through testing and inspection.
2. The remaining four units in the sampling batch shall be considered to be in compliance with the code when the one sampled unit in the batch of five dwelling units has demonstrated compliance.
3. Where the one dwelling or dwelling unit tested and inspected in the batch of five fails to demonstrate compliance with the code then that unit and 3 consecutive dwellings or dwelling units shall demonstrate compliance without incidence of failure before batch sampling is allowed to continue.

Exception: An *approved* sampling plan shall be used as an alternative to Section R401.2.2.1.

Revise as follows:

R405.4.2 (IRC N1105.4.2) Compliance report. Compliance software tools shall generate a report that documents that the *proposed design* complies with Section R405.3. A compliance report on the *proposed design* shall be submitted with the application for the building permit. Upon completion of the building, a compliance report based on the as-built condition of the building shall be submitted to the *code official* before a certificate of occupancy is issued. ~~Batch sampling of buildings to determine energy code compliance shall only be allowed for stacked multiple-family units.~~ Compliance reports shall include information in accordance with Sections R405.4.2.1 and R405.4.2.2. Where the *proposed design* of a building could be built on different sites where the cardinal orientation of the building on each site is different, compliance of the *proposed design* for the purposes of

the application for the building permit shall be based on the worst-case orientation, worst-case configuration, worst-case *building* air leakage and worst- case duct leakage. Such worst-case parameters shall be used as inputs to the compliance software for energy analysis.

Reason: Currently, sampling is only addressed within the Simulated Performance Path section R405 of the IECC. It states, "Batch sampling of *buildings* to determine energy code compliance shall only be allowed for stacked multiple-family units." Narrowing the allowance for sampling to stacked multi-family units makes a lot of sense but narrowing sampling to only the Simulated Performance path does not. This proposal broadens the ability to sample dwelling units regardless of the pathway used to navigate the IECC.

In researching this proposal, it became evident that sampling means something different to the code compliance community than it does to the verification and builder program community. My discussions with the code compliance community indicated that they believe that sampling is only a tool that is used for lessening the requirement of blower door and duct leakage testing every permitted dwelling unit. The verification and builder program community, on the other hand, uses sampling to verify compliance of any requirement of compliance. Therefore, this proposal states that sampling used for anything other than blower door or duct leakage testing must have a sampling plan submitted at permitting that is approved by the authority having jurisdiction. In this way, it is ultimately up to the jurisdiction to determine their comfort level with the use of sampling for other code compliance feature and building types than diagnostic testing and stacked multi-family dwelling units.

Currently, the code does not define in any way what sampling means. The second half of this proposal defines the minimum requirements for sampling, which not only offers guidance to the jurisdiction for what to expect but also offers a baseline for which to assess the merits of submitted sampling plans which may be submitted to potentially broaden the scope of what could be sampled.

In specific markets, such as Phoenix Arizona, sampling is a common occurrence and in others, it never occurs. This proposal ensures that regardless of where it is used that there is a common understanding of what it is and how it can be used for code compliance in comparison to compliance with programs such as EnergyStar or LEED for homes.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

It is not clear how to assess the cost impact of a proposal like this as it depends completely on the quality of the installation of the code required item. If everything passes inspection the first time it can save money due to requiring fewer inspections, but if something fails it must be tested 3 more times and it could increase cost. The most important aspect of the proposal is not associated with cost it is associated with the ability to use sampling regardless of the compliance path chosen.

Proposal # 4805

RE43-19

RE44-19

IECC: R402.2.3 (IRC N1102.2.3)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

R402.2.3 (IRC N1102.2.3) Eave baffle. For air-permeable insulations in vented attics, a baffle shall be installed adjacent to soffit and eave vents. Baffles shall maintain ~~an~~ a net free area opening equal or greater than the size of the vent. The baffle shall extend over the top of the attic insulation. The baffle shall be permitted to be any solid material. The baffle shall be installed to the outer edge of the exterior wall top plate so as to provide maximum space for attic insulation coverage over the top plate. Where soffit venting is not continuous, baffles shall be installed continuously to prevent ventilation air in the eave soffit from bypassing the baffle.

Reason: The objective of the attic eave baffles is to provide a continuous pathway for air flow from the eave vent to the ridge or pot vent located higher up on the roof without allowing air to migrate through the insulation that is used, thus reducing the insulations ability to retard heat flow. In order to ventilate the attic according to the IRC section R806.2 a minimum net free area is called out. For air to go out of the roof vent air must enter through the eave vent and if the net free area is not equal at the eave vent and the path the air takes from the eave to the roof vent above the insulation, the IRC required ventilation can not occur. Thus, the inclusion of the language “net free area” for the defined ventilation created with the baffle.

In the IECC section R402.2.2 the code states “Insulation shall extend over the top plate of the wall plate to the outer edge of such plate and shall not be compressed.” This section is discussing installation not related R-value requirements that may change depending on the IECC compliance pathway. This proposal adds an installation instruction to better ensure that attic insulation can be installed, as much as possible over, the top plate to achieve the energy savings of the installation.

IRC Section R806.3 states that, “Where eave or cornice vents are installed, blocking, bridging and insulation shall not block the free flow of air.” When air enters non-continuous attic eave vents and fills the eave with air that air travels both through the designated space created by the eave baffles and through the surrounding insulation in adjacent bays. The insulation is slowing or “blocking” the free flow of air that section R806.3 is trying to preserve. In addition, ventilated attics use the depth of the installed insulation to overcome the performance implications of not being able to enclose the insulation on the attic ventilation side. The intrusion of eave vent ventilation into the attic insulation at the drywall plane separating the attic from conditioned space below degrades the ability of the insulation to inhibit the flow of energy and achieve the desired R-value. This proposal uses continuous baffles to better ensure that eave ventilation passes cleanly over the top of all installed insulation bettering the performance of the ventilation system and the installed insulation.

Cost Impact: The code change proposal will increase the cost of construction

Depending on the design of the attic eave ventilation system minimal cost increases could be incurred from requiring the installation of continuous soffit baffles. However, cost of ownership would go down in relationship to the first cost as the ability of the insulation to reduce heat lose would increase.

Proposal # 4800

RE44-19

RE45-19

IECC: R402.2.3 (IRC N1102.2.3)

Proponent: Shaunna Mazingo, City of Westminster, representing Colorado Chapter of ICC Energy Code Development Committee (smozingo@cityofwestminster.us)

2018 International Energy Conservation Code

Revise as follows:

R402.2.3 (IRC N1102.2.3) Eave baffle. (Mandatory) For air-permeable insulations in vented attics, a baffle shall be installed adjacent to soffit and eave vents. Baffles shall maintain an opening equal or greater than the size of the vent. The baffle shall extend over the top of the attic insulation. The baffle shall be permitted to be any solid material.

Reason: Because Section R402.2 Specific Insulation Requirements (Prescriptive), is marked prescriptive R402.2.3 automatically becomes prescriptive but there is no reason that Eave Baffles should be allowed to be traded off. We understand that the SEHPCAC committee is putting forth a proposal to revise all of the prescriptive verses mandatory requirements, which we approve of, but it may not pass, so we are doing this as a back up plan.

Cost Impact: The code change proposal will increase the cost of construction
Truly there should be no cost impact because eave baffles should have always been installed. However, if someone was trading them off there would be a cost for installing a baffle now. The cost is dependent on the material used, it could be as simple as a piece of cardboard. So, the cost would be for the labor.

Proposal # 5312

RE45-19

RE46-19

IECC: R402.2.4 (IRC N1102.2.4) (New), R402.2.4 (IRC N1102.2.4)

Proponent: David Collins, SEHPCAC, representing SEHPCAC (SEHPCAC@iccsafe.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Energy Conservation Code

Add new text as follows:

R402.2.4 (IRC N1102.2.4) Access hatches and doors. Access hatches and doors from conditioned to unconditioned spaces such as attics and crawlspaces shall be insulated to the same level required for the wall or ceiling R-value in Table R402.1.2 in which they are installed.

Exception: Vertical doors providing access from conditioned spaces to unconditioned spaces that comply with the fenestration requirements of Table R402.1.2 based on the applicable climate zone specified in Chapter 3

Revise as follows:

~~R402.2.4 (IRC N1102.2.4)~~ **R402.2.4.1 (IRC N1102.4.1) Access hatches and doors- doors installation (Mandatory).** Access hatches and doors from conditioned spaces to unconditioned spaces such as attics and crawl spaces shall be ~~weatherstripped and insulated to a level equivalent to the insulation on the surrounding surfaces- weatherstripped.~~ Access that prevents damaging or compressing the insulation shall be provided to all equipment. Where loose-fill insulation is installed, a wood-framed or equivalent baffle or retainer shall be installed to prevent the loose-fill insulation from spilling into the living space when the attic access is opened. The baffle or retainer shall provide a permanent means of maintaining the installed Rvalue of the loose-fill insulation.

~~Exception:~~ Vertical doors providing access from conditioned spaces to unconditioned spaces that comply with the fenestration requirements of Table R402.1.2 based on the applicable climate zone specified in Chapter 3.

Reason: R402.2.4 includes both prescriptive provisions (required insulation levels) and non-tradeable (mandatory) installation specifications. This proposal does not add new requirements; rather, it separates the prescriptive and mandatory provisions into separate sections.

The insulation installation requirements of new Sec. R402.2.4.1 have no value or metric that can be used for modeling purposes; they are non-tradeable (mandatory).

Note that the SEHPCAC has a proposal to eliminate the use of the labels "prescriptive" and "mandatory" in favor of a tabular method of identifying non-tradeable requirements. If that proposal is successful, ICC staff have stated that sections being individually approved to be labeled as 'mandatory' will instead have their respective section numbers added to the new C407.2 table of requirements that are non-tradeable in the performance path.

This proposal is submitted by the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx> (<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>)

Cost Impact: The code change proposal will increase the cost of construction

The code change may increase construction costs for a subset of buildings that may have been designed using the Total Building Performance or EIR compliance methods that included did not include weatherstripping or baffles around the applicable hatches and doors.

Proposal # 4494

RE46-19

RE47-19

IECC: R402.2.4 (IRC N1102.2.4)

Proponent: Stephen Skalko, representing Marwin Company (svskalko@svskalko-pe.com)

2018 International Energy Conservation Code

Revise as follows:

R402.2.4 (IRC N1102.2.4) Access hatches and doors. Access doors from *conditioned spaces* to *unconditioned spaces* such as attics and crawl spaces shall be weatherstripped and insulated to a level equivalent to the insulation on the surrounding surfaces. Access that prevents damaging or compressing the insulation shall be provided to all equipment. Where loose-fill insulation is installed, a wood-framed or equivalent baffle or retainer shall be installed to prevent the loose-fill insulation from spilling into the living space when the attic access is opened. The baffle or retainer shall provide a permanent means of maintaining the installed Rvalue of the loose-fill insulation.

Exception Exceptions:

1. Vertical doors providing access from *conditioned spaces* to *unconditioned spaces* that comply with the fenestration requirements of Table R402.1.2 based on the applicable *climate zone* specified in Chapter 3.
2. In Climate Zones 1 through 4 horizontal pull-down stair-type access hatches in ceiling assemblies that provide access from conditioned to unconditioned spaces shall not be required to comply with the insulation level of the surrounding surfaces provided the hatch meets all of the following:
 - 2.1. The average U-factor of the hatch shall not exceed U-0.10 or have an average insulation R-value less than R-10.
 - 2.2. Not less than 75 percent of the panel area shall have an insulation R-value of at least R-13.
 - 2.3. The net area of the framed opening shall be less than or equal to 13.5 square feet, and
 - 2.4. The perimeter of the hatch edge shall be weatherstripped.

The reduction shall not apply to the U-factor alternative approach in Section R402.1.4 or the total UA alternative in Section R402.1.5.

Reason: A code change similar to this proposal was submitted to the IECC and IRC during the 2016 Group B code cycle (RE50-16). At the Code Action Hearing in Louisville, KY the IECC Code Development Committee (CDC) saw the logic of the proposal and recommended the change for Approval As Submitted. The CDC reason given was:

The practical implications outweigh the minimal loss of insulation R-value. Experience with products that can comply with these requirements is a superior method as compared what has been done in the past and provides for a long-term solution.

Their reason is consistent with our experience that the added insulation requirement in section R402.2.4 (N1102.2.4) is frequently achieved with “field crafted detachable apparatuses”. Unfortunately, over time these are commonly discarded or worse, set aside compressing adjacent ceiling insulation thus defeating the intended benefit. The objective of this proposal is to address this field modification issue and provide for a more permanent installed solution.

During the 2015 ICC code development cycle for the IRC and the IECC an exception was added to the ceiling insulation requirements for vertical doors providing access to attic areas in IECC Section R402.2.4 and IRC Section N1102.2.4. This exception was based on the premise that vertical attic access doors between conditioned and unconditioned spaces can be treated as fenestration. Horizontally positioned attic access hatches are a similar issue. These horizontal hatches are being required to have insulation levels that match the surrounding ceiling which is significantly more stringent than skylight fenestration products located in these same ceiling assemblies.

For example, in Table R402.1.2 (N1102.1.2) Skylights are required to meet a U-factor that ranges from 0.75 in Climate Zone 1 to 0.55 in Climate Zone 8. In addition, Section R402.3.3 (N1102.3.3) allows up to 15 square feet of the fenestration per dwelling unit (which includes skylights) to be exempt from the requirements in Table R402.1.2 N1102.1.2). It does not make sense to require R-30 to R-49 insulation for a pull down stair type access hatch in an insulated ceiling when one can have a skylight up to 15 square feet in area that is exempt from the envelope requirements or that has a U-FACTOR of 0.55-0.75 (less than R-2). Insulating pull down stair access hatches to the levels specified in N1102.2.4 (R402.2.4), compared to the skylights insulation requirements is expensive, and in many cases not practical.

Because affordable, pre-manufactured pull-down stair access systems are not readily available to meet the R-30 to R-49 target field customization of access hatches is sometimes employed to achieve these performance levels. Inspection and verification for compliance becomes a challenge. As noted previously, long term system performance of these field customized entry devices may also vary. Commonly these “field crafted detachable apparatuses” are designed to be removed for attic access and placed on the adjacent attic joists. This results in the insulation being compressed thus reducing its effectiveness. Also providing sufficient air sealing around the hatch that remains durable long term is difficult. Finally, removal of the insulated covers for access may present a safety hazard to service personnel, inspectors and building owners having to stand on ladders while removing the hatches.

Quality standardized manufactured pull down stair systems however provide a safer, permanent access with proven performance for the life of the structure. Factory built energy rated access systems provide consistent air sealing performance and ensure consistent energy performance while helping to maintain air quality through reduced air infiltration.

This proposal provides a solution by permitting a reasonable reduction in the insulation values for pull down stair access hatches that are less than or equal to 13.5 square feet (approximately 30" X 64") in attic ceilings. This maximum size accommodates most manufactured products available. The U-value specified at U-0.10 is less stringent than the U-values specified for the insulated ceilings but is far more stringent than those permitted for skylights in all Climate Zones. Too the size limit is more stringent than that permitted for skylights which can have one unit up to 15 square feet in size exempted from the code requirements while all other skylights are less stringent than the pull down stair assembly proposed. Finally, the proposal also does not allow this reduction to be factored into the U-Factor alternative calculation procedure in R4002.1.4 (N1102.1.4) or the total UA alternative procedure in R402.1.5 (N1102.1.5). This is consistent with the limitations in Section R402.2.1 (N1102.2.1) for ceilings with attic spaces and in Section R402.3.3 (N1102.3.3) for skylights.

Though the previous code change RE50-16 was recommended for approval as submitted a public comment was submitted. At the Public Comment Hearing (PCH) in Kansas City, MO the commenter raised concerns about the impact of such reduced insulation levels in cold climates. The membership overturned the action of the committee and RE50-16 was disapproved.

The intent of this proposal is the same as the original proposal previously approved by the IECC Code Development Committee with two basic improvements.

1. The criteria that horizontal pull-down stair-type access hatches must meet has been formatted in a list format to aid the code user in determining the requirements to be met by this exception.
2. The reduced insulation level for these horizontal pull-down stair-type access hatches is limited to Climate Zones 1-4 in response to previous objections for this exception in cold climates.

Recommend the IECC Code Development Committee again take action to Approve As Submitted.

Cost Impact: The code change proposal will decrease the cost of construction
The reduced cost of field installed apparatuses and insulation will offset the cost of the pull-down stair

Proposal # 5561

RE47-19

RE48-19

IECC: R402.2.4 (IRC N1102.2.4)

Proponent: Shaunna Mozingo, City of Westminster, representing Colorado Chapter of ICC Energy Code Development Committee (smozingo@cityofwestminster.us)

2018 International Energy Conservation Code

Revise as follows:

R402.2.4 (IRC N1102.2.4) Access hatches and doors. (Mandatory) Access doors from *conditioned spaces* to *unconditioned spaces* such as attics and crawl spaces shall be weatherstripped and insulated to a level equivalent to the insulation on the surrounding surfaces. Access that prevents damaging or compressing the insulation shall be provided to all equipment. Where loose-fill insulation is installed, a wood-framed or equivalent baffle or retainer shall be installed to prevent the loose-fill insulation from spilling into the living space when the attic access is opened. The baffle or retainer shall provide a permanent means of maintaining the installed Rvalue of the loose-fill insulation.

Exception: Vertical doors providing access from *conditioned spaces* to *unconditioned spaces* that comply with the fenestration requirements of Table R402.1.2 based on the applicable *climate zone* specified in Chapter 3.

Reason: Because Section R402.2 Specific Insulation Requirements (Prescriptive), is marked prescriptive R402.2.4 automatically becomes prescriptive but there is no reason that Access Hatches and Door Sealing and Insulation level should be allowed to be traded off. We understand that the SEHPCAC committee is putting forth a proposal to revise all of the prescriptive verses mandatory requirements, which we approve of, but it may not pass, so we are doing this as a back up plan.

Cost Impact: The code change proposal will increase the cost of construction

There is no reason that this should increase cost because it's mandatory that you seal the thermal envelope, and you always have to provide insulation in a vented attic, the level just depends on which path you choose. But, people will argue that since it was prescriptive you didn't really have to do it, so there could be a charge for weather stripping and insulation, amount dependent on material used.

Proposal # 5315

RE48-19

RE49-19

IECC: R402.2.4 (IRC N1102.2.4)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

R402.2.4 (IRC N1102.2.4) Access ~~hatches~~ hatch doors and ~~doors~~ insulation retention. ~~Access~~ Vertical or horizontal access doors from conditioned spaces to unconditioned spaces such as attics and crawl spaces shall be weatherstripped and insulated to a level equivalent to the insulation on the surrounding surfaces. Access that prevents damaging or compressing the insulation shall be provided to all equipment. Where loose-fill insulation is installed, a wood-framed or equivalent baffle, retainer, or retainer dam shall be installed to prevent the loose-fill insulation from spilling into the living space ~~when the attic access is opened.~~ from higher to lower sections of the attic, and from attics covering conditioned spaces to unconditioned spaces. The baffle or retainer shall provide a permanent means of maintaining the installed Rvalue of the loose-fill insulation.

Exception: Vertical doors providing access from conditioned spaces to unconditioned spaces that comply with the fenestration requirements of Table R402.1.2 based on the applicable climate zone specified in Chapter 3.

Reason: This section of the code is solely about the installation of insulation in the attic and retaining it in its installed location to ensure that it performs as intended by the manufacturer. The use of wooden or equivalent baffle retainer or insulation dam to hold insulation in place at the attic hatch needs to be expanded to include insulation that is installed in raised ceilings or separating conditioned from unconditioned spaces. The inclusion of additional language to this proposal improves how insulation will perform when installed in these locations.

Cost Impact: The code change proposal will increase the cost of construction. Attention to detail in installation dams and baffles will initially take slightly more labor but will be negligible once methods are in place to do it right the first time. The cost of ownership and cost of builder warranty is lowered.

Proposal # 4799

RE49-19

RE50-19

IECC: R202 (IRC N1101.6), R402.2.5 (IRC N1102.2.5)

Proponent: Felix Zemel, representing ICC Region 6 -- North East Regional Coalition (felix@pracademicsolutions.com); Peter Zvingilas, ICC Region 6- North East Regional Coalition, Town of Groton and Voluntown CT (pzvingilas@voluntown.gov)

2018 International Energy Conservation Code

Revise as follows:

R402.2.5 (IRC N1102.2.5) Mass walls. Mass walls where used as a component of the *building thermal envelope* shall be one of the following:

1. Above-ground walls of concrete block, concrete, insulated concrete form, masonry cavity, brick but not brick veneer, adobe, compressed earth block, rammed earth, solid timber, mass timber, or solid logs.
2. Any wall having a heat capacity greater than or equal to 6 Btu/ft² ● °F (123 kJ/m² ● K).

Add new definition as follows:

MASS TIMBER Structural elements of Type IV construction primarily of solid, built-up, panelized or engineered wood products that meet minimum cross-section dimensions of Type IV construction, as defined in the *International Building Code*

Reason: This new term, as approved in the 2018 Group A Code Hearings for the IBC, adds a new type of construction into the residential provisions of the IECC. By adding this definition, the subsequent definitions of mass walls can be updated to include mass walls. Addition of mass timber into the prescriptive list of materials that are considered mass walls will make it possible for any material meeting the IBC definition of mass timber to be used without additional testing for heat capacity.

Cost Impact: The code change proposal will decrease the cost of construction

By adding mass timber into the prescriptive list of materials constituting a mass wall, builders will be able to use mass timber for building envelope features without requiring additional testing for heat capacity of the material. By saving on this testing, the cost of construction is expected to decrease.

Proposal # 4765

RE50-19

RE51-19

IECC: TABLE R402.2.5 (IRC N1102.2.6)

Proponent: Jonathan Humble, American Iron and Steel Institute, representing American Iron and Steel Institute (Jhumble@steel.org)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.2.6 (IRC N1102.2.6)
STEEL-FRAME CEILING, WALL AND FLOOR INSULATION R-VALUES**

WOOD FRAME R-VALUE REQUIREMENT	COLD-FORMED STEEL-FRAME EQUIVALENT R-VALUE ^a
Steel Truss Ceilings ^b	
R-30	R-38 or R-30 + 3 or R-26 + 5
R-38	R-49 or R-38 + 3
R-49	R-38 + 5
Steel Joist Ceilings ^b	
R-30	R-38 in 2 x 4 or 2 x 6 or 2 x 8 R-49 in any framing
R-38	R-49 in 2 x 4 or 2 x 6 or 2 x 8 or 2 x 10
Steel-Framed Wall, 16 inches on center	
R-13	R-13 + 4.2 or R-21 + 2.8 or R-0 + 9.3 or R-15 + 3.8 or R-21 + 3.1
R-13 + 3	R-0 + 11.2 or R-13 + 6.1 or R-15 + 5.7 or R-19 + 5.0 or R-21 + 4.7
<u>R-13+5</u>	<u>R-0+15 or R-13+9 or R-15+8.5 or R-19+8 or R-21+7</u>
<u>R-13+10</u>	<u>R-0+20 or R-13+15 or R-15+14 or R-19+13 or R-21+13</u>
R-20	R-0 + 14.0 or R-13 + 8.9 or R-15 + 8.5 or R-19 + 7.8 or R-19 + 6.2 or R-21 + 7.5
R-20 + 5	R-13 + 12.7 or R-15 + 12.3 or R-19 + 11.6 or R-21 + 11.3 or R-25 + 10.9
R-21	R-0 + 14.6 or R-13 + 9.5 or R-15 + 9.1 or R-19 + 8.4 or R-21 + 8.1 or R-25 + 7.7
Steel Framed Wall, 24 inches on center	
R-13	R-0 + 9.3 or R-13 + 3.0 or R-15 + 2.4
R-13 + 3	R-0 + 11.2 or R-13 + 4.9 or R-15 + 4.3 or R-19 + 3.5 or R-21 + 3.1
<u>R-13+5</u>	<u>R-0+15 or R-13+7.5 or R-15+7 or R-19+6 or R-21+6</u>
<u>R-13+10</u>	<u>R-0+20 or R-13+13 or R-15+12 or R-19+11 or R-21+11</u>
R-20	R-0 + 14.0 or R-13 + 7.7 or R-15 + 7.1 or R-19 + 6.3 or R-21 + 5.9
R-20 + 5	R-13 + 11.5 or R-15 + 10.9 or R-19 + 10.1 or R-21 + 9.7 or R-25 + 9.1
R-21	R-0 + 14.6 or R-13 + 8.3 or R-15 + 7.7 or R-19 + 6.9 or R-21 + 6.5 or R-25 + 5.9
Steel Joist Floor	
R-13	R-19 in 2 x 6, or R-19 + 6 in 2 x 8 or 2 x 10
R-19	R-19 + 6 in 2 x 6, or R-19 + 12 in 2 x 8 or 2 x 10

- a. The first value is cavity insulation *R*-value, the second value is continuous insulation *R*-value. Therefore, for example, “R-30+3” means R-30 cavity insulation plus R-3 continuous insulation.
- b. Insulation exceeding the height of the framing shall cover the framing.

Reason: Commenter’s Reason: This proposal expands the listing for cold-formed steel equivalent *R*-values in order to coordinate with Tables R402.1.2 and N1102.1.2 entitled “Insulation and Fenestration Requirements by Component”.

History and Selection of Methodology: The RESCheck methodology was originally selected for determining equivalency since its methodology for calculating wood and steel framed *U*-factors has served as the basis for *U*-factor calculations of these assemblies since the publication of the 2004 IECC Supplement Edition. This approach was again used for consistency in this code change proposal.

Details of Calculations and Assumptions: The *U*-factors from Tables R402.1.4 (and N1102.1.4) for wood framed walls were used as the benchmark to determine the equivalent insulation (Cavity and continuous) *R*-values for cold-formed steel framing. The cold-formed steel framed walls at 16” o.c. and 24” o.c. were then calculated where cavity and exterior insulation were added in order to achieve near equivalent *U*-factors as

for wood framed wall assemblies. This resulted in R-values and U-factors for cold-formed steel framed walls that can be considered comparable to wood wall assemblies.

In addition to the above modification, we are also proposing the deletion of the R-19+6.2 assembly configuration for the Wood 16 O/C category R-20. After a re-analysis we found that the U-factor is higher than the wood assembly U-factor comparison sufficient enough to recommend its departure.

Conclusion: Adopting the proposed modifications is intended to provide related prescriptive for cold-formed steel framed assembly options consistent with the options listed for wood framed assemblies in the opaque thermal envelope tables.

Bibliography: Bartlett, R., Connell, L.M., Gowri, K., Lucas, R.G., Schultz, R.W., Taylor, Z.T., Wilberg, J.D., "Methodology for Developing the REScheck Software through Version 4.4.3", U.S. Department of Energy, Washington, DC, contracted through the Pacific Northwest National Laboratory, Richland, WA, September 2012.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This section provides information that was not previously set forth in the code, and does not change the requirements of current code, thus there is no cost impact when compared with present requirements.

Proposal # 4026

RE51-19

RE52-19

IECC: R402.2.7 (IRC N1102.2.7)

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Delete without substitution:

~~**R402.2.7 Walls with partial structural sheathing.** Where Section R402.1.2 requires continuous insulation on exterior walls and structural sheathing covers 40 percent or less of the gross area of all exterior walls, the required continuous insulation R-value shall be permitted to be reduced by an amount necessary, but not more than R-3 to result in a consistent total sheathing thickness on areas of the walls covered by structural sheathing. This reduction shall not apply to the U-factor alternative in Section R402.1.4 and the Total UA alternative in Section R402.1.5.~~

Reason: The purpose of this code change proposal is to improve efficiency by eliminating an unnecessary prescriptive exception to the wall insulation requirements. The IECC currently allows an exception to the otherwise reasonable wall insulation requirements, which results in decreased energy efficiency in up to 40% of the wall area without any corresponding improvements elsewhere in the building.

We do not believe it is appropriate to weaken the code simply because of a design choice made by the builder, even if it is a common construction practice. Given the broad range of trade-off options available through the Total UA path, DOE's REScheck software, the performance path, and the Energy Rating Index, we believe it is no longer necessary to carve out specific exceptions like this when an energy-neutral trade-off could easily be performed in one of these alternative paths.

Cost Impact: The code change proposal will increase the cost of construction

Construction costs could be increased for the subset of homes that might have taken advantage of this exception in the prescriptive path because it will require the installation of insulation sufficient to meet the R-value requirement in Table R402.1.2. However, this change will not increase costs for homes built to all other compliance paths in the IECC, since the footnote exception already does not apply to those homes. We believe the elimination of this exception will provide homeowners with the superior energy and cost-savings they expect from a code-compliant home.

Proposal # 4014

RE52-19

RE53-19

IECC R402.2.8(N 1102.2.8)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com); Shaunna Mozingo (sdmozingo@shaunnamozingo.com)

2018 International Energy Conservation Code

SECTION R402 BUILDING THERMAL ENVELOPE

Revise as follows:

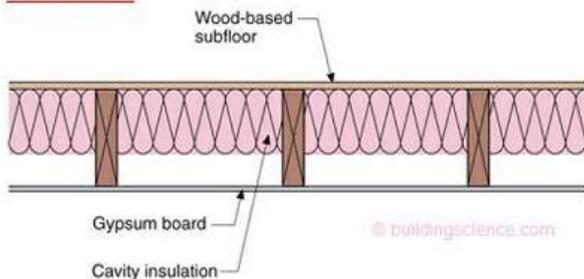
R402.2.8 (N1102.2.8) Floors. Floor framing cavity insulation shall comply with one of the following:

1. Insulation shall be installed to maintain permanent contact with the underside of the subfloor decking in accordance with manufacturer instructions to maintain required R-value or readily fill the available cavity space.
2. Floor framing cavity insulation shall be permitted to be in contact with the top side of sheathing separating the cavity and the unconditioned space below. Insulation shall extend from the bottom to the top of all perimeter floor framing members and the framing members shall be air sealed.
3. A combination of cavity and continuous insulation shall be installed so that the cavity insulation is

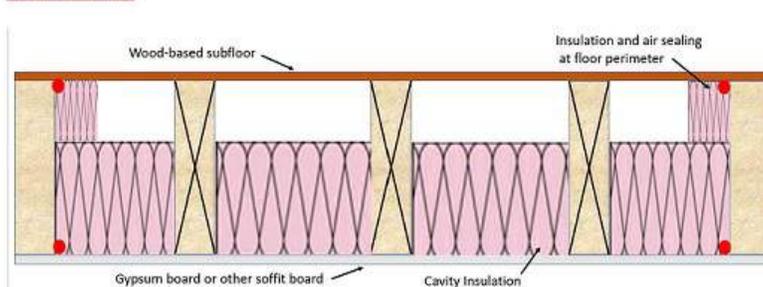
Exception: ~~As an alternative, the floor framing cavity insulation shall be in contact with the top side top-side of sheathing or the continuous insulation that is installed on the bottom side underside of the floor framing where combined with insulation that meets or exceeds the minimum wood frame wall R-value in Table R402.1.2 and that extends separating the cavity and the unconditioned space below. The combined R-value of the cavity and continuous insulation shall equal the required R-value for floors. Insulation shall extend from the bottom to the top of all perimeter floor framing members. members and the framing members shall be air sealed.~~

Reason: With the introduction of the exception in this section of the code in the 2015 IECC, it has become exceedingly difficult to not only understand what installations are allowed but how to explain and enforce what is allowed. This revision of the language does not change how insulation in floor systems are currently allowed to be installed but clarifies and simplifies the language. To better understand the requirements, I have included the diagrams below:

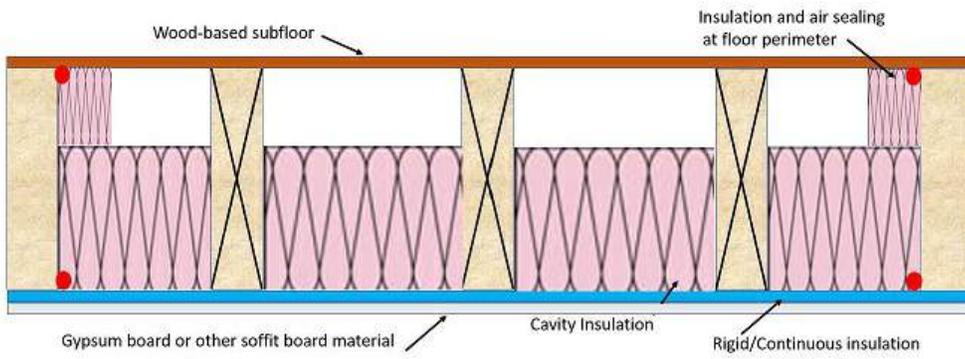
Installation #1



Installation #2



Installation #3



Cost Impact: The code change proposal will not increase or decrease the cost of construction. There is not cost impact associated with this proposal as all installations are currently allowed in the IECC.

Proposal # 5263

RE53-19

RE54-19

IECC: R402.2.9 (IRC N1102.2.9)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

R402.2.9 (IRC N1102.2.9) Basement walls. Walls associated with conditioned basements shall be insulated from the top of the ~~basement wall~~ down to 10 feet (3048 mm) below grade or to the basement floor, whichever is less. ~~Walls associated with unconditioned basements shall comply with this requirement except where the floor overhead is insulated in accordance with Sections R402.1.2 and R402.2.8; comply with the following requirements:~~

1. Basement walls that define the *building thermal envelope* shall be insulated. The R-value shall be in accordance with the compliance path that is defined at the time of obtaining the building permit. Unconditioned basements shall comply with the floor insulation requirements of Section R402.2.8.
2. Unfinished basement walls that define the *building thermal envelope* shall have insulation that is permanently fastened to the wall. The insulation shall cover the exposed portion of the top of the foundation wall not covered by the sill plate, and extend downward to the finished floor below.
3. Finished basement walls that define the *building thermal envelope* shall be insulated with material that fully fills the framed stud cavity of the finished wall or material that upon installation fully fills the available space. A 1 in. (25 mm) gap is allowed between the framed cavity and insulation, and the concrete foundation wall. Insulation shall be installed between framed bottom plates and the foundation floor when floating walls are used. Insulation shall be installed at the top of the foundation wall not covered by the sill plate.

Reason: This section of the code defines required installation requirements of the code that are not defined by manufacturer instructions. Since the section does not define R-value requirements requirement #1 defines that the R-value installed needs to be in accordance with the compliance path that is used. Requirement #2 is specific to installation requirements for unfinished basement walls and requirement #3 is specific to installation requirements for finished basement walls. All requirements ensure that if the basement wall defines the *building thermal envelope* it is completely insulated and that there are no thermal bypasses allowed in the installation.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

There is no cost impact associated with this code proposal as it only clarifies the existing installation requirements of the code that are not adequately defined in the current section of the code

Proposal # 4798

RE54-19

RE55-19

IECC: R402.2.9 (IRC N1102.2.9)

Proponent: Darren Meyers, P.E., International Energy Conservation Consultants LLC, representing Self (dmeyers@ieccode.com)

2018 International Energy Conservation Code

Revise as follows:

R402.2.9 (IRC N1102.2.9) Basement walls. Walls associated with conditioned basements shall be insulated from the top of the *basement wall* down to 10 feet (3048 mm) below grade or to the basement floor, whichever is less. Walls associated with unconditioned basements shall comply with this requirement except where:

1. the floor overhead, including the underside stairway stringer leading to the basement, is insulated in accordance with Sections R402.1.2 and applicable provisions of R402.2, and R402.2.8.
2. there are no uninsulated duct, domestic hot water, or hydronic heating surfaces exposed to the basement, and
3. there are no HVAC supply or return diffusers serving the basement, and
4. the walls surrounding the stairway and adjacent to conditioned space are insulated in accordance with Sections R402.1.2 and applicable provisions of R402.2, and
5. the door(s) leading to the basement from conditioned spaces are insulated in accordance with Sections R402.1.2 and applicable provisions of R402.2, and weatherstripped in accordance with Section R402.4, and
6. the building thermal envelope separating the basement from adjacent conditioned spaces complies with Section R402.4.

Reason: It is outrightly false to presume that the simple act of insulating the floor over the basement absolves one from considering the basement an extension of "conditioned space." This proposal offers an outline of the appropriate characteristics that must be present in order to "willfully and knowingly" remove a basement from consideration as an extension of "conditioned space."

Cost Impact: The code change proposal will increase the cost of construction

One has to presume that if the entirety of the country and affected territories were utilizing the provisions of Section R402.2.9 "as written," that the code change proposed would increase the cost of construction. Our belief is that a significant majority of the country enforcing the 2018 IECC has a level of sophistication consistent with the concepts of thermal and pressure boundaries proposed. As such, we believe, the code change proposal will not increase the cost of construction.

Proposal # 5460

RE55-19

RE56-19

IECC: R402.2.9 (IRC N1102.2.9)

Proponent: donald sivigny, State of MN, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Energy Conservation Code

Revise as follows:

R402.2.9 (IRC N1102.2.9) Basement walls. Walls associated with conditioned basements shall be insulated from the top of the *basement wall* down to 10 feet (3048 mm) below grade or to the basement floor top of footing, whichever is less. Foundation insulation shall be installed in accordance with the manufacturer's instructions. Walls associated with unconditioned basements shall comply with this requirement except where the floor overhead is insulated in accordance with Sections R402.1.2 and R402.2.8.

Reason: The language in the IECC requirement is revised by replacing the phrase "or to the basement floor" with "or to the top of the footing." The top of the footing is lower than the basement floor. This modification is necessary because the foundation system must be protected from heat loss beyond the top the basement floor system. By providing insulation to the top of the footing, heat loss at the intersection of the concrete floor and the foundation wall is reduced. This heat loss can create durability and moisture issues at the Foundation wall which will encourage mold growth. The section is further amended by adding a sentence that states, "Foundation insulation shall be installed according to the manufacturer's installation instructions." This additional requirement is necessary because if the manufacturer's instructions are not followed, the product may not perform as it is intended.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code (Section R303.2) currently requires products to be installed in accordance with the manufacturer's instructions. The proposal simply reinforces the requirement to ensure that the insulation performs as intended. As such, no additional materials or installation labor are necessary.

Proposal # 5129

RE56-19

RE57-19

IECC: R402.4.1.1 (IRC N1102.4.1.1)

Proponent: Aaron Gary, representing Self (aaron.gary@texenergy.org)

2018 International Energy Conservation Code

Revise as follows:

R402.4.1.1 (IRC N1102.4.1.1) Installation. The components of the *building thermal envelope* as indicated in Table R402.4.1.1 shall be installed in accordance with Grade I as defined by RESNET/ICC 301 Appendix A, the manufacturer's instructions and the criteria indicated in Table R402.4.1.1, as applicable to the method of construction. Where required by the *code official*, an *approved* third party shall inspect all components and verify compliance.

Reason: Unlike the ERI path, the Prescriptive and Performance path assume that envelope insulation is always installed as intended. Pointing only to the manufacturer's instructions however makes this very hard to manage for contractors and code officials as there is no central repository of manufacturer's instructions for them to easily reference nor do they usually have time to read more than what is clearly and simply stated in the Code. Supplementing the manufacturer's installation instructions with something that is easy for all involved to reference and developed for ICC 700 (an ANSI approved standard that many of the insulation manufacturer's contributed to) would greatly increase the ease of use of the Code. Usable and understandable Code would lead to better installations and enforcement. The end result then would not be predicted savings (as models already assume a near perfection which is rarely achieved in real life) but actual energy savings to the end user, i.e. the home owner or apartment dweller.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
If the manufacturer's instructions are already being met, then this code proposal will not increase or decrease the cost of construction.

Proposal # 4560

RE57-19

RE58-19

IECC: TABLE R402.4.1.1 (IRC N1102.4.1.1)

Proponent: Shaunna Mazingo, City of Westminster, representing Colorado Chapter of ICC Energy Code Development Committee (smazingo@cityofwestminster.us)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.4.1.1 (IRC N1102.4.1.1)
AIR BARRIER AND INSULATION INSTALLATION^a**

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of framed walls shall be insulated by completely filling the cavity with a material having a thermal resistance, R-value, of not less than R-3 per inch. Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between framing and skylights, and the jambs of windows and doors, shall be sealed.	—
Rim joists	Rim joists shall include the air barrier.	Rim joists shall be insulated.
Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing; and shall extend from the bottom to the top of all perimeter floor framing members.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	Crawl space insulation, where provided instead of floor insulation, shall be permanently attached to the walls.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.	—
Narrow cavities	—	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	—
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be sealed to the finished surface.	Recessed light fixtures installed in the building thermal envelope shall be air tight and IC rated.
Plumbing and wiring	—	In exterior walls, batt insulation shall be cut neatly to fit around wiring and plumbing, or insulation, that on installation readily conforms to available space, shall extend behind piping and wiring.

Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.	Exterior walls adjacent to showers and tubs shall be insulated.
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical and communication boxes. Alternatively, air-sealed boxes shall be installed.	—
HVAC register boots	HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	—
Concealed sprinklers	Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	—

- a. Inspection of log walls shall be in accordance with the provisions of ICC 400.

Reason: The redundancy in this requirement for continuous air barrier makes this section confusing. The thermal envelope is already the exterior wall so it doesn't make sense to have that verbiage inserted here, so we are removing it along with the redundant statement.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. We are just removing redundant language.

Proposal # 5318

RE58-19

RE59-19

IECC: R402.2.9 (IRC N1102.2.9) (New), R402.2.9 (IRC N1102.2.9)

Proponent: David Collins, SEHPCAC, representing SEHPCAC (SEHPCAC@iccsafe.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Energy Conservation Code

Add new text as follows:

R402.2.9 (IRC N1102.2.9) Basement Walls Basement walls shall be insulated in accordance with Table R402.1.2.

Exception: Basement walls associated with unconditioned basements where the floor overhead is insulated in accordance with Sections R402.1.2 and R402.2.8.

Revise as follows:

~~R402.2.9 (IRC N1102.2.9) R402.2.9.1 (IRC N1102.2.9.1) Basement walls insulation installation (Mandatory).~~ ~~Walls associated with conditioned basements. Where basement walls are insulated, the insulation shall be insulated installed from the top of the basement wall down to 10 feet (3048 mm) below grade or to the basement floor, whichever is less. Walls associated with unconditioned basements shall comply with this requirement except where the floor overhead is insulated in accordance with Sections R402.1.2 and R402.2.8.~~

Reason: R402.2.9 includes both prescriptive provisions (required insulation levels) and non-tradeable (mandatory) installation specifications. This proposal does not add new requirements; rather, it separates the prescriptive and mandatory provisions into separate sections.

The insulation installation requirements of new Sec. R402.2.9.1 have no value or metric that can be used for modeling purposes; they are non-tradeable (mandatory).

Note that the SEHPCAC has a proposal to eliminate the use of the labels "prescriptive" and "mandatory" in favor of a tabular method of identifying non-tradeable requirements. If that proposal is successful, ICC staff have stated that sections being individually approved to be labeled as 'mandatory' will instead have their respective section numbers added to the new C407.2 table of requirements that are non-tradeable in the performance path.

This proposal is submitted by the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx> (<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>)

Cost Impact: The code change proposal will increase the cost of construction

The code change may increase construction costs for a subset of buildings that may have been designed using the Total Building Performance or EIR compliance methods that did not follow the basement wall insulation installations provisions contained in this section.

Proposal # 4495

RE59-19

RE60-19

IECC: R402.2.10, R402.2.10.1 (IRC N1102.2.10.1) (New)

Proponent: David Collins, SEHPCAC, representing SEHPCAC (SEHPCAC@iccsafe.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Energy Conservation Code

Revise as follows:

R402.2.10 (IRC N1102.2.10) Slab-on-grade floors. Slab-on-grade floors with a floor surface less than 12 inches (305 mm) below grade shall be insulated in accordance with Table R402.1.2. ~~The insulation shall extend downward from the top of the slab on the outside or inside of the foundation wall. Insulation located below grade shall be extended the distance provided in Table R402.1.2 by any combination of vertical insulation, insulation extending under the slab or insulation extending out from the building. Insulation extending away from the building shall be protected by pavement or by not less than 10 inches (254 mm) of soil. The top edge of the insulation installed between the exterior wall and the edge of the interior slab shall be permitted to be cut at a 45-degree (0.79 rad) angle away from the exterior wall.~~

Exception: Slab-edge insulation is not required in jurisdictions designated by the *code official* as having a very heavy termite infestation.

Add new text as follows:

R402.2.10.1 (IRC N1102.2.10.1) Slab-on-grade floor insulation installation (Mandatory) Where installed, the insulation shall extend downward from the top of the slab on the outside or inside of the foundation wall. Insulation located below grade shall be extended the distance provided in Table R402.1.2 by any combination of vertical insulation, insulation extending under the slab or insulation extending out from the building. Insulation extending away from the building shall be protected by pavement or by not less than 10 inches (254 mm) of soil. The top edge of the insulation installed between the exterior wall and the edge of the interior slab shall be permitted to be cut at a 45-degree (0.79 rad) angle away from the exterior wall.

Reason: R402.2.10 includes both prescriptive provisions (insulation levels) and non-tradeable (mandatory) installation specifications, plus an embedded exception for termite infestations.

This proposal does not add new requirements; rather, it separates the prescriptive and mandatory provisions into separate sections and clarifies the exception to required insulation in jurisdictions designated by the code official as having a very heavy termite infestation.

The insulation installation requirements of new Sec. R402.2.10.1 have no value or metric that can be used for modeling purposes; they are non-tradeable (mandatory).

Note that the SEHPCAC has a proposal to eliminate the use of the labels "prescriptive" and "mandatory" in favor of a tabular method of identifying non-tradeable requirements. If that proposal is successful, ICC staff have stated that sections being individually approved to be labeled as 'mandatory' will instead have their respective section numbers added to the new C407.2 table of requirements that are non-tradeable in the performance path.

This proposal is submitted by the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx> (<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>)

Cost Impact: The code change proposal will increase the cost of construction

The code change may increase construction costs for a subset of buildings that may have been designed using the Total Building Performance or EIR compliance methods that included slab on grade with insulation installed not in accordance with the provisions of this section.

Proposal # 4496

RE60-19

RE61-19

IECC: R402.2.11 (IRC N1102.2.11)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

R402.2.11 (IRC N1102.2.11) Crawl space walls. As an alternative to insulating floors over crawl spaces, crawl space walls shall be insulated provided that the crawl space is not vented to the outdoors. Crawl space wall insulation shall be permanently fastened to the wall and shall extend downward from the floor to the finished grade elevation and then vertically or horizontally for not less than an additional 24 inches (610 mm): sill plate on top of the crawlspace wall to the floor of the crawlspace. Exposed earth in unvented crawl space foundations shall be covered with a continuous Class I vapor retarder in accordance with the International Building Code or International Residential Code , as applicable. Joints of the vapor retarder shall overlap by 6 inches (153 mm) and be sealed or taped. The edges of the vapor retarder shall extend not less than 6 inches (153 mm) up stem walls and shall be attached and sealed to the stem walls.

Reason: The foundation of an unvented conditioned crawlspace must be insulated to have a continuous building thermal envelope. It is less clear if the floor of the crawlspace needs to be insulated. However, what is known is that the extension of the wall insulation 24" horizontally over the dirt or vapor retarder on the dirt floor inside the crawlspace is not being enforced with any regularity. When using the Ekotrope or REMRate modeling software to demonstrate compliance with the cost compliance report used in Section R405 it is easy to demonstrate no value associated with the 24" of extended insulation. The crawlspace dirt floor is 3-5 feet below grade and it is not required to be insulated fully. Similarly, there is no requirement to insulate the concrete floor in a basement that is eight feet below grade. If there were a requirement there would be countless arguments regarding the cost-effectiveness of the insulation. This proposal aims to take the 24" extension of insulation out of the code in order to fully focus on insulating the portion of the foundation that is associated with the majority of the heat loss or gain.

On the other side of the equation, when portions of concrete foundation walls are not insulated such as the top of the foundation adjacent to the sill plate it is easy to demonstrate value for the installation of insulation. IR camera imaging, as well as Ekotrope and REMRate modeling, can demonstrate the impact of small portions of uninsulated building thermal envelope.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

Would be cost saving associated with this proposal as the 24" extension of insulation over the floor of the crawlspace would be removed as a requirement from the code while asking for a small portion of insulation to be installed at the top of the foundation wall.

Proposal # 4795

RE61-19

RE62-19

IECC: R402.2.11 (IRC N1102.2.11) (New), R402.2.11 (IRC N1102.2.11)

Proponent: David Collins, SEHPCAC, representing SEHPCAC (SEHPCAC@iccsafe.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Energy Conservation Code

Add new text as follows:

R402.2.11 (IRC N1102.2.11) Crawl space walls. Crawl space walls shall be insulated in accordance with Table R402.1.2.

Exception: Crawl space walls associated with a crawlspace that is vented to the outdoors and the floor overhead is insulated in accordance with Sections R402.1.2 and R402.2.8.

Revise as follows:

~~R402.2.11 (IRC N1102.2.11)~~ R402.2.11.1 (IRC N1102.2.11.1) Crawl space walls: walls insulation installation (Mandatory). ~~As an alternative to insulating floors over crawl spaces, crawl space walls shall be insulated provided that the crawl space is not vented to the outdoors. Crawl~~ Where crawl space wall insulation is installed, it shall be permanently fastened to the wall and shall extend downward from the floor to the finished grade elevation and then vertically or horizontally for not less than an additional 24 inches (610 mm). Exposed earth in unvented crawl space foundations shall be covered with a continuous Class I vapor retarder in accordance with the International Building Code or International Residential Code, as applicable. Joints of the vapor retarder shall overlap by 6 inches (153 mm) and be sealed or taped. The edges of the vapor retarder shall extend not less than 6 inches (153 mm) up stem walls and shall be attached to the stem walls.

Reason: Originally drafted as one section, the language included both prescriptive provisions (insulation levels) and mandatory insulation installation, and an embedded exception. This proposal does not add new requirements, it separates the prescriptive and mandatory provisions as well as the exception.

This proposal is submitted by the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx> (<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>)

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The code change may increase construction costs for a subset of buildings that may have been designed using the Total Building Performance or EIR compliance methods that included slab on grade with insulation installed not in accordance with the provisions of this section.

Proposal # 4698

RE62-19

RE63-19

IECC: R402.2.14 (IRC N1102.2.14) (New)

Proponent: John Woestman, representing Extruded Polystyrene Foam Association (jwoestman@kellenccompany.com)

2018 International Energy Conservation Code

Add new text as follows:

R402.2.14 (IRC N1102.2.14) Airspaces. Where the thermal properties of airspaces are used to comply with this code in accordance with Section R401.2, such airspaces shall be enclosed in an unventilated cavity constructed to minimize air-flow into and out of the enclosed air space. Airflow shall be deemed minimized when the enclosed airspace is located on the interior side of the continuous air-barrier and is bounded on all sides by building components.

Exception: The thermal resistance of airspaces located on the exterior side of the continuous air barrier and adjacent to and behind the exterior wall-covering material shall be determined in accordance with ASTM C1363 modified with an airflow entering the bottom and exiting the top of the airspace at an air movement rate of not less than 70 mm/second.

Reason: This proposal is identical to requirements for airspaces added to the 2018 IECC-C (Section 402.2.7). It also is consistent with ASHRAE 90.1-2016 (Section A9.4.2) which was the basis for IECC-C Section 402.2.7. These provisions will ensure that the R-value of airspaces are properly accounted for when used as an optional means of energy code compliance.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposal provides needed requirements for the additional and optional use of airspaces as a supplemental means of energy code compliance.

This proposal may add an option that's currently not in the code.

Proposal # 5239

RE63-19

RE64-19

IECC: R402.2.14 (IRC N1102.2.14) (New)

Proponent: Jay Crandell, P.E., ARES Consulting / ABTG, representing Foam Sheathing Committee of the American Chemistry Council

2018 International Energy Conservation Code

Add new text as follows:

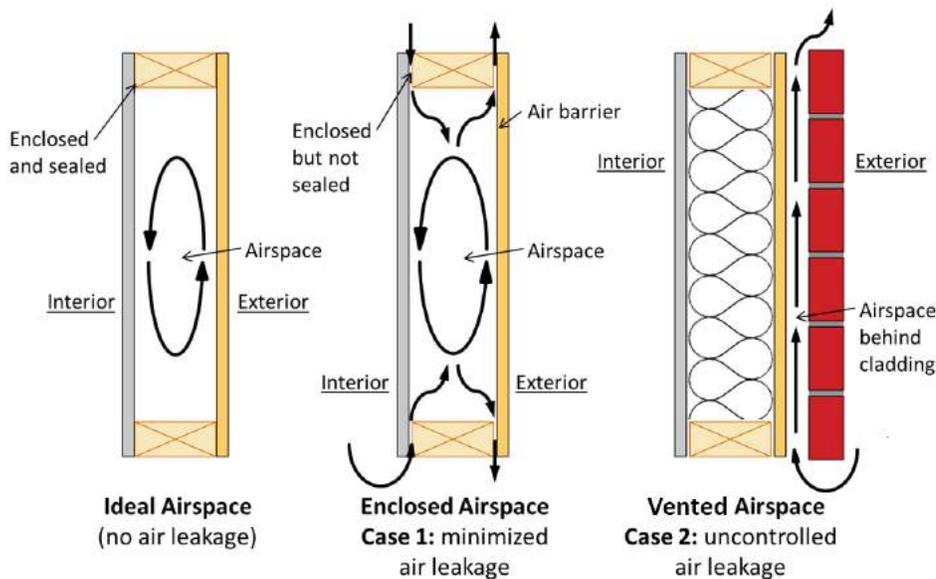
R402.2.14 (IRC N1102.2.14) Airspaces Where the R-value of an airspace is used for compliance in accordance with Section R401.2, the airspace shall be located on the interior side of the continuous air barrier and bounded on all sides by building components.

Exception: Alternative airspace conditions and means of determining R-value shall be permitted in accordance with Section C402.2.7.

Reason: This proposal coordinates the residential provisions with the prescriptive “deemed-to-comply” requirements for airspaces added to the 2018 IECC-C (Section 402.2.7). These requirements also are consistent with and based on ASHRAE 90.1-2016 (Section A9.4.2). They are applicable to both commercial and residential buildings because the thermal behavior of airspaces in assemblies doesn’t depend on building occupancy or use. Therefore, it is appropriate to consistently address airspace requirements in the IECC-R when their thermal resistance (R-value) is used as a means for compliance through the prescriptive, performance, or ERI approach of Section R401.2. An exception is provided to give flexibility for alternative airspace configurations or solutions based on the provisions (and exception) in Section C402.2.7 of the IECC-Commercial provisions.

For background on why these provisions were added to the 2018 IECC-C and also are needed in the IECC-R, the following explanation is provided. The R-values of airspaces are based on an assumption of “no air leakage” (see 2013 ASHRAE Handbook of Fundamentals, Chapter 26, Table 3, footnote b). This is illustrated in the figure below as an “ideal airspace”. As a practical matter, however, fully enclosed airspaces located to the interior of an air barrier are permitted to be considered ideal (see Case 1 in figure below). But, many airspace applications are far from “ideal” and are not fully enclosed; see Case 2 in the figure below. Air leakage into and out of an air-space due to ventilation airflow (especially if an intentionally vented airspace as common behind cladding systems) can significantly degrade its R-value, yet there is currently no standard calculation method or test method to account for this impact on an airspace R-value that otherwise is assumed to be “ideal”. This concern has been appropriately addressed in the IECC-C and, therefore, should be consistently applied to the IECC-R.

For additional information regarding performance of different air-space applications and conditions that affect R-value performance, refer to the figure below, a powerpoint at <http://www.appliedbuildingtech.com/content/air-space-r-value>, and the research report referenced in the bibliography.



Bibliography: Evaluation of Reflective and Non-Reflective Airspaces for Energy Code and FTC R-value Rule Compliance, ABTG Research Report No. 1601-02, Applied Building Technology Group, LLC, <http://www.appliedbuildingtech.com/rr/1601-02>

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The use of airspaces for compliance is not a requirement in the code and is therefore optional. This proposal provides for the option to appropriately include the R-value of airspaces which may reduce the cost of construction. For current applications that are using the R-value of airspaces that are not appropriately quantified or constructed, the cost of construction may increase. Thus, the appropriate conclusion is that the proposal may reduce cost, increase cost, or have no impact on cost depending on the specific case.

RE65-19

IECC: R202 (IRC N1101.6), R402.3 (IRC N1102.3) (New), ASTM Chapter 6 (IRC Chapter 44)

Proponent: Amanda Hickman, The Hickman Group, representing Reflective Insulation Manufacturers Association International (amanda@thehickmangroup.com)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Add new definition as follows:

RADIANT BARRIER. A material having a low emittance surface of 0.1 or less installed in building assemblies.

Add new text as follows:

R402.3 (IRC N1102.3) Radiant barriers (Mandatory). Where installed to reduce thermal radiation, *radiant barriers* shall be installed in accordance with ASTM C1743.

Add new standard(s) as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken PA 19428-2959

ASTM C1743: Standard Practice for Installation and Use of Radiant Barrier Systems (RBS) in Residential Building Construction

Reason: This proposal DOES NOT require the use of radiant barriers. But rather requires that WHEN radiant barriers are used, they comply with the appropriate ASTM standard. Furthermore this proposal provides important information to the code user and code enforcement community regarding radiant barriers.

Radiant barriers follow two ASTM Standards – ASTM C1313/C1313M, "Standard Specification for Sheet Radiant Barriers for Building Construction Applications," and ASTM C1743, "Standard Practice for Installation and Use of Radiant Barrier Systems (RBS) in Residential Building Construction".

The definition for "Radiant Barrier" was approved in the last cycle and is included in the 2015 IBC.

The proposed language is being included in this section specifically because the American Society for Testing and Materials (ASTM) classifies radiant barriers as thermal insulation. The ASTM committee C16 on Thermal Insulation includes published standards for this product. Subcommittee C16.21 deals specifically with reflective products, which include reflective insulation, radiant barrier and interior radiation control coatings. C16.21 develops standards and practices for these reflective building material thermal insulating products.

The Federal Trade Commission includes radiant barrier products in "**CFR Part 460 Labeling and Advertising of Home Insulation: Trade Regulation Rule**".

Radiant barrier products include a surface with an emittance of 0.1 or less that is installed in roof assemblies or attics with the low-emittance surface facing an open or ventilated air space. The low emittance material can be bonded to plastic film, woven fabric, reinforced paper, OSB or plywood. The thermal performance of radiant barriers depends on emittance and location in the attic, wall or roof assembly. Radiant barriers are predominantly installed in attic spaces below the roof deck. The low-emittance surface of radiant barrier products dramatically reduces the heat gain by radiation into the structure and attic HVAC ducts. For this reason, radiant barriers are especially effective in warm sunny climates where they provide reduced use of air conditioning. Radiant barrier products that are available include single-sheet material, multi-layer assemblies and wood sheathing with attached aluminum film or foil. The single sheet material is installed in roof assemblies by attaching directly to the roof deck, in between the rafters or trusses or to the underside of the rafters or trusses. The foil-faced sheathing is installed with the low-emittance side of the sheathing or panel facing toward the attic space to create a radiant barrier. Attic radiant barriers are in extensive use. These products have been on the market for several decades and are used by 87 of the top 100 US Builders. They have an established history and have been accepted into several regional code requirements. Over one billion square feet of the product is being installed annually.

Many state and jurisdictional codes already include references on radiant barriers. These are the state and city codes that include radiant barrier:

IBC: 2018 Section 1509 Radiant Barriers Installed Above Deck

Hawaii

Chapter 181 of Title 3, 2015, Section 407.2, Table 407.1

Texas

The Code of the City of Austin, Texas, Supplement 134-2018, Chapter 25-12, Article 12, Section R402.6

Florida

2017 Florida Building Code, Energy Conservation, 6th Edition

Section 405.7.1 Installation Criteria for homes claiming the radiant barrier option

Figure R405.7.1 Acceptable attic radiant barrier configurations

Table R303.2.1 Insulation Installation Standards

California

Title 24, 2016, Part 6, Subchapter 1, Definition Radiant Barrier

Title 24, 2016, Part 6, Subchapter 2, Section 110.8 Mandatory requirements for insulation, roofing products, and radiant barriers

Title 24, 2016, Part 6, Subchapter 8, Section 150.1 (c), Prescriptive standards / component packages

Title 24, 2016, Reference Residential Appendices, Radiant Barriers

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal will not increase the cost of construction because it only adds informational language regarding radiant barriers.

Proposal # 4482

RE65-19

RE66-19

IECC: TABLE R402.4.1.1 (IRC N1102.4.1.1)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.4.1.1 (IRC N1102.4.1.1)
AIR BARRIER, AIR SEALING, AND INSULATION INSTALLATION^a**

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	<p>The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier shall be air sealed.</p> <p>Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be <u>air sealed in a manner that does not interfere with its accessibility.</u></p>	<p>The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.</p> <p>All access hatches and doors shall be installed in accordance with Section R402.2.4</p> <p><u>Raised vertical or diagonal surfaces that are greater than 1' foot in height into the ventilated attic shall be insulated in accordance with the knee wall provisions.</u></p> <p><u>Raised vertical or diagonal surfaces that are 1 foot or less in height into a ventilated attic shall be buried with insulation to maintain the ceilings R-value.</u></p> <p><u>Eave Baffles shall be installed in accordance with Section R402.2.3</u></p>
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, R-value, of not less than R-3 per inch. Exterior thermal envelope insulation for frame walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between framing and skylights, and the jamb of windows and doors, shall be sealed.	—
Rim joists	Rim joists shall include the air barrier.	Rim joists shall be insulated.
Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing; and shall extend from the bottom to the top of all perimeter floor framing members.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	Crawl space insulation, where provided instead of floor insulation, shall be permanently attached to the walls.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.	—
Narrow cavities	—	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.

Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	—
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be sealed to the finished surface.	Recessed light fixtures installed in the building thermal envelope shall be air tight and IC rated.
Plumbing and wiring	—	In exterior walls, batt insulation shall be cut neatly to fit around wiring and plumbing, or insulation, that on installation readily conforms to available space, shall extend behind piping and wiring.
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.	Exterior walls adjacent to showers and tubs shall be insulated.
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical and communication boxes. Alternatively, air-sealed boxes shall be installed.	—
HVAC register boots	HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	—
Concealed sprinklers	Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	—

a. Inspection of log walls shall be in accordance with the provisions of ICC 400.

Reason: Air barrier and air sealing criteria section:

- Air sealing measures are called out so the table column should incorporate air sealing in its name as it is different than air barrier.
- We are seeing attic access hatches caulked shut so the included language change is to ensure that access to the attic space is maintained.

Insulation installation criteria section:

- Section references have been incorporated in the proposed language change as code required installation issues have been defined in those sections of the code. The problem from an implementation perspective is that the defined installation is in the prescriptive section of the code. So, does the code intend for attic eave baffles to be traded off or not installed if a home uses R405 or R406 compliance paths? I don't believe so. Therefore, the inclusion of section references ensures enforcement language and that the section becomes mandatory for all pathways in the code as it should be.
- Raised ceiling that penetrate into the attic space are particularly difficult to insulate. The guidance given by the proposed language helps those in the field identify particularly difficult areas to insulate, as well as, guidance on how to successfully meet the code requirement.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposed language does not increase the cost of construction but rather offers guidance and clarity of existing requirements.

Proposal # 5347

RE66-19

RE67-19

IECC: TABLE R402.4.1.1 (IRC N1102.4.1.1)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.4.1.1 (IRC N1102.4.1.1)
AIR BARRIER AND INSULATION INSTALLATION^a**

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	<p>A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier.</p> <p><u>The building's thermal envelope shall contain a continuous air barrier that is in alignment with the insulation on the conditioned and unconditioned side of the assembly.^b</u></p> <p><u>All penetrations breaks or joints in the air barrier assembly shall be air sealed.</u></p>	<p>Air-permeable insulation shall not be used as an air sealing material.</p> <p><u>Air-permeable insulation shall be enclosed inside the air barrier assembly^b.</u></p> <p><u>Verification or certification of insulation installation shall be in accordance with Section R303</u></p>
Ceiling/attic	The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, R-value, of not less than R-3 per inch. Exterior thermal envelope insulation for frame walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between framing and skylights, and the jambs of windows and doors, shall be sealed.	—
Rim joists	Rim joists shall include the air barrier.	Rim joists shall be insulated.
Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing; and shall extend from the bottom to the top of all perimeter floor framing members.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	Crawl space insulation, where provided instead of floor insulation, shall be permanently attached to the walls.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.	—
Narrow cavities	—	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	—
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be sealed to the finished surface.	Recessed light fixtures installed in the building thermal envelope shall be air tight and IC rated.

Plumbing and wiring	—	In exterior walls, batt insulation shall be cut neatly to fit around wiring and plumbing, or insulation, that on installation readily conforms to available space, shall extend behind piping and wiring.
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.	Exterior walls adjacent to showers and tubs shall be insulated.
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical and communication boxes. Alternatively, air-sealed boxes shall be installed.	—
HVAC register boots	HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	—
Concealed sprinklers	Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	—

- a. Inspection of log walls shall be in accordance with the provisions of ICC 400.
- b. Air barrier and Insulation full enclosure is not required in unconditioned/ventilated attic spaces and at rim joists.

Reason: Air barrier and air sealing criteria section:

- This code change proposal is intended to offer clarification to this section of table R402.4.1.1 for those in the field that use it to build homes that are compliant with the air testing requirements of the IECC. In the 2018 IECC definitions section, air barriers and building thermal envelope were changed to recognize that the air barrier and building thermal envelope are an assembly of things not necessarily one component of the building. See definitions below. By removing poor language regarding continuous air barriers this section has been focused to better define the alignment of the air barrier and thermal barrier. In addition, it offers definition for other requirements in the table for installing an interior air barrier in location like behind a tub.
 - **AIR BARRIER.** One or more materials joined together in a continuous manner to restrict or prevent the passage of air through the *building thermal envelope* and its assemblies.
 - **BUILDING THERMAL ENVELOPE.** The *basement walls, exterior walls, floors, ceiling, roofs* and any other *building element assemblies* that enclose *conditioned space* or provide a boundary between *conditioned space* and exempt or unconditioned space.
- Air sealing measures are called out so the table column should incorporate air sealing in its name as it is different than air barrier.

Insulation Installation Criteria:

- Manufactures of air permeable insulation have begun to recognize that their installation literature must incorporate language and pictures showing that air permeable insulation must be enclosed inside of air barrier assemblies. This table promotes this installation instruction in location such as behind tubs, on attic knee walls, etc. Therefore, the general section should begin with an overarching statement that states how air permeable insulation shall be installed.
- See attached PDF insulation installation instructions from NAIMA

A footnote has been added to ensure a common understanding that insulation installed in a ventilated attic and at the rim joist is not required to be enclosed within an air barrier assembly. The new footnote is necessary as the item it is associated with defines the installed alignment between air barriers and air permeable insulation within building cavity installation, i.e. walls and floor cavities.

Using references to other sections of the code enables reinforcement of what is required. In this case, the reference is to certificates that document the R-values of the material installed which must be created and posted.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposed language does not increase the cost of construction but rather offers guidance and clarity of existing requirements.

RE68-19

IECC: TABLE R402.4.1.1 (IRC N1102.4.1.1)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.4.1.1 (IRC N1102.1.1)
AIR BARRIER AND INSULATION INSTALLATION^a**

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, R-value, of not less than R-3 per inch. Exterior thermal envelope insulation for frame walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between framing and skylights, and the jambs of windows and doors, shall be sealed.	—
Rim joists	Rim joists shall include the air barrier.	Rim joists shall be insulated.
Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing; and shall extend from the bottom to the top of all perimeter floor framing members.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	Crawl space insulation, where provided instead of floor insulation, shall be permanently attached to the walls.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.	—
Narrow cavities	—	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	—
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be sealed to the finished surface.	Recessed light fixtures installed in the building thermal envelope shall be air tight and IC rated.

Plumbing and wiring, or other obstructions	All holes created by wiring, plumbing or other obstructions in the air barrier assembly shall be air sealed.	<p>In exterior walls, batt insulation shall be cut neatly to fit around wiring and plumbing, or insulation, that on installation readily conforms to available space, shall extend behind piping and wiring.</p> <p>Insulation shall be installed to fill the available space and surround wiring, plumbing, or other obstructions, unless the required R-value can be met by installing insulation and air barrier systems completely to the exterior side of the obstructions.</p>
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.	Exterior walls adjacent to showers and tubs shall be insulated.
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical and communication boxes. Alternatively, air-sealed boxes shall be installed.	—
HVAC register boots	HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	—
Concealed sprinklers	Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	—

a. Inspection of log walls shall be in accordance with the provisions of ICC 400.

Reason: Component:

- The component section of this table item has been amended to include other obstructions as there are a number of obstructions that end up in insulated building cavities that insulation must be split around so that it fully encloses the obstruction. In this revised section plumbing and wiring become examples of obstructions, but things like gas or HVAC duct works amongst other things now can be included.

Air barrier and air sealing criteria section:

- Although it seems obvious it does need to be stated that holes in the continuous air barrier need to be sealed. This is a specific reminder regarding holes that are created by wiring, plumbing, or other obstruction in cavities need to be air sealed.

Insulation Installation Criteria:

- Insulating around obstructions in building cavities can and may happen with material other than fiberglass batts. This code change proposal opens up the possibility of insulating plumbing in exterior walls, for example, so that the plumbing is not surrounded by insulation but rather completely exposed to the warm side of the cavity.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposed language does not increase the cost of construction, but rather offers guidance and clarity of existing requirements.

RE69-19

IECC: R402.4.1.1 (IRC N1102.4.1.1), TABLE R402.4.1.1 [IRC N1102.4.1.1], TABLE R402.2.4.1.1(2) [IRC N1102.2.4.1.1(2)] (New)

Proponent: Aaron Gary, representing Self (aaron.gary@texenergy.org); Craig Conner, self, representing self (craig.conner@mac.com)

2018 International Energy Conservation Code

Revise as follows:

R402.4.1.1 (IRC N1102.4.1.1) Installation. The components of the *building thermal envelope* as indicated in Table R402.4.1.1 (1) shall be installed in accordance with the manufacturer’s instructions and the criteria indicated in ~~Table R402.4.1.1~~ Tables R402.4.1.1(1) and R402.4.1.1(2), as applicable to the method of construction. Where required by the *code official*, an *approved* third party shall inspect all components and verify compliance.

**TABLE R402.4.1.1(1) [IRC N1102.4.1.1 (1)]
AIR BARRIER AND INSULATION INSTALLATION^a**

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, R-value, of not less than R-3 per inch. Exterior thermal envelope insulation for frame walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between framing and skylights, and the jambs of windows and doors, shall be sealed.	—
Rim joists	Rim joists shall include the air barrier.	Rim joists shall be insulated.
Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing; and shall extend from the bottom to the top of all perimeter floor framing members.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	Crawl space insulation, where provided instead of floor insulation, shall be permanently attached to the walls.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.	—
Narrow cavities	—	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	—
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be sealed to the finished surface.	Recessed light fixtures installed in the building thermal envelope shall be air tight and IC rated.

Plumbing and wiring	—	In exterior walls, batt insulation shall be cut neatly to fit around wiring and plumbing, or insulation, that on installation readily conforms to available space, shall extend behind piping and wiring.
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.	Exterior walls adjacent to showers and tubs shall be insulated.
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical and communication boxes. Alternatively, air-sealed boxes shall be installed.	—
HVAC register boots	HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	—
Concealed sprinklers	Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	—

a. Inspection of log walls shall be in accordance with the provisions of ICC 400.

Add new text as follows:

TABLE R402.2.4.1.1(2) [IRC N1102.2.4.1.1(2)]
GRADE 1 INSULATION INSTALLATION

<u>Inspection is conducted before insulation is covered.</u>
<u>Air-permeable insulation is enclosed on all six sides and is in substantial contact with the sheathing material on one or more sides (interior or exterior) of the cavity. Air permeable insulation in ceilings is not required to be enclosed when the insulation is installed in substantial contact with the surfaces it is intended to insulate.</u>
<u>Cavity insulation uniformly fills each cavity side-to-side and top-to-bottom, without substantial gaps or voids around obstructions (such as blocking or bridging).</u>
<u>Cavity insulation compression or incomplete fill amounts to 2 percent or less, presuming the compressed or incomplete areas are a minimum of 70 percent of the intended fill thickness; occasional small gaps are acceptable.</u>
<u>Exterior rigid insulation has substantial contact with the structural framing members or sheathing materials and is tightly fitted at joints.</u>
<u>Cavity insulation is split, installed, and/or fitted tightly around wiring and other services.</u>
<u>Exterior sheathing is not visible from the interior through gaps in the cavity insulation.</u>
<u>Faced batt insulation is permitted to have side-stapled tabs, provided the tabs are stapled neatly with no buckling, and provided the batt is compressed only at the edges of each cavity, to the depth of the tab itself.</u>
<u>Where properly installed, ICFs, SIPs, and other wall systems that provide integral insulation are deemed in compliance with this section.</u>

Reason: The table above is copied directly from ICC 700-2015.

Unlike the ERI path, the Prescriptive and Performance path assume that envelope insulation is always installed as intended. Pointing only to the manufacturer's instructions however makes this very hard to manage for contractors and code officials as there is no central repository of manufacturer's instructions for them to easily reference nor do they usually have time to read more than what is clearly and simply stated in the Code. Supplementing the manufacturer's installation instructions with something that is easy for all involved to reference and developed for ICC 700 (an ANSI approved standard that many of the insulation manufacturer's contributed to) would greatly increase the ease of use of the Code. Usable and understandable Code would lead to better installations and enforcement. The end result then would not be predicted savings (as models already assume a near perfection which is rarely achieved in real life) but actual energy savings to the end user, i.e. the home owner or apartment dweller.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

If the manufacturer's instructions are already being met, then this code change proposal will not increase or decrease the cost of construction.

RE70-19

IECC: TABLE R402.4.1.1 (IRC N1102.4.1.1)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.4.1.1 (IRC N1102.4.1.1)
AIR BARRIER AND INSULATION INSTALLATION^a**

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, R-value, of not less than R-3 per inch. Exterior thermal envelope insulation for frame walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between framing and skylights, and the jambs of windows and doors, shall be sealed.	—
Rim joists	Rim joists shall include the air barrier.	Rim joists shall be insulated.
Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing; and shall extend from the bottom to the top of all perimeter floor framing members.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	Crawl space insulation, where provided instead of floor insulation, shall be permanently attached to the walls.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.	—
Narrow cavities	—	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	—
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be <u>air sealed to the finished surface</u> in accordance with Section R402.4.5	Recessed light fixtures installed in the building thermal envelope shall be air tight, IC rated, <u>and shall be buried or surrounded with insulation.</u>
Plumbing and wiring	—	In exterior walls, batt insulation shall be cut neatly to fit around wiring and plumbing, or insulation, that on installation readily conforms to available space, shall extend behind piping and wiring.
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.	Exterior walls adjacent to showers and tubs shall be insulated.

Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical and communication boxes. Alternatively, air-sealed boxes shall be installed.	—
HVAC register boots	HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	—
Concealed sprinklers	Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	—

- a. Inspection of log walls shall be in accordance with the provisions of ICC 400.

Reason: Air barrier and air sealing criteria section:

- Recessed lighting fixture air leakage is outlined in the prescriptive section R402.4.5 and clearly describes that this component shall be air sealed. The instruction are not limited to sealing the recessed light to the finished surface, so referencing the requirements of the prescriptive section makes sense. In addition, there is need to ensure that the installation criteria is used when assessing R405 and R406 compliance. The addition of this language does that.

Insulation Installation Criteria:

- The concept of burring or surrounding building components in insulation was introduced last code development cycle. Metal housing of air tight canned lights are conductive and are now required to be manufactured so that insulation can be in continuous contact with them. At least R-30 attic insulation is required in all climate zones which means that the depth of the insulation is greater than the height of the recessed canned light. This additional language ensure that the insulation will be installed to fully cover the top of the cannot just be in contact with the side of the can.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposed language does not increase the cost of construction but rather offers guidance and clarity of existing requirements.

Proposal # 5395

RE70-19

RE71-19

IECC: TABLE R402.4.1.1 (IRC N1102.4.1.1)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.4.1.1 (IRC N1102.4.1.1)
AIR BARRIER AND INSULATION INSTALLATION^a**

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, R-value, of not less than R-3 per inch. Exterior thermal envelope insulation for frame walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between framing and skylights, and the jambs of windows and doors, shall be sealed.	—
Rim joists	Rim joists shall include the air barrier.	Rim joists shall be insulated.
Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing; and shall extend from the bottom to the top of all perimeter floor framing members.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	Crawl space insulation, where provided instead of floor insulation, shall be permanently attached to the walls.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.	—
Narrow cavities	—	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	<u>Insulated portions of the garage separation assembly shall be installed in accordance with Section R303 and R402.2.8</u>
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be sealed to the finished surface.	Recessed light fixtures installed in the building thermal envelope shall be air tight and IC rated.
Plumbing and wiring	—	In exterior walls, batt insulation shall be cut neatly to fit around wiring and plumbing, or insulation, that on installation readily conforms to available space, shall extend behind piping and wiring.
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.	Exterior walls adjacent to showers and tubs shall be insulated.

Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical and communication boxes. Alternatively, air-sealed boxes shall be installed.	—
HVAC register boots	HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	—
Concealed sprinklers	Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	—

- a. Inspection of log walls shall be in accordance with the provisions of ICC 400.

Reason: Insulation Installation Criteria:

- Many in the field that use table R402.4.1.1 as a guide to how to meet the requirements of the codes insulation and air leakage sections. Currently the component section for garage separation is blank on the insulation installation column. Unfortunately, many feel that because the section is blank that there is not a requirement to install insulation in the same manner as any other wall or floor component that separated conditioned and unconditioned space. Therefore, there is need to ensure that the installation criteria is used when assessing R402, R405 and R406 compliance. The addition of this language does that.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposed language does not increase the cost of construction but rather offers guidance and clarity of existing requirements.

Proposal # 5388

RE71-19

RE72-19

IECC: TABLE R402.4.1.1

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.4.1.1 (IRC N1102.4.1.1)
AIR BARRIER AND INSULATION INSTALLATION^a**

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, R-value, of not less than R-3 per inch. Exterior thermal envelope insulation for frame walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between framing and skylights, and the jambs of windows and doors, shall be sealed.	—
Rim joists	Rim joists shall include the air barrier.	Rim joists shall be insulated.
Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing; and shall extend from the bottom to the top of all perimeter floor framing members.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	Crawl space insulation, where provided instead of floor insulation, shall be permanently attached to the walls.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.	—
Narrow cavities	<u>Narrow cavities, of an inch or less, not able to be insulated, shall be air sealed.</u>	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	—
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be sealed to the finished surface.	Recessed light fixtures installed in the building thermal envelope shall be air tight and IC rated.
Plumbing and wiring	—	In exterior walls, batt insulation shall be cut neatly to fit around wiring and plumbing, or insulation, that on installation readily conforms to available space, shall extend behind piping and wiring.
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.	Exterior walls adjacent to showers and tubs shall be insulated.

Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical and communication boxes. Alternatively, air-sealed boxes shall be installed.	—
HVAC register boots	HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	—
Concealed sprinklers	Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	—

a. Inspection of log walls shall be in accordance with the provisions of ICC 400.

Reason: Air barrier and air sealing criteria section:

- Air sealing of these small cavities that connect to the exterior air barrier assembly need to be filled with something. Typically expanding air sealing foam would be used. This added language is in recognition that all narrow cavities cannot be practically insulated so instead they can be air sealed.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposed language does not increase the cost of construction but rather offers guidance and clarity of existing requirements.

Proposal # 5381

RE72-19

RE73-19

IECC: R402.4.1.1 (IRC N1102.4.1.1)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.4.1.1 (IRC N1102.4.1.1)
AIR BARRIER AND INSULATION INSTALLATION^a**

Portions of table not shown remain unchanged.

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening shaft openings, and other similar penetrations to the exterior or unconditioned space shall be <u>air</u> sealed.	<u>Penetrations through the building thermal envelope and what is passed through the penetration, shall not damage or compress the insulation surrounding the penetration.</u>

- a. Inspection of log walls shall be in accordance with the provisions of ICC 400.

Reason: Air barrier and air sealing criteria section:

- There are a number of penetrations that occur through the continuous air barrier assemblies of a home. They are too numerous to list yet some examples are given to create context and additional language was added to ensure that the examples were not thought to be the only penetrations that needs to be sealed.

Insulation Installation Criteria:

- Insulating properly around a penetration and the object that is placed through the penetration in the buildings continuous air barrier assembly and thermal envelop is relatively easy to accomplish when insulation is installed after the penetration has been sealed, but when insulation has been installed first and then a penetration is created damaged insulation often occurs. In either instance this new language points out that insulation still must be installed well regardless.

See attached PDF for pictoral documentation

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposed language does not increase the cost of construction but rather offers guidance and clarity of existing requirements.

Proposal # 5375

RE73-19

RE74-19

IECC: R402.4.1.1 (IRC N1102.4.1.1)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.4.1.1 (IRC N1102.4.1.1)
AIR BARRIER, AIR SEALING, AND INSULATION INSTALLATION^a**

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, R-value, of not less than R-3 per inch. Exterior thermal envelope insulation for frame walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between framing and skylights, and the jambs of windows and doors, shall be sealed.	—
Rim joists	Rim joists shall include the air barrier.	Rim joists shall be insulated.
Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing; and shall extend from the bottom to the top of all perimeter floor framing members.
Crawl space walls, basement walls, and slabs	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder/air barrier in accordance with Section R402.2.11 with overlapping joints taped. A class 1 vapor retarder shall not be installed on the interior side of air permeable insulation in exterior below-grade walls. All penetrations through concrete foundation walls and slabs shall be air sealed.	Crawl space wall insulation installation, where provided instead of floor insulation, shall be permanently attached to the walls installed in accordance with Section R402.2.11. Conditioned basement foundation wall insulation shall be installed in accordance with Section R402.2.9. Slab on grade floor insulation shall be installed in accordance with Section R402.2.10.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.	—
Narrow cavities	—	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	—

Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be sealed to the finished surface.	Recessed light fixtures installed in the building thermal envelope shall be air tight and IC rated.
Plumbing and wiring	—	In exterior walls, batt insulation shall be cut neatly to fit around wiring and plumbing, or insulation, that on installation readily conforms to available space, shall extend behind piping and wiring.
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.	Exterior walls adjacent to showers and tubs shall be insulated.
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical and communication boxes. Alternatively, air-sealed boxes shall be installed.	—
HVAC register boots	HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	—
Concealed sprinklers	Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	—

a. Inspection of log walls shall be in accordance with the provisions of ICC 400.

Reason: Component:

- Currently only crawl space walls are being addressed by this table. Other foundation types such as basement and slabs have components that need to be addressed, thus the proposal to change the title of this component section.

Air barrier and air sealing criteria section:

- The vapor retarder criteria outlined in the prescriptive section R402.2.11 clearly describes how vapor retarders must be installed over the dirt floor of a conditioned crawl space. There is no need to further explain it in this table, but there is need to ensure that the installation criteria is used when assessing R405 and R406 compliance. The addition of this language does that.
- Borrowing from language used in the EnergyStar checklist, I have used this section to ensure that below grade walls are insulated, but do not contain a class 1 vapor retarder that can trap moisture behind them. More vapor permeable materials such as class 2 Kraft faced batts or perforated vinyl or FSK (foil scrim kraft) blankets, as well as, class 3 vapor retarders are allowed. In Colorado we do see class 1 vapor retarders installed in this location and efficiency a building durability issue occur.
- Many feel that concrete foundation walls and slabs are air tight, but we forget that these building assemblies are often penetrated with sump pits, plumbing lines, and the like. These locations must be addressed in order to meet the air leakage requirements of the code.

Insulation Installation Criteria:

- Crawl space insulation installation as outlined in the prescriptive section R402.2.11 clearly describes how insulation must be installed on this component. There is no need to further explain it in this table, but there is need to ensure that the installation criteria is used when assessing R405 and R406 compliance. The addition of this language does that.
- Basement wall insulation installation is outlined in the prescriptive section R402.2.9 and clearly describes how insulation must be installed on this component. However, basement walls were never included as a component of this table. Therefore, there is need to ensure that the installation criteria is used when assessing R405 and R406 compliance. The addition of this language does that.
- Likewise slab insulation is outlined in the prescriptive section R402.2.10 and clearly describes how insulation must be installed on this component. However, slab insulation was never included as a component of this table. Therefore, there is need to ensure that the installation criteria is used when assessing R405 and R406 compliance. The addition of this language does that.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposed language does not increase the cost of construction but rather offers guidance and clarity of existing requirements.

RE75-19

IECC: TABLE R402.4.1.1 (IRC N1102.4.1.1)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.4.1.1 (IRC N1102.4.1.1)
AIR BARRIER, AIR SEALING, AND INSULATION INSTALLATION^a**

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, R-value, of not less than R-3 per inch. Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between framing and skylights, and the jamb of windows and doors, shall be sealed.	—
Rim joists	Rim joists shall include the air barrier.	Rim joists shall be insulated.
Floors, <u>separating conditioned from unconditioned space</u> , including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation. Floor cavity air permeable insulation shall be enclosed inside an air barrier assembly — Floor systems shall be fully air sealed including continuously air sealed at all edge and perimeter rim joist framing members.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing; and shall extend from the bottom to the top of all perimeter floor framing members in accordance with the requirements of Section R402.2.8.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	Crawl space insulation, where provided instead of floor insulation, shall be permanently attached to the walls.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.	—
Narrow cavities	—	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	—
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be sealed to the finished surface.	Recessed light fixtures installed in the building thermal envelope shall be air tight and IC rated.

Plumbing and wiring	—	In exterior walls, batt insulation shall be cut neatly to fit around wiring and plumbing, or insulation, that on installation readily conforms to available space, shall extend behind piping and wiring.
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.	Exterior walls adjacent to showers and tubs shall be insulated.
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical and communication boxes. Alternatively, air-sealed boxes shall be installed.	—
HVAC register boots	HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	—
Concealed sprinklers	Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	—

a. Inspection of log walls shall be in accordance with the provisions of ICC 400.

Reason: Component:

- It needs to be clear that the floor cavities that are being addressed by this table are only floors that separate conditioned from unconditioned space. It is surprising how not all understand this.

Air barrier and air sealing criteria section:

- Floor cavities are wall cavities laid down, therefore, air permeable insulation installed inside the cavity also needs to be enclosed by the air barrier assembly. As the IECC allows alternative insulation techniques for insulating floors as seen in the exceptions detailed in Section R402.2.8 it become more important to ensure that the rim joist of the insulated floor not only get insulated, but is air tight, because the insulation no longer must be installed adjacent to the subfloor decking. The proposed language change brings this to light for builders and trades that are executing the code requirements.

Insulation Installation Criteria:

- The insulation installation criteria outlined in the prescriptive section R402.2.8 clearly describes how insulation in floor systems must be installed. There is no need to further explain it in this table, but there is need to ensure that the installation criteria is used when assessing R405 and R406 compliance. The addition of this language does that.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposed language does not increase the cost of construction but rather offers guidance and clarity of existing requirements.

RE76-19

IECC: TABLE R402.4.1.1 (IRC N1102.4.1.1)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.4.1.1 (IRC N1102.4.1.1)
AIR BARRIER AND INSULATION INSTALLATION^a**

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, R-value, of not less than R-3 per inch. Exterior thermal envelope insulation for frame walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between framing and skylights, and the jambs of windows and doors, shall be sealed.	—
Rim joists	Rim joists shall include the air barrier.	Rim joists shall be insulated.
Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing; and shall extend from the bottom to the top of all perimeter floor framing members.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	Crawl space insulation, where provided instead of floor insulation, shall be permanently attached to the walls.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.	—
Narrow cavities	—	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	—
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be sealed to the finished surface.	Recessed light fixtures installed in the building thermal envelope shall be air tight and IC rated.
Plumbing and wiring	—	In exterior walls, batt insulation shall be cut neatly to fit around wiring and plumbing, or insulation, that on installation readily conforms to available space, shall extend behind piping and wiring.
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.	Exterior walls adjacent to showers and tubs shall be insulated.

Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical and communication boxes. Alternatively, air-sealed boxes shall be installed.	—
HVAC register boots	HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	—
Concealed sprinklers	Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	—
<u>Rooms containing a fuel burning appliance</u>	<u>Rooms containing a fuel burning appliance shall comply with Section R402.4.4</u>	<u>Rooms containing a fuel burning appliance shall be insulated and air sealed in accordance with Section R402.4.4 and the requirements of this table.</u>

a. Inspection of log walls shall be in accordance with the provisions of ICC 400.

Reason: Component Section:

- When added to the IECC, Rooms containing fuel burning appliances defined a new area of the building that defines the separation between conditioned space and unconditioned space (i.e. The Building Thermal Envelope) Therefore, the linkage between the requirements that are listed in the prescriptive section R402.4.4 and table R402.4.1.1 need to be consistently and thoroughly expressed in the code to better ensure compliance.

Air barrier and air sealing criteria section:

- Requirements for rooms containing fuel burning appliance is outlined in the prescriptive section R402.4.4 which clearly describes that this room defines the separation between conditioned space and unconditioned space and shall contain air barriers and be air sealed. However, this requirement is located in the prescriptive section of the code and therefore, there is need to ensure that the installation criteria is used when assessing R405 and R406 compliance. The addition of this language does that.

Insulation Installation Criteria:

- Requirements for rooms containing fuel burning appliance is outlined in the prescriptive section R402.4.4 which clearly describes that this room defines the separation between conditioned space and unconditioned space and shall insulated accordingly like any other assembly adjacent to the exterior of the home. However, this requirement is located in the prescriptive section of the code and therefore, there is need to ensure that the installation criteria is used when assessing R405 and R406 compliance. The addition of this language does that.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposed language does not increase the cost of construction, but rather offers guidance and clarity of existing requirements.

RE77-19

IECC: TABLE R402.4.1.1 (IRC N1102.4.1.1)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

**TABLE R402.4.1.1 (IRC N1102.4.1.1)
AIR BARRIER AND INSULATION INSTALLATION^a**

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, <i>R</i> -value, of not less than R-3 per inch. Exterior thermal envelope insulation for frame walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between framing and skylights, and the jamb of windows and doors, shall be sealed.	—
Rim joists	Rim joists shall include the air barrier.	Rim joists shall be insulated.
Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing; and shall extend from the bottom to the top of all perimeter floor framing members.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	Crawl space insulation, where provided instead of floor insulation, shall be permanently attached to the walls.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.	—
Narrow cavities	—	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	—
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be sealed to the finished surface.	Recessed light fixtures installed in the building thermal envelope shall be air tight and IC rated.
Plumbing and wiring	—	In exterior walls, batt insulation shall be cut neatly to fit around wiring and plumbing, or insulation, that on installation readily conforms to available space, shall extend behind piping and wiring.
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.	Exterior walls adjacent to showers and tubs shall be insulated.
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical and communication boxes. Alternatively, air-sealed boxes shall be installed.	—
HVAC register boots	HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	—

Concealed sprinklers	Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	—
Area Separation Walls	<u>Air sealing measures shall be permitted to be installed on top of approved fire blocking material installed within area separation walls when fire blocking remains visible after air sealing, to limit air infiltration and create an air barrier between conditioned and unconditioned space. Area separation/adiabatic walls shall be considered an exterior wa</u>	<u>Insulation shall fully fill the stud cavity of area separation walls and be installed according to manufacture instructions.</u> <u>A 1" gap is allowed between the cavity insulation/framing and the area separation wall.</u>

- a. Inspection of log walls shall be in accordance with the provisions of ICC 400.

Reason: Component Section:

- The 2009 IECC referenced air sealing common walls between dwelling units and this section of the IECC was removed during the 2012 code development cycle. The removal, however, did not diminish the significance of air leakage within these assemblies either directly from the outside or from unit to attached unit. It is EnergyLogic's experience that town homes that are twice as small as a single family detached home leak twice as much, or more, than the single family home due solely to the area separation wall. Air sealing of this assembly cannot be ignored if our intent is to provide a code that offers a quantifiable amount of energy savings for all single-family dwelling units. This is why this section is being proposed to be added back into the code within this table.

Air barrier and air sealing criteria section:

- In Colorado we are finding success air sealing on top of approved fire blocking material. In this way the fire UL listed fire blocking material, which is usually installed in the same location where one wants to air seal, is not replaced by a non-UL listed material and the true area separation wall has not been disturbed. Take for example shaft liner area separation wall construction. The fire portion of the assembly is usually two layers of 1" thick type X gypsum which creates a two-hour fire separation. The type X gypsum is also an approved fire block that can be installed between the framing that holds the fire area separation wall in place and the two layers of type X gypsum fire area separation wall. The material is installed in the gap to the ventilated attic, between floors, and to the front and back of the dwelling units. When it is air sealed it is still visible and the air sealing does not impair its fire blocking ability.
- The next proposed language in this section of the table states that area separation walls perform like any other exterior wall so if you have a component of this table that is installed adjacent to an area separation wall then it should be installed in accordance with the requirements and guidance of this table. For example, if a tub, drop ceiling, utility box, or knee wall is installed against an area separation wall then it should be installed in accordance with this table as it is outside of the fire rated portion of the assembly yet it ensures the continuity of the interior air barrier portion of the assembly.

Insulation Installation Criteria:

- The importance of installing insulation in accordance with manufacture instructions within area separation walls cannot be overstated. First, there is a significant amount of ambient air moving within the assemblies so it is a myth to believe that an adiabatic assembly has no heat loss or gain. Second the insulation is also used to dampen sound transmission from unit to unit. For these reasons the insulation installation verification must be equally as stringent as it is when observed in other assemblies. The language in this section specifically deals with the cavity insulation and recognizes that the assembly is often designed with a gap between the insulation and the fire rated portion of the assembly.

Go to the following web site to see

<https://www.energy.gov/sites/prod/files/2016/12/f34/BA-ASW-Webinar-2016-12-15.pdf>

DOE Building America

"Air Sealing Best Practices and Code Compliance for Multifamily Area Separation Walls"

National Renewable Energy Laboratory Linh Truong

Pacific Northwest National Laboratory Pam Cole

IBACOS Ari Rapport

EnergyLogic Robby Schwarz

Additional Resource:

<https://basc.pnnl.gov/code-compliance/air-sealing-and-insulating-common-walls-party-walls-multi-family-buildings-code>

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The proposed language does not increase the cost of construction, but rather offers guidance and clarity of existing requirements.

Proposal # 5445

RE77-19

RE78-19

IECC: TABLE R402.4.1.1 (IRC N1102.4.1.1)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.4.1.1 (IRC N1102.4.1.1)
AIR BARRIER AND INSULATION INSTALLATION^a**

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, R-value, of not less than R-3 per inch. Exterior thermal envelope insulation for frame walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between framing and skylights, and the jambs of windows and doors, shall be sealed.	—
Rim joists	Rim joists shall include the air barrier.	Rim joists shall be insulated.
Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing; and shall extend from the bottom to the top of all perimeter floor framing members.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	Crawl space insulation, where provided instead of floor insulation, shall be permanently attached to the walls.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.	—
Narrow cavities	—	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	—
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be sealed to the finished surface.	Recessed light fixtures installed in the building thermal envelope shall be air tight and IC rated.
Plumbing and wiring	—	In exterior walls, batt insulation shall be cut neatly to fit around wiring and plumbing, or insulation, that on installation readily conforms to available space, shall extend behind piping and wiring.
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.	Exterior walls adjacent to showers and tubs shall be insulated.

Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical and communication boxes. Alternatively, air-sealed boxes shall be installed.	—
HVAC register boots	HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	=
Concealed sprinklers	<p>Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.</p>	<p><u>Fire sprinklers installed in locations where they are subject to freezing shall be designed and installed in accordance with Section P2904 or NFPA 13D.</u></p> <p><u>To maintain a contiguous air and thermal barrier it shall be permitted to bury the sprinkler piping in insulation to protect it from freezing.</u></p> <p>-</p> <p><u>To determine the minimum amount of insulation required above the sprinkler line when insulation is also installed below the line use the following formulas:</u></p> <p><u>For cold regions: $R_o = R_i (T_o - 40) / (40 - T_i)$</u></p> <p><u>For hot regions: $R_o = R_i (T_o - 120) / (120 - T_i)$</u></p> <p><u>Where:</u></p> <p><u>T_i = ACCA manual J Conditioned living space Indoor heating or cooling design temperature.</u></p> <p><u>T_o = The lowest/highest recorded temperature of the outdoor, unconditioned attic space.</u></p> <p><u>R_i = The R-value of the insulation used between the tubing and the conditioned living space below.</u></p> <p><u>R_o = The R-value of the insulation used above the tubing.</u></p>

a. Inspection of log walls shall be in accordance with the provisions of ICC 400.

Reason: Currently no insulation installation guidance is offered by table R402.1.1 from concealed sprinklers and the majority of the time sprinkler lines that are installed within the building's thermal envelope or in ventilated unconditioned attics are installed in such a way that dramatically impacts the energy performance of the sections of envelope they are installed in. This is primarily due to installing insulation only on the cold side of the sprinkler line which creates a miss alignment between the insulation and the air barrier. Installation techniques like tenting over the top of the sprinkler line or placing all the insulation to the cold side of the assembly are not part of the insulation manufacturer's installation instructions for any other obstruction in the assembly including water lines.

This proposed language and formula come from Uponor who manufactures a potable water fire sprinkler system that at times gets installed outside the conditioned space of the home. There is no sure way to ensure that the sprinkler line will not freeze regardless of how it is installed if the line is run in unconditioned space, but there are options out there to insulate the line and not damage the overall performance of the building's thermal envelope. The proposal language merely points out the option without making any requirements that the insulation must be installed in a particular fashion. It mirrors the air barrier air sealing column of this section in that it does not attempt to supersede any fire code requirement.

See link for more information: <https://www.uponorpro.com/~media/extranet/files/fire%20safety/aquasafe%20attic%20insulation%20guidelines.ashx?version=062520180239>

Uponor

AquaSAFE™ Attic Insulation Calculator

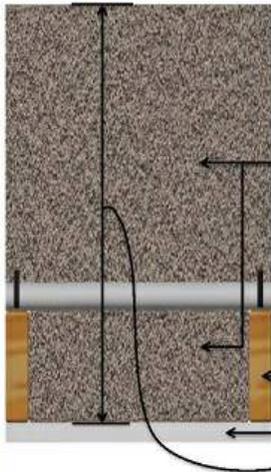
Per Uponor's AquaSAFE™ Attic Insulation Guidelines, the following formula determines the minimum amount of insulation required above AquaPEX™ tubing when insulation is also installed below the tubing.

$$R_o = R_i (T_o - 40) / (40 - T_i)$$

Where,

- T_i = The Temperature of the indoor, conditioned living space.
- T_o = The Temperature of the outdoor, unconditioned attic space
- R_i = The R-value of the insulation between the tubing and the conditioned living space below
- R_o = The R-value of the insulation above the tubing

Change the values in the Red boxes to the specifics of the project.



	<input type="text" value="Cold"/>	Select Climate
R-Value	<input type="text" value="3.13"/>	Select Type of Insulation (if "Other" enter the R value of insulation in the yellow box)
	<input type="text" value="3.5"/>	For "Other" insulation, enter the R-Value per inch of insulation
	<input type="text" value="2x4"/>	Select Type of Bottom Chord Framing
	<input type="text" value="0.56"/>	Select Sheet Rock Thickness
	<input type="text" value="60"/>	(T _i) Enter the Indoor Temperature
	<input type="text" value="0"/>	(T _o) Enter the Lowest/Highest Recorded Temperature
	<input type="text" value="11.515"/>	(R _i) The R-value of the insulation between the tubing and the conditioned living space below
	<input type="text" value="23.03"/>	(R _o) The R-value of the insulation above the tubing
	<input type="text" value="11"/>	Total Depth of Insulation (Inches)

These calculations are used in a scenario where insulation may be installed below and above tubing in cold areas. The parameters reflect a worst case scenario of 60°F indoor air temperature, an outdoor air temperature matching the record low/high of 0°F. A total minimum of 12 inches of insulation in the attic on top of the sheet rock is required to maintain tubing temperature of 40°F in accordance with 9.1.1 of NFPA 13D 2013 edition.

*Not for use to determine insulation requirements of exterior walls.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposed language does not increase the cost of construction, but rather offers guidance and clarity of existing requirements.

RE79-19

IECC: TABLE R402.4.1.1 (IRC N1102.4.1.1)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.4.1.1 (IRC N1102.4.1.1)
AIR BARRIER AND INSULATION INSTALLATION^a**

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, R-value, of not less than R-3 per inch. Exterior thermal envelope insulation for frame walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between framing and skylights, and the jambs of windows and doors, shall be sealed.	—
Rim joists	Rim joists shall include the air barrier.	Rim joists shall be insulated.
Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing; and shall extend from the bottom to the top of all perimeter floor framing members.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	Crawl space insulation, where provided instead of floor insulation, shall be permanently attached to the walls.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.	—
Narrow cavities	—	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	—
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be sealed to the finished surface.	Recessed light fixtures installed in the building thermal envelope shall be air tight and IC rated.
Plumbing and wiring	—	In exterior walls, batt insulation shall be cut neatly to fit around wiring and plumbing, or insulation, that on installation readily conforms to available space, shall extend behind piping and wiring.
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.	Exterior walls adjacent to showers and tubs shall be insulated.

Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical and communication boxes. Alternatively, air-sealed boxes shall be installed.	—
HVAC register boots	HVAC supply and return register boots that penetrate building thermal envelope shall be air sealed to the subfloor, wall covering or ceiling penetrated by the boot.	<u>HVAC supply and return register boots located within the <i>buildings thermal envelope</i> shall not damage or compress the insulation surrounding them.</u>
Concealed sprinklers	Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	—

a. Inspection of log walls shall be in accordance with the provisions of ICC 400.

Reason: Air barrier and air sealing criteria section:

- The change to this section of language in the table slightly broadens the scope of sealing to not only include air sealing between inside and outside but to include sealing of all supply and return boots to the surface they penetrate. This helps to gain more control and predictability of air flow in and out of interstitial spaces as well as improves the performance of the HVAC system. This concept was first introduced by the EnergyStar program.

Insulation Installation Criteria:

- Nationally we like open floor plans which means that more and more duct is being installed in exterior walls and attics. The supply and return duct installation and the insulation installation must be coordinated so that the insulation is not damaged or compressed resulting in the reduction of required R-value.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposed language does not increase the cost of construction, but rather offers guidance and clarity of existing requirements.

Proposal # 5442

RE79-19

RE80-19

IECC: TABLE R402.4.1.1 (IRC N1102.4.1.1)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.4.1.1 (IRC N1102.4.1.1)
AIR BARRIER AND INSULATION INSTALLATION^a**

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, R-value, of not less than R-3 per inch. Exterior thermal envelope insulation for frame walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between framing and skylights, and the jamb of windows and doors, shall be sealed.	—
Rim joists	Rim joists shall include the air barrier.	Rim joists shall be insulated.
Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing; and shall extend from the bottom to the top of all perimeter floor framing members.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	Crawl space insulation, where provided instead of floor insulation, shall be permanently attached to the walls.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.	—
Narrow cavities	—	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	—
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be sealed to the finished surface.	Recessed light fixtures installed in the building thermal envelope shall be air tight and IC rated.
Plumbing and wiring	—	In exterior walls, batt insulation shall be cut neatly to fit around wiring and plumbing, or insulation, that on installation readily conforms to available space, shall extend behind piping and wiring.
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.	Exterior walls adjacent to showers and tubs shall be insulated.

<p><u>Electrical, phone, fan or other utility boxes on exterior walls /ceilings</u></p>	<p>The air barrier shall be installed behind electrical and communication boxes. Alternatively, air sealed boxes shall be installed.</p> <p><u>Electrical, phone, fan or other utility boxes shall be air sealed or air tight boxes shall be installed.</u></p> <p><u>Electrical, phone, fan or other utility boxes, that penetrate the building thermal envelope, shall be air sealed to the subfloor, wall covering or ceiling penetrated by the box.</u></p>	<p><u>Spaces behind electrical, phone, fan or other utility boxes on exterior walls shall be insulated or filled by insulation that on installation readily conforms to the available cavity space.</u></p> <p><u>Electrical, phone, fan or other utility boxes installed in floors, attics or to other insulated spaces shall have insulation cut or blown to fit snugly around them or upon installation readily conforms to the available space.</u></p>
<p>HVAC register boots</p>	<p>HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.</p>	<p>—</p>
<p>Concealed sprinklers</p>	<p>Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.</p>	<p>—</p>

- a. Inspection of log walls shall be in accordance with the provisions of ICC 400.

Reason: Component column:

- Although technically speaking, low voltage, speaker, or computer wire boxes are a form of electrical box many builders and trade partners only view true 20- or 15-amp power outlet or switch gang boxes as electrical boxes. By simply broadening the definition to utility box we can ensure that any such box that is installed in an exterior wall or ceiling is insulated and air sealed properly.

Air barrier and air sealing criteria section:

- In this section the two requirements have been broken apart for greater clarity. First an air tight box of some sort must be installed and second the box must be sealed to the surface that it penetrates.

Insulation Installation Criteria:

- Currently there is no guidance in this table regarding insulating behind electrical boxes in any insulated assembly. This added language rectifies this and offers guidance.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposed language does not increase the cost of construction, but rather offers guidance and clarity of existing requirements

RE81-19

IECC: TABLE R402.4.1.1 (IRC N1102.4.1.1)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.4.1.1 (IRC N1102.4.1.1)
AIR BARRIER AND INSULATION INSTALLATION^a**

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, R-value, of not less than R-3 per inch. Exterior thermal envelope insulation for frame walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between framing and skylights, and the jambs of windows and doors, shall be sealed.	—
Rim joists	Rim joists shall include the air barrier.	Rim joists shall be insulated.
Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing; and shall extend from the bottom to the top of all perimeter floor framing members.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	Crawl space insulation, where provided instead of floor insulation, shall be permanently attached to the walls.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.	—
Narrow cavities	—	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	—
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be sealed to the finished surface.	Recessed light fixtures installed in the building thermal envelope shall be air tight and IC rated.
Plumbing and wiring	—	In exterior walls, batt insulation shall be cut neatly to fit around wiring and plumbing, or insulation, that on installation readily conforms to available space, shall extend behind piping and wiring .

Shower/tub and fireplaces on exterior walls	<p>The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.</p> <p>An air barrier shall be installed to separate the exterior wall insulation from showers, tubs and fireplaces.</p> <p>Tub and shower drain trap penetrations through the subfloor shall be air sealed.</p> <p>Fireplace doors shall comply with the requirements of Section R402.4.2</p>	<p>Exterior walls adjacent to showers, and tubs, and fireplaces shall separate the wall from the shower or tub be insulated and, where insulated with air permeable insulation, shall be enclosed by an air barrier assembly.</p>
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical and communication boxes. Alternatively, air-sealed boxes shall be installed.	—
HVAC register boots	HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	—
Concealed sprinklers	Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesives sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	—

a. Inspection of log walls shall be in accordance with the provisions of ICC 400.

Reason: Component column:

- The 2012 IECC Air barrier and Insulation table was the last table that specifically referenced the void space behind fireplaces that are located on exterior walls. Just like behind tubs and shower pans a supplemental air barrier is needed on the interior side to enclose the insulation as the drywall plain has been moved to the front of the fireplace.

Air barrier and air sealing criteria section:

- This first revision continues to require the installation of a supplemental air barrier in areas where drywall, tile backer, or other air impermeable material will not be installed as the finished surface is not in alignment with the insulation installed in the building's thermal envelope. The only addition, other than clarification, is the addition of the area behind fireplaces on exterior walls.
- Air sealing the tub and shower drain trap penetration eliminates a significant leakage source especially when located in floor systems over unconditioned spaces. This air leakage often creates condensation on the back side of tubs and shower pans which leads to mold and other building durability issues.
- Fireplace door air sealing is outlined in the prescriptive section R402.4.2 and clearly describes that this component shall be air sealed. The instruction should not be limited to fireplaces that are installed using the prescriptive compliance options. Therefore, there is need to ensure that the installation criteria is used when assessing R405 and R406 compliance. The addition of this language does that.

Insulation Installation Criteria:

- Manufactures of air permeable insulation have begun to recognize that their installation literature must incorporate language and pictures showing that air permeable insulation must be enclosed inside of air barrier assemblies. The current language offered no guidance of this fact and therefore was amended.
- See attached PDF example of newer installation instructions

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposed language does not increase the cost of construction, but rather offers guidance and clarity of existing requirements.

RE82-19

IECC: TABLE R402.4.1.1 (IRC N1102.4.1.1)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.4.1.1 (IRC N1102.4.1.1)
AIR BARRIER, AIR SEALING, AND INSULATION INSTALLATION^a**

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, R-value, of not less than R-3 per inch. Exterior thermal envelope insulation for frame walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between framing and skylights, and the jambs of windows and doors, shall be sealed.	—
Rim joists	Rim joists shall include the <u>an exterior</u> air barrier. ^b <u>The junction of the rim board to the sill plate and the rim board and the subfloor shall be air sealed</u>	Rim joists shall be insulated <u>so that the insulation maintains permanent contact with the exterior rim board.</u> ^b
Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing; and shall extend from the bottom to the top of all perimeter floor framing members.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	Crawl space insulation, where provided instead of floor insulation, shall be permanently attached to the walls.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.	—
Narrow cavities	—	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	—
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be sealed to the finished surface.	Recessed light fixtures installed in the building thermal envelope shall be air tight and IC rated.

Plumbing and wiring	—	In exterior walls, batt insulation shall be cut neatly to fit around wiring and plumbing, or insulation, that on installation readily conforms to available space, shall extend behind piping and wiring.
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.	Exterior walls adjacent to showers and tubs shall be insulated.
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical and communication boxes. Alternatively, air-sealed boxes shall be installed.	—
HVAC register boots	HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	—
Concealed sprinklers	Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesives/sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	—

- a. Inspection of log walls shall be in accordance with the provisions of ICC 400.
- b. Air barrier and Insulation full enclosure is not required in unconditioned/ventilated attic spaces and at rim joists.

Reason: Table title change

- The objective of table R402.4.1.1 is to offer guidance for how to create an air tight home that meets the air leakage requirements of the IECC. Air barrier and insulation installation are part of the equation to be able to accomplish this goal, but air sealing is another part of it that is missing from the title. The tables name should accurately reflect what it is intended to do and that is what the proposal aim is. Currently air sealing measures are discussed to some extent in the table and the hope is that additional air sealing measure will be incorporated this cycle.

Air barrier and air sealing criteria section:

- In many sections of this table the guidance that is given tells the builder or trade partner to add a supplemental interior air barrier to the assembly. For example, at shafts, double walls, or behind tubs and fireplaces where the interior drywall, or primary interior air barrier is not in alignment with the insulation. The rim joist is one area where a nationally cost-effective solution for enclosing air permeable insulation with an interior air barrier has not been identified. Therefore, it is even more crucial that the exterior air barrier be air tight. The proposed language makes this clear.
- In order for the exterior air barrier to be air tight and air sealed properly the exterior rim board must be sealed to the sill plate and the sub floor. The added language ensure that this crucial area of low side air leakage is addressed.

Insulation installation criteria section:

- **A footnote** has been added to ensure a common understanding that insulation installed in a ventilated attic and at the rim is not require to be enclosed within an air barrier assembly. The footnote is necessary as the item it is associated with defines the installed alignment between air barriers and air permeable insulation within building cavity installation, i.e. walls and floor cavities.
- Most often fiberglass batt insulation is used to insulate the rim joist area of a home. If the batt is installed so that it is not in contact with the surface it is intended to insulated it does not work properly. We often see it installed in a crescent shape where the bulk of the material is not touching the rim board. The added language and footnote clearly and concisely describe how to insulate this unique area of a home.

See photo examples of the issues in the attached PDF

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposed language does not increase the cost of construction but rather offers guidance and clarity of existing requirements.

RE83-19

IECC: TABLE R402.4.1.1

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robb@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

TABLE R402.4.1.1 (IRC TABLE N1102.4.1.1)
AIR BARRIER, AIR SEALING, AND INSULATION INSTALLATION^a

Portions of table not shown remain unchanged.

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Windows, skylights and doors	The space between framing and skylights, and the jambsof windows and doors, shall be air sealed.	<u>Insulation installed in framing around windows, skylights and doors shall be cut to fit the cavity or shall be filled with insulation that on installation readily conforms to the available cavity space.</u>

- a. Inspection of log walls shall be in accordance with the provisions of ICC 400.

Reason: Air barrier and air sealing criteria section:

- A simple adjective creates better clarity

Insulation installation criteria section:

- Often the framing around windows creates spaces that are odd sizes and shapes. I think of a recent house that I inspected that had several octangle widows fit into a square opening. The cavities that were created would not be defined as narrow cavities section of this table, but would be addressed be the proposed language.

See attached PDF for pictorial documentaion of the issue

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposed language does not increase the cost of construction but rather offers guidance and clarity of existing requirements.

Proposal # 5358

RE83-19

RE84-19

IECC: TABLE R402.4.1.1

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.4.1.1 (IRC N1102.4.1.1)
AIR BARRIER, AIR SEALING, AND INSULATION INSTALLATION^a**

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.
Walls	<p>The junction of the foundation and sill plate shall be <u>air sealed</u>.</p> <p>The junction of <u>the all top plates and drywall adjacent to unconditioned space above</u> shall be <u>gasketed or air sealed</u>.</p> <p>Knee walls shall be <u>air sealed</u>.</p>	<p><u>Wall and knee wall cavity air permeable insulation shall be enclosed inside the air barrier assembly.</u></p> <p><u>Corners in exterior frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, R-value, of not less than R-3 per inch.</u></p> <p><u>Headers on exterior walls shall be insulated to a minimum R-3.</u></p> <p><u>Building thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier assembly.</u></p> <p><u>Knee wall cavities that are defined by roof truss framing shall maintain a minimum 3.5" inch insulated cavity that can accommodate an R-value that is either required in the wall or can be traded off.</u></p>
Windows, skylights and doors	The space between framing and skylights, and the jambs of windows and doors, shall be sealed.	—
Rim joists	Rim joists shall include the air barrier.	Rim joists shall be insulated.
Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing; and shall extend from the bottom to the top of all perimeter floor framing members.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	Crawl space insulation, where provided instead of floor insulation, shall be permanently attached to the walls.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.	—
Narrow cavities	—	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	—

Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be sealed to the finished surface.	Recessed light fixtures installed in the building thermal envelope shall be air tight and IC rated.
Plumbing and wiring	—	In exterior walls, batt insulation shall be cut neatly to fit around wiring and plumbing, or insulation, that on installation readily conforms to available space, shall extend behind piping and wiring.
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.	Exterior walls adjacent to showers and tubs shall be insulated.
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical and communication boxes. Alternatively, air-sealed boxes shall be installed.	—
HVAC register boots	HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	—
Concealed sprinklers	Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	—

a. Inspection of log walls shall be in accordance with the provisions of ICC 400.

Reason: Table title change

- The objective of table R402.4.1.1 is to offer guidance for how to create an air tight home that meets the air leakage requirements of the IECC. Air barrier and insulation installation are part of the equation to be able to accomplish this goal, but air sealing is another part of it that is missing from the title. The tables name should accurately reflect what it is intended to do and that is what the proposal aim is. Currently air sealing measures are discussed to some extent in the table and the hope is that additional air sealing measure will be incorporated this cycle.

Air barrier and air sealing criteria section:

- Clarification of the language requiring drywall to be sealed to the top plate is needed. In the field there is confusion regarding what exterior means. Does it mean four exterior walls or does it mean top plates that are adjacent to unconditioned space. The gained clarity of this air sealing activity addresses one of the largest air leakage sources on the high side of the home.
- The junction of the bottom plate to the subfloor on exterior walls had not been addressed yet is again one of the largest sources of air leakage in homes and therefore was added to the table.

Insulation Installation Criteria:

- Air permeable insulation must be enclosed in an air barrier in order to trap the pockets of air that are required to resist the flow of energy. This new language expresses that so it can be executed properly in the field.
- Corners and headers are significantly different assemblies. Headers, in particulate may not have a true cavity to insulate and may be better suited to insulate with foam board. This proposal breaks the two assemblies into separately addressed assemblies.
- Adding the defined term Building Thermal Envelop ensures clarity in this section of the code.
- Nationally we are seeing more and more knee walls that are defined by the flat edge of a 2x4 truss. The 1.5" dimension does not offer enough space to properly insulate. In such cases the truss will need to be over framed to enable insulation to be installed. The included language defines the minimum insulated space.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposed language does not increase the cost of construction but rather offers guidance and clarity of existing requirements.

RE85-19

IECC: TABLE R402.4.1.1

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.4.1.1
AIR BARRIER, AIR SEALING, AND INSULATION INSTALLATION^{a,b}**

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, R-value, of not less than R-3 per inch. Exterior thermal envelope insulation for frame walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between framing and skylights, and the jambs of windows and doors, shall be sealed.	—
Rim joists	Rim joists shall include the air barrier.	Rim joists shall be insulated.
Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing; and shall extend from the bottom to the top of all perimeter floor framing members.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	Crawl space insulation, where provided instead of floor insulation, shall be permanently attached to the walls.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.	—
Narrow cavities	—	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	—
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be sealed to the finished surface.	Recessed light fixtures installed in the building thermal envelope shall be air tight and IC rated.
Plumbing and wiring	—	In exterior walls, batt insulation shall be cut neatly to fit around wiring and plumbing, or insulation, that on installation readily conforms to available space, shall extend behind piping and wiring.
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.	Exterior walls adjacent to showers and tubs shall be insulated.

Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical and communication boxes. Alternatively, air-sealed boxes shall be installed.	—
HVAC register boots	HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	—
Concealed sprinklers	Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	—

- a. Inspection of log walls shall be in accordance with the provisions of ICC 400.
- b. The requirements of this table are mandatory in accordance with Section R402.4 and shall be applied to all components of the building's thermal envelope. Building elements not specifically addressed in the table shall be sealed, as appropriate, and consistent with the requirements of this table in order to maintain the continuity of the air barrier.

Reason: The objective of table R402.4.1.1 is to offer guidance for how to create an air tight home that meets the air leakage requirements of the IECC. Air barrier and insulation installation are part of the equation to be able to accomplish this goal, but air sealing is another part of it that is missing from the title. The tables name should accurately reflect what it is intended to do and that is what the proposal aim is.

An additional footnote is being proposed here to first reiterate that the items included in this table are mandatory and second to show that in reality the principals demonstrated in the table are the important mandatory items. The code, and this table in particular cannot address every situation that will arise in the field. Therefore, the principals of installation air barrier, air sealing, and insulation installation demonstrated in the table must be clearly expressed and exemplified in order for builders and trade partners to successfully executed them regardless as unique instances of construction and installation occur.

For example, the table reinforces the need for the continuity of the air barrier assembly and its alignment with the thermal barrier of the home. The components described in the table express many of the situations where this must be executed but it can't explain every unique knee wall, tub, or fire fireplace surround. Therefore, the principals embodies in the table are used to successfully execute the continuity of the air barrier and alignment with insulation throughout the building thermal envelope.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The proposed language does not increase the cost of construction but rather offers guidance and clarity of existing requirements.

Proposal # 5342

RE85-19

RE86-19

IECC: R402.4.1.1 (IRC N1102.4.1.1)

Proponent: Howard Ahern, representing self (howard.ahern@airexmf.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.4.1.1 (IRC N1102.4.1.1)
AIR BARRIER AND INSULATION INSTALLATION^a**

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, R-value, of not less than R-3 per inch. Exterior thermal envelope insulation for frame walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between framing and skylights, and the jambs of windows and doors, shall be sealed.	—
Rim joists	Rim joists shall include the air barrier.	Rim joists shall be insulated.
Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing; and shall extend from the bottom to the top of all perimeter floor framing members.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	Crawl space insulation, where provided instead of floor insulation, shall be permanently attached to the walls.
Shafts, penetrations	Duct shafts, utility penetrations and flue shafts opening to exterior or unconditioned space shall be sealed. <u>Utility Penetrations of the air barrier shall be caulked, gasketed or otherwise sealed and shall allow for expansion, contraction of materials and mechanical vibration</u>	—
Narrow cavities	—	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	—
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be sealed to the finished surface.	Recessed light fixtures installed in the building thermal envelope shall be air tight and IC rated.
Plumbing and wiring	—	In exterior walls, batt insulation shall be cut neatly to fit around wiring and plumbing, or insulation, that on installation readily conforms to available space, shall extend behind piping and wiring.

Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.	Exterior walls adjacent to showers and tubs shall be insulated.
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical and communication boxes. Alternatively, air-sealed boxes shall be installed.	—
HVAC register boots	HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	—
Concealed sprinklers	Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	—

a. Inspection of log walls shall be in accordance with the provisions of ICC 400.

Reason: This change gives clarification to utility penetrations sealing of the air barrier and provide for more sustainable sealing and is the same language adopted in the 2018 IECC C402.5.1.1-

"Penetrations of the air barrier shall be caulked, gasketed or otherwise sealed in a manner compatible with the construction materials and location. Sealing shall allow for expansion and contraction of materials and mechanical vibration."

Sealing need to allow for expansion and contraction of materials so they do not crack, or dislodge from the material they are affixed too. Utility penetrations can be plumbing piping, gas piping but refrigerant piping vibrates and must be sealed in a manner to allow this mechanical vibration.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This change will not increase the cost of construction, the change simply tells the installer that sealing methods must allow for expansion and contraction and in the case of refrigeration piping that unlike other pipe penetration it vibrates so some sealing items might not cope with vibration or turn to power from the friction created

Proposal # 5241

RE86-19

RE87-19

IECC: TABLE R402.4.1.1 (IRC N1102.4.1.1)

Proponent: Kevin Rose, representing Mass Save

2018 International Energy Conservation Code

Revise as follows:

AIR BARRIER AND INSULATION INSTALLATION^a

Portions of table not shown remain unchanged.

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.	<p>All insulation shall be installed at Grade I quality in accordance with RESNET/ICC 301.</p> <p>Air-permeable insulation shall not be used as a sealing material.</p>

- a. Inspection of log walls shall be in accordance with the provisions of ICC 400.

Reason: Currently, the code requires that insulation is installed “in accordance with the manufacturer’s instructions.” As these instructions vary by product and manufacturer, the code requirement for insulation installation quality does not seem to be applied consistently across the industry and is difficult to enforce. The intent of this code change is establish a single, clear, consistent standard for high quality insulation installation by leveraging ICC/RESNET 301, a consensus standard already referenced by the 2018 IECC.

The intent of the current language is not being realized in the field. A 2016 study of 146 new homes in Massachusetts shows that, despite a long history of utility efficiency programs and progressive energy codes, insulation installation in the state has significant room for improvement. Table 14 of this study provides the full breakdown of insulation installation quality data in these 146 homes; the primary finding is that the vast majority of homes in the state receive merely fair installation quality.

“Auditors estimated that 86% of homes have mostly Grade II, a typical installation quality represented by moderate amounts of gaps and compression. Grade I—the best quality, representing an install with limited installation defects—is the majority install quality in only 10% of the homes.” (pg. 17).

Bibliography: 2016 third-party study of 146 new homes in Massachusetts: <http://ma-eeac.org/wordpress/wp-content/uploads/Single-Family-Code-Compliance-Baseline-Study-Volume-2.pdf>

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal only provides clearer and more enforceable language than the existing code. It does not alter the intended stringency of the code provision, and it does not incur any additional installation or verification costs. Therefore there is no change in the cost of construction.

Proposal # 5082

RE87-19

RE88-19

IECC: R202 (IRC N1101.6), R402.4.1.2 (IRC N1102.4.1.2) , R403.6 (IRC N1103.6)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com); Joseph Lstiburek, representing self (joe@buildingscience.com); Mike Moore, representing Broan-NuTone (mmoore@newportventures.net)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Add new definition as follows:

DWELLING UNIT ENCLOSURE AREA. The sum of the area of ceiling, floors, and walls separating a dwelling unit's conditioned space from the exterior or from adjacent conditioned or unconditioned spaces. Wall height shall be measured from the finished floor of the dwelling unit to the underside of the floor above.

R402.4 (IRC N1102.4) Air leakage (Mandatory). The *building thermal envelope* shall be constructed to limit air leakage in accordance with the requirements of Sections R402.4.1 through R402.4.5.

Revise as follows:

R402.4.1.2 (IRC N1102.4.1.2) Testing. The *building* or dwelling unit shall be tested and verified as having an air leakage rate not exceeding five air changes per hour in *Climate Zones* 1 and 2, and three air changes per hour in *Climate Zones* 3 through 8. Testing shall be conducted in accordance with RESNET/ICC 380, ASTM E 779 or ASTM E 1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). Where required by the *code official*, testing shall be conducted by an *approved* third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*. Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope*.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures.
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.
3. Interior doors, where installed at the time of the test, shall be open.
4. Exterior or interior terminations for continuous ventilation systems shall be sealed.
5. Heating and cooling systems, where installed at the time of the test, shall be turned off.
6. Supply and return registers, where installed at the time of the test, shall be fully open.

Exception: An air leakage rate not exceeding 0.30 cfm per ft² of the dwelling unit enclosure area shall be an accepted alternative in all *climate zones* for:

1. Attached single and multifamily building dwelling units.
2. Buildings or dwelling units that are 1500 square feet or smaller.

R403.6 (IRC N1103.6) Mechanical ventilation (Mandatory). The *building and each dwelling unit* shall be provided with ~~ventilation that complies~~ mechanical ventilation. The mechanical ventilation system shall ~~comply~~ with the requirements of the International Residential Code or International Mechanical Code, as applicable, or with other *approved* means of ventilation. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

Reason: Air changes per hour (ACH) is a volumetric calculation that is used to express air exchanges in a home when the house is brought to 50 Pascal's pressure with relation to outside. It is calculated using the house volume and the cubic feet per minute airflow rate as measured at the blower door to reflect the number of times each hour the volume of air in the house is exchanged with the outside. Although it can be used to express the air leakage rate of an efficient or inefficient home, it does not have a direct correlation with the holes through which air is passing and, therefore, is not a measurement that is best used to quantify how air tight a dwelling is. This is especially true for small volume and attached dwellings.

This proposal introduces an exception to using ACH to quantify air leakage in attached and small volume dwelling units because ACH is biased against small volume and attached dwellings. Although it is not difficult to get a single-family median size home to pass 3 or 5 ACH as required by the IECC, it is significantly difficult to get a small volume and or an attached home to pass. The alternative metric more accurately reflects leakage through the exterior enclosure area which removes built in volumetric bias while continuing to ensure a tight structure.

The alternative metric uses a cubic foot per minute (CFM) per square foot (ft²) of dwelling unit enclosure area metric to demonstrate compliance with the IECC. This metric allows the air leakage measured at 50 Pascals divided by the building surface area to be used to assess the air tightness of

the building enclosure. Unlike ACH, a CFM/ ft² of dwelling unit enclosure area normalizes the building air leakage per unit of building envelope surface area, the actual location where air is infiltrating or exfiltrating the dwelling regardless of where the air is coming from, which removes the volumetric bias that is causing small volume and attached dwellings units to fail the code require blower door test. In addition, it is not possible to only measure air leakage to the ambient outdoors in attached dwellings which is what ACH assumes. The air leakage measurement is actually quantifying the leakage that is coming from attached dwellings, stairs, elevator shafts or other parts of the building that may be connected to the living space of the tested unit. Air leakage from a conditioned space to any other space, as well as, two the ambient outdoors continues to be an energy efficiency issue, but it also is a health issue from an indoor air quality perspective, as well as, a building durability issue from a building science perspective. Reducing air leakage from all surfaces of the building enclosure promotes the IECC's intent while providing a metric that makes better sense for the building type in question.

The use of a more accurate reflection of air leakage that better represents the distribution of holes that are occurring in the building enclosure has begun to be adopted in programs such as EnergyStar, LEED, and Passive House and by standards created by the US Army Corp of Engineers and ASHRAE. Largely this is happening in multifamily construction as looking at the CFM/ft² of building enclosure area better represents leakage that is occurring in an attached dwelling unit. However, small volume is also a significant issue which this proposal addresses. The CFM/ft² of enclosure area will allow both small volume and attached dwellings to be more successful at meeting the intent and requirements of the code.

The proposal also defines "Dwelling Unit Enclosure Area" as the sum of the area of ceiling, floors, and walls separating a dwelling unit's conditioned space from the exterior or from adjacent conditioned or unconditioned spaces. In addition, the definition offers a small piece of defined guidance in order to further understand the measurement that must take place to calculate the dwelling unit enclosure area. This guidance states that the wall height shall be measured from the finished floor of the dwelling unit to the underside of the floor above. Lastly, the proposal ensures that the intent of the code, to ensure that the structure is built tight and ventilated correctly with mechanical ventilation, is maintained. If this exception is adopted into the code, as proposed, then ventilation must also be ensured regardless of how air tightness of the structure is expressed.

Why the change to R403.6?

It was pointed out in the last code cycle, that this metric could have an unintended loophole since it is not used in the IRC. To avoid that, the section was edited to ensure whole house mechanical ventilation continues to be required and installed

Why The change to IRC 303.4?

It was pointed out in the last code cycle, that this metric could have an unintended loophole since it is not used in the IRC. To avoid that, the section was edited to ensure whole house mechanical ventilation continues to be required and installed

Cost Impact: The code change proposal will decrease the cost of construction
This proposal would reduce cost for the following reasons.

- Some jurisdictions nationally allow Guarded testing, an alternative blower door testing method that attempts to only quantify air leakage between conditioned space and the outdoors. This testing method requires multiple individuals and blower doors to be run simultaneously. Using a CFM/ft² of enclosure area Metric ensures a tight building thermal enclosure in the most cost-effective way by only requiring one tester and piece of equipment per test.
- Air leakage pathways depend on the type of area separation assembly that is used between attached units. Some assemblies such as shaft liner areas separation walls are fairly tight from unit to unit and leak substantially to the outdoors while others promote leakage between units, common spaces, and other defined unconditioned spaces in the building. An enclosure test for attached dwellings allows for identification of the most cost-effective air sealing option per assembly that is chosen.
- Air sealing of exterior walls in mid to large size single family homes has become cost effective, repeatable, and achievable. Small volume homes don't have the same opportunities for sealing as volume is the primary driver not the number or size of holes to the exterior. Therefore, multiple re-inspections are needed and additional application of air sealing measures to chase down very small reductions in air leakage that still don't result in passing 3 and in some cases 5 ACH occur. A more reasonable metric for small volume dwelling would result in more passing units and less re-inspections while still meeting the tightness goals of the code.
- In attached housing there is an additional fire and air separation wall, floor, and or ceiling where often only a limited amount of air sealing is allowed. However, with a reasonable metric such a 0.30 CFM/ft² of enclosure area one is looking at the entire surface area. This creates parity with single family homes as they have the opportunity to address all surfaces of the dwelling when seeking to reduce the infiltration rate to pass the requirements of code.
- The value of allowing an exception to use 0.30 CFM/ft² of enclosure area is that air-sealing varies directly with the amount of surface area. Two dwellings can have surface area that differs by 15%, but still have the same volume and the current metric offers the same leakage allowance. If the surface area can be addressed in the measurement than the playing field is leveled and attached and small volume dwelling units would not have the problems passing the IECC.

RE89-19

IECC: R402.4.1.2 (IRC N1102.4.1.2)

Proponent: Roger Papineau, Self, representing Self (hbagta.codeguy@gmail.com)

2018 International Energy Conservation Code

R402.4.1.2 (IRC N1102.4.1.2) Testing. The *building* or dwelling unit shall be tested and verified as having an air leakage rate not exceeding five air changes per hour in *Climate Zones* 1 and 2, and three air changes per hour in *Climate Zones* 3 through 8. Testing shall be conducted in accordance with RESNET/ICC 380, ASTM E 779 or ASTM E 1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). ~~Where required by the code official, testing shall be conducted by an approved third party.~~ A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*. Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope*.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures.
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.
3. Interior doors, where installed at the time of the test, shall be open.
4. Exterior or interior terminations for continuous ventilation systems shall be sealed.
5. Heating and cooling systems, where installed at the time of the test, shall be turned off.
6. Supply and return registers, where installed at the time of the test, shall be fully open.

Exception: For additions and alterations, the air barrier and insulation shall be inspected in accordance with TABLE R402.4.1.1.

Reason: Some building officials are refusing to accept reports from certified blower door test providers. This requirement may create for-profit third party companies.

Exception. There is no economical prescriptive method of separating the existing structure from the new work. The common wall, or floor/ceiling have no air leakage requirements and therefore could create false ACH results.

Cost Impact: The code change proposal will decrease the cost of construction
This may result in cost savings by eliminating unreliable testing.

Proposal # 5482

RE89-19

RE90-19

IECC: R202 (IRC N1101.6) , R402.4.1.2 (IRC N1102.4.1.2) , R403.6 (IRC N1102.6)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com); Joseph Lstiburek, representing self (joe@buildingscience.com); Mike Moore, representing Broan-NuTone (mmoore@newportventures.net)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Add new definition as follows:

DWELLING UNIT ENCLOSURE AREA. The sum of the area of ceiling, floors, and walls separating a dwelling unit's conditioned space from the exterior or from adjacent conditioned or unconditioned spaces. Wall height shall be measured from the finished floor of the dwelling unit to the underside of the floor above.

Revise as follows:

R402.4.1.2 (IRC N1102.4.1.2) Testing. The *building* or dwelling unit shall be tested and verified as having an air leakage rate not exceeding five air changes per hour or 0.28 cubic feet per minute (CFM) per square foot (ft²) of dwelling unit enclosure area in *Climate Zones* 1 and 2, and three air changes per hour or 0.17 CFM per (ft²) of dwelling unit enclosure area in *Climate Zones* 3 through 8. Testing shall be conducted in accordance with RESNET/ICC 380, ASTM E 779 or ASTM E 1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). Where required by the *code official*, testing shall be conducted by an *approved* third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*. Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope*.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures.
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.
3. Interior doors, where installed at the time of the test, shall be open.
4. Exterior or interior terminations for continuous ventilation systems shall be sealed.
5. Heating and cooling systems, where installed at the time of the test, shall be turned off.
6. Supply and return registers, where installed at the time of the test, shall be fully open.

R403.6 (IRC N1102.6) Mechanical ventilation (Mandatory). ~~The *building and each dwelling unit* shall be provided with ventilation that complies~~ mechanical ventilation. The mechanical ventilation system shall comply with the requirements of the International Residential Code or International Mechanical Code, as applicable, or with other *approved* means of ventilation. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

Reason: Air changes per hour (ACH) is a volumetric metric that is useful for air quality measurements in buildings but is not the correct expression of air leakage from an energy or building durability perspective. This proposal introduces the ability to use an alternative cubic foot per minute (CFM) per square foot (ft²) of dwelling unit enclosure area metric for measuring air leakage in a building. In this way, the air leakage measured at 50 Pascals divided by the building surface area is used to assess the airtightness of the construction and building envelope. Unlike ACH, a CFM/ ft² of dwelling unit enclosure area metric normalizes the building air leakage per unit of building envelope surface area; the actual location where air is infiltrating or exfiltrating the building. To this end, the proposal also defines "Dwelling Unit Enclosure Area" as the sum of the area of ceiling, floors, and walls separating a dwelling unit's conditioned space from the exterior or from adjacent conditioned or unconditioned spaces. In addition, the definition offers guidance to further understand the measurement that must take place to calculate the dwelling unit enclosure area. This guidance states that the wall height shall be measured from the finished floor of the dwelling unit to the underside of the floor above. Lastly, the proposal ensures that the intent of the code, to ensure that the structure is built tight and ventilated correctly with mechanical ventilation, is maintained. If an additional option is adopted into the code, as proposed, then ventilation must also be ensured regardless of how air tightness of the structure is expressed.

Since 1980, The Energy Conservatory, has not only been a leader in air leakage science, but also one of the prominent manufacturers of the blower door air measurement tool. In their article, "Which Is A Better Metric For Measuring Airtightness: ACH @ 50 Pa Or CFM/ Ft² Of Surface Area @ 50 Pa?", which is adapted and added to in this reason statement, we get the basis of the argument for the introduction of a new metric into the International Energy Conservation Code for the measurement of air leakage.

To paraphrase, when measuring the airtightness of a building the objective is to learn how much leakage is occurring across the building's enclosure area. It is analogous to moisture permeability or the measurement of moisture across the building's enclosure area and thermal transmittance, the rate at which heat is transferred across the building enclosure area. The rate of air leakage or tightness does not depend on the volume of the structure as defined by the building's enclosure area but does depend on the holes associated with the surface area of the structure. Air

permeability of a material is typically measured as the flow per area at a given pressure difference across the material. U value measurements are similar. If we want a metric to use to measure the airtightness quality of construction of the exterior enclosure of buildings it makes sense to use a metric that equates flow to the size and number of holes in the building's thermal enclosure.

The article continues with an example to help demonstrate how volume is not proportional to surface area:

Comparison between ACH50 and CFM50/ft² for a 2000 ft² home at 3 ACH50

House Is 50 X 40 X 8

Volume = 16,000 ft³

Surface Area = 50 X 40 X 2 + 180 X 8 = 5440 ft²

CFM50 = (3 X 16000)/60 = 800 CFM

CFM50/ft² = 800/5440 = 0.147 CFM50/ft²

Increase height to 2 story at 3 ACH50

House Is 50 X 40 X 16 Volume = 32,000 ft³

Surface area = 50 X 40 X 2 + 180 X 16 = 6880 ft²

CFM50 = (3 X 32000)/60 = 1600 cfm

CFM50/ft² = 1600/6880 = 0.233 CFM50/ft²

In this example, when the volume is doubled, the surface area increased by 26%. And when the ACH50 stays the same, the CFM/ ft² of surface area increased by 58%. I have attached an Excel spreadsheet calculator that further defines the disconnect between ACH and CFM/ ft² of surface area to further elaborate the issue. In the attached calculator you can change the ratio of width and length of the building to see the effect on the resulting expressions of air leakage. An independent yet similar calculator can be found at this Residential Energy Dynamic link <http://www.residentialenergydynamics.com/REDCalcFree/Tools/AirLeakageMetrics>

The primary purpose of this code change proposal is to introduce the CFM/ft² of surface area metric into the code. Deciding on where to set the minimum allowable leakage rate is difficult largely due to the earlier volume and surface area discussion. Both tests are performed at a pressure differential of 0.2 inch water gauge (50 Pa), which is a the traditional residential testing pressure so an attempt was made to align the introduction of a CFM/ft² of surface area metric with the existing ACH50 metric of 3 and 5 air changes per hour. ACH being a volumetric measurement penalized small volume dwelling units so a decision was made to concentrate on a size range of dwellings between 2500 and 5500 square feet. By doing this and using the attached conditioned floor space to shell area calculator we were able to see that little variation occurred between ACH and CFM/ft² of surface area metric when changing the size ratio of the modeled house within this house size range. By rounding up, the proposal is using .17 CFM/ft² of surface area metric to align with 3 ACH and .28 CFM/ft² of surface area metric to align with 5 ACH. By using these numbers, small volume homes, while not having a volumetric penalty, are allowed to be a little more leaky and large volume homes must achieve just about the same level of tightness if not a slight bit more. As the average home size in the United States is approximately just less than 2500 square feet this code change proposals purpose of introducing a better measurement metric without removing the codes traditional measurement methodology, provide additional flexibility while maintaining similar stringency.

The Energy Conservatory suggests that the use of Air Changes per Hour at 50 Pa (ACH50) started approximately 60 years ago by researchers who were interested in ways to predict the natural infiltration rate of buildings, which at the time was most commonly measured in Air Changes per Hour. At the time air quality in buildings was being studied and the metric made sense. If a pollutant is released in a building, the time for the concentration to decay by a certain percentage depends on the infiltration measured in air changes per hour. The analysis of a tracer gas decay test gives a result in air changes per hour. So, when they started measuring airtightness, for use in estimating natural infiltration in air changes per hour, it made sense to use ACH50 as the metric.

However, as discussed earlier, two homes with the same volume can have very different surface areas and holes associated with the building enclosure area.

Value is gained by including a surface area-based metric in that air-sealing varies directly with the amount of surface area not the amount of volume in the dwelling. Two buildings can have surface areas that differs by 15%, but have the same volume and the current metric offers the same leakage allowance. Therefore, if the purpose of measuring air leakage is to determine something about the construction quality, air leakage rate, energy efficiency and building durability the metric should be associated with the flow of air through holes in the enclosure. To quantify these things ACH is the wrong metric. It does not tell you anything about the quantity and air leakage through holes in the building. Conversely, the CFM/ ft² of surface area metric concretely expresses the quantity of air leakage through the building's exterior enclosure. When an enclosure is tight more energy is conserved as well as allowing better control and predictability of air flow, thermal flow, and moisture flow.

Many standards are now using square foot of enclosure area instead of ACH. Examples include EnergyStar, US Army Corp of Engineers, LEED, US Passive House and ASHRAE 62.2. This proposal is the first step to bring this better expression of air leakage into the code. It has been created in such a way that options are maintained allowing jurisdictions and building professionals flexibility in defining air leakage requirements.

Link to Energy Conservatory article from which portions of this reason statement have been added:

<https://support.energyconservatory.com/hc/en-us/articles/204176240-Which-is-a-better-metric-for-measuring-airtightness-ACH-50-Pa-or-CFM-ft-of-surface-area-50-Pa->

Why the change to R403.6?

It was pointed out in the last code cycle, that this metric could have an unintended loophole since it is not used in the IRC. To avoid that, the section was edited to ensure whole house mechanical ventilation continues to be required and installed

Why The change to IRC 303.4?

It was pointed out in the last code cycle, that this metric could have an unintended loophole since it is not used in the IRC. To avoid that, the section was edited to ensure whole house mechanical ventilation continues to be required and installed. In a companion change RB71-19, I have proposed changes to IRC R303.4 as a correlary to this change in the IECC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

There should be no cost implication associated with the adoption of this proposed language. Dwellings will continue to need to be tested and testing prices will not change due to an additional option for how to express the results of the test.

Proposal # 5276

RE90-19

RE91-19

IIECC: R202 (IRC N1101.6), R402.4.1.2 (IRC N1102.4.1.2), R403.6 (IRC N1103.6)

Proponent: Gayathri Vijayakumar, Steven Winter Associates, Inc., representing Steven Winter Associates, Inc. (gayathri@swinter.com); Joseph Lstiburek, Building Science Corporation, representing self (joe@buildingscience.com); Joel Martell, NAHB, representing NAHB (jmartell@nahb.org); Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com); Mike Moore, Newport Ventures, representing Broan-NuTone (mmoore@newportventures.net)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

DWELLING UNIT. A single unit providing complete independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking and sanitation.

RESIDENTIAL BUILDING. For this code, includes detached one- and two-family dwellings and townhouses as well as *Group R-2*, R-3 and R-4 buildings three stories or less in height above grade plane.

Add new definition as follows:

DWELLING UNIT ENCLOSURE AREA. The sum of the areas of the walls, floors, ceilings, and any other building element assemblies that enclose the *conditioned space* of the *dwelling unit* or provide a boundary between the *conditioned space* of the *dwelling unit* and exterior or adjacent conditioned or unconditioned spaces.

R402.4 (IRC N1102.4) Air leakage (Mandatory). The *building thermal envelope* shall be constructed to limit air leakage in accordance with the requirements of Sections R402.4.1 through R402.4.5.

R402.4.1 (IRC N1102.4.1) Building thermal envelope. The *building thermal envelope* shall comply with Sections R402.4.1.1 and R402.4.1.2. The sealing methods between dissimilar materials shall allow for differential expansion and contraction.

Revise as follows:

R402.4.1.2 (IRC N1102.4.1.2) Testing. The *building or dwelling unit* shall be tested and verified as having an air leakage rate not exceeding five air changes per hour in *Climate Zones* 1 and 2, and three air changes per hour in *Climate Zones* 3 through 8. Testing shall be conducted in accordance with RESNET/ICC 380, ASTM E 779 or ASTM E 1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals).

Exception: For *dwelling units* other than detached one-family dwellings, an air leakage rate not exceeding 0.3 cfm per ft² of the *dwelling unit enclosure area* shall be an accepted alternative in all *Climate Zones*. Testing shall be conducted in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals).

Where required by the *code official*, testing shall be conducted by an *approved* third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*. Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope*.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures.
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.
3. Interior doors, where installed at the time of the test, shall be open.
4. Exterior or interior terminations for continuous ventilation systems shall be sealed.
5. Heating and cooling systems, where installed at the time of the test, shall be turned off.
6. Supply and return registers, where installed at the time of the test, shall be fully open.

R403.6 (IRC N1103.6) Mechanical ventilation (Mandatory). The ~~building~~ *Each dwelling unit* shall be provided with ~~ventilation that complies~~ *mechanical ventilation*. The *mechanical ventilation system* shall comply with the requirements of the International Residential Code or International Mechanical Code, as applicable, or with other *approved* means of ventilation. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

Reason: Why allow a different metric than ACH50?

A surface area based metric is more appropriate than a volume based metric since air-sealing varies directly with the amount of surface area. Depending on the floor plan, two apartments can have total surface area that differ by 15-25%, but still have the same volume and floor area. The

current volume-based metric (3 or 5 ACH50) results in the same maximum air leakage allowed for these two different apartments, yet one apartment has significantly more surface area which to seal, making it inherently more difficult to achieve compliance. While this logic holds true for detached homes as well, in this proposal, this metric is being proposed for attached units only. Other proposals have been submitted to propose this metric for detached homes as well.

Is this cfm50/ft2 metric used anywhere else?

The metric proposed in this "Exception" has been successfully used in above-code multifamily programs since 2005 (ENERGY STAR Multifamily High Rise, LEED, and Passive House). It is also used in the Commercial provisions of IECC (C402.5), but at 75 Pa instead of 50 Pa. For comparison, 0.3 cfm50/ ft2 of dwelling unit enclosure area proposed here is the same as the commercial requirements for EXTERIOR envelope (0.4 cfm75/ft2), but this proposal requires it on ALL surfaces of the apartment enclosure, resulting in dwelling units that are individually sealed as tight as a commercial building's exterior envelope.

Will this create a challenge for code officials or individuals conducting the tests?

This metric is already reported on many air leakage reports that code officials receive today, so there is no change in reporting or effort in conducting the tests. Testing results are measured in CFM50, not ACH50. This CFM50 test value is translated into multiple metrics, and just as easily can be translated to CFM50/ft2 as ACH50.

Will this result in more efficient buildings?

While many focus on air leakage to the outdoors, air leakage within a multifamily building also results in energy losses. Conditioned air can leak to/from a dwelling unit to another vacant (unconditioned) unit, or the unheated stairwell or elevator shaft, the non conditioned corridor, or laundry room.

This proposal seeks to provide a reasonable alternative metric that will encourage builders to air seal and test successfully at the dwelling unit level instead of testing at the building level and potentially missing significant leakage pathways within the building that cause energy loss. Testing at the dwelling unit will result in tighter dwelling units and in the process, tighter buildings.

Why the change to R403.6?

It was pointed out in the last code cycle, that this metric could have an unintended loophole since it is not used in the IRC. To avoid that, the section was edited to avoid any potential loophole.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Since this metric is simply an alternative to the current dwelling unit tests allowed, there is no change in costs.

Proposal # 4640

RE91-19

RE92-19

IECC: SECTION R202, (New), R402.4, R402.4.1.2, SECTION R403, R403.6

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Add new text as follows:

DWELLING UNIT ENCLOSURE AREA. The sum of the area of ceiling, floors, and walls separating a dwelling unit's conditioned space from the exterior or from adjacent conditioned or unconditioned spaces. Wall height shall be measured from the finished floor of the dwelling unit to the underside of the floor above.

Revise as follows:

R402.4 (IRC N1101.6) Air leakage (Mandatory). The *building thermal envelope* shall be constructed to limit air leakage in accordance with the requirements of Sections R402.4.1 through R402.4.5.

R402.4.1.2 (IRC N1102.4.1.2) Testing. The *building* or dwelling unit shall be tested and verified as having an air leakage rate not exceeding five air changes per hour or 0.28 cubic feet per minute (CFM) per square foot (ft²) of dwelling unit enclosure area in *Climate Zones* 1 and 2, and three air changes per hour or 0.17 CFM per (ft²) of dwelling unit enclosure area in *Climate Zones* 3 through 8. Testing shall be conducted in accordance with RESNET/ICC 380, ASTM E 779 or ASTM E 1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). Where required by the *code official*, testing shall be conducted by an *approved* third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*. Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope*.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures.
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.
3. Interior doors, where installed at the time of the test, shall be open.
4. Exterior or interior terminations for continuous ventilation systems shall be sealed.
5. Heating and cooling systems, where installed at the time of the test, shall be turned off.
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SECTION R403 (IRC N1103) SYSTEMS

R403.6 (IRC N1103.6) Mechanical ventilation (Mandatory). ~~The *building*~~ Each dwelling unit shall be provided with mechanical ventilation ~~that complies~~. The mechanical ventilation system shall comply with the requirements of the International Residential Code or International Mechanical Code, as applicable, or with other *approved* means of ventilation. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

Reason: Air changes per hour (ACH) is a volumetric metric that is useful for air quality measurements in buildings but is not the correct expression of air leakage from an energy or building durability perspective. This proposal introduces the ability to use an alternative cubic foot per minute (CFM) per square foot (ft²) of dwelling unit enclosure area metric for measuring air leakage in a building. In this way, the air leakage measured at 50 Pascals divided by the building surface area is used to assess the airtightness of the construction and building envelope. Unlike ACH, a CFM/ ft² of dwelling unit enclosure area metric normalizes the building air leakage per unit of building envelope surface area; the actual location where air is infiltrating or exfiltrating the building. To this end, the proposal also defines "Dwelling Unit Enclosure Area" as the sum of the area of ceiling, floors, and walls separating a dwelling unit's conditioned space from the exterior or from adjacent conditioned or unconditioned spaces. In addition, the definition offers guidance to further understand the measurement that must take place to calculate the dwelling unit enclosure area. This guidance states that the wall height shall be measured from the finished floor of the dwelling unit to the underside of the floor above. Lastly, the proposal ensures that the intent of the code, to ensure that the structure is built tight and ventilated correctly with mechanical ventilation, is maintained. If an additional option is adopted into the code, as proposed, then ventilation must also be ensured regardless of how air tightness of the structure is expressed.

Since 1980, The Energy Conservatory, has not only been a leader in air leakage science, but also one of the prominent manufacturers of the blower door air measurement tool. In their article, "Which Is A Better Metric For Measuring Airtightness: ACH @ 50 Pa Or CFM/ Ft² Of Surface Area @ 50 Pa?", which is adapted and added to in this reason statement, we get the basis of the argument for the introduction of a new metric into the International Energy Conservation Code for the measurement of air leakage.

To paraphrase, when measuring the airtightness of a building the objective is to learn how much leakage is occurring across the building's enclosure area. It is analogous to moisture permeability or the measurement of moisture across the building's enclosure area and thermal transmittance, the rate at which heat is transferred across the building enclosure area. The rate of air leakage or tightness does not depend on the volume of the structure as defined by the building's enclosure area but does depend on the holes associated with the surface area of the structure. Air permeability of a material is typically measured as the flow per area at a given pressure difference across the material. U value measurements are similar. If we want a metric to use to measure the airtightness quality of construction of the exterior enclosure of buildings it makes sense to use a metric that equates flow to the size and number of holes in the building's thermal enclosure.

The article continues with an example to help demonstrate how volume is not proportional to surface area:

Comparison between ACH50 and CFM50/ft² for a 2000 ft² home at 3 ACH50

House Is 50 X 40 X 8

Volume = 16,000 ft³

Surface Area = 50 X 40 X 2 + 180 X 8 = 5440 ft²

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CFM50/ft² = 800/5440 = 0.147 CFM50/ft²

Increase height to 2 story at 3 ACH50

House Is 50 X 40 X 16 Volume = 32,000 ft³

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In this example, when the volume is doubled, the surface area increased by 26%. And when the ACH50 stays the same, the CFM/ ft² of surface area increased by 58%. I have attached an Excel spreadsheet calculator that further defines the disconnect between ACH and CFM/ ft² of surface area to further elaborate the issue. In the attached calculator you can change the ratio of width and length of the building to see the effect on the resulting expressions of air leakage. An independent yet similar calculator can be found at this Residential Energy Dynamic link <http://www.residentialenergydynamics.com/REDCalcFree/Tools/AirLeakageMetrics>

The primary purpose of this code change proposal is to introduce the CFM/ft² of surface area metric into the code. Deciding on where to set the minimum allowable leakage rate is difficult largely due to the earlier volume and surface area discussion. Both tests are performed at a pressure differential of 0.2 inch water gauge (50 Pa), which is the traditional residential testing pressure so an attempt was made to align the introduction of a CFM/ft² of surface area metric with the existing ACH50 metric of 3 and 5 air changes per hour. ACH being a volumetric measurement penalized small volume dwelling units so a decision was made to concentrate on a size range of dwellings between 2500 and 5500 square feet. By doing this and using the attached conditioned floor space to shell area calculator we were able to see that little variation occurred between ACH and CFM/ft² of surface area metric when changing the size ratio of the modeled house within this house size range. By rounding up, the proposal is using .17 CFM/ft² of surface area metric to align with 3 ACH and .28 CFM/ft² of surface area metric to align with 5 ACH. By using these numbers, small volume homes, while not having a volumetric penalty, are allowed to be a little more leaky and large volume homes must achieve just about the same level of tightness if not a slight bit more. As the average home size in the United States is approximately just less than 2500 square feet this code change proposals purpose of introducing a better measurement metric without removing the codes traditional measurement methodology, provide additional flexibility while maintaining similar stringency.

The Energy Conservatory suggests that the use of Air Changes per Hour at 50 Pa (ACH50) started approximately 60 years ago by researchers who were interested in ways to predict the natural infiltration rate of buildings, which at the time was most commonly measured in Air Changes per Hour. At the time air quality in buildings was being studied and the metric made sense. If a pollutant is released in a building, the time for the concentration to decay by a certain percentage depends on the infiltration measured in air changes per hour. The analysis of a tracer gas decay test gives a result in air changes per hour. So, when they started measuring airtightness, for use in estimating natural infiltration in air changes per hour, it made sense to use ACH50 as the metric.

However, as discussed earlier, two homes with the same volume can have very different surface areas and holes associated with the building

enclosure area.

Value is gained by including a surface area-based metric in that air-sealing varies directly with the amount of surface area not the amount of volume in the dwelling. Two buildings can have surface areas that differs by 15%, but have the same volume and the current metric offers the same leakage allowance. Therefore, if the purpose of measuring air leakage is to determine something about the construction quality, air leakage rate, energy efficiency and building durability the metric should be associated with the flow of air through holes in the enclosure. To quantify these things ACH is the wrong metric. It does not tell you anything about the quantity and air leakage through holes in the building. Conversely, the CFM/ ft² of surface area metric concretely expresses the quantity of air leakage throught the building's exterior enclosure. When an enclosure is tight more energy is conserved as well as allowing better control and predictability of air flow, thermal flow, and moisture flow.

Many standards are now using square foot of enclosure area instead of ACH. Examples include EnergyStar, US Army Corp of Engineers, LEED, US Passive House and ASHRAE 62.2. This proposal is the first step to bring this better expression of air leakage into the code. It has been created in such a way that options are maintained allowing jurisdictions and building professionals flexibility in defining air leakage requirements.

Link to Energy Conservatory article from which portions of this reason statement have been added:

<https://support.energyconservatory.com/hc/en-us/articles/204176240-Which-is-a-better-metric-for-measuring-airtightness-ACH-50-Pa-or-CFM-ft-of-surface-area-50-Pa->

Cost Impact: The code change proposal will not increase or decrease the cost of construction
There should be no cost implication associated with the adoption of this proposed language. Dwellings will continue to need to be tested and testing prices will not change due to an additional option for how to express the results of the test.

Proposal # 4783

RE92-19

RE93-19

IECC: R402.4.1.2 (IRC N1102.4.1.2)

Proponent: Aaron Gary, representing Self (aaron.gary@texenergy.org)

2018 International Energy Conservation Code

Revise as follows:

R402.4.1.2 (IRC N1102.4.1.2) Testing. The *building* or dwelling unit shall be tested and verified as having an air leakage rate not exceeding five air changes per hour, or 0.32 cfm/ft² of enclosure bounding the dwelling for dwellings 1,600 square feet or less, in *Climate Zones* 1 and 2, and three air changes per hour, or 0.23 cfm/ft² of enclosure bounding the dwelling for dwellings 1,600 square feet or less, in *Climate Zones* 3 through 8. Testing shall be conducted in accordance with RESNET/ICC 380, ASTM E 779 or ASTM E 1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). Where required by the *code official*, testing shall be conducted by an *approved* third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*. Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope*.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures.
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.
3. Interior doors, where installed at the time of the test, shall be open.
4. Exterior or interior terminations for continuous ventilation systems shall be sealed.
5. Heating and cooling systems, where installed at the time of the test, shall be turned off.
6. Supply and return registers, where installed at the time of the test, shall be fully open.

Reason: All homes and apartments are required to be built tight. What is the most appropriate measurement of tightness is open for debate even within the Code where the metric is dependent on which section being referenced. The different metrics are important though because none of them are perfect and some are more applicable to one building type or another. For example, we believe that small homes and apartments are penalized by the ACH metric. A home that is 1600 sq. feet vs. a home that is 3,000 sq. feet can have the same level of attention to detail regarding the air sealing of a home, yet due to the decreased volume of the smaller home, the smaller dwelling will have a much harder time meeting it's ACH target. When volume is the deciding factor in the air leakage, this will always be the case. This built-in bias for larger homes with the ACH metric is because the ratio of surface area of the envelope (or walls bounding the dwelling) to the volume is not a linear relationship. Further the number of penetrations required by Code that can not be sealed effectively (exhaust ducts, mechanical ventilation intakes, fire-sprinkler penetrations, etc.) and the instances of penetrations that result in inadvertent leakage (plumbing penetrations, electrical penetrations, windows, doors, etc.) may be similar for a small dwelling as a large dwelling. For example: A house that is 1,000 square feet or 6,000 square feet will most often have one kitchen with all its associated openings and penetrations.

The infiltration metric we are proposing is derived from the ACH equivalencies accepted in ICC 700-2020 (which is currently in its first Public Comment). We are proposing that this equivalency only be accepted for dwellings under 1,600 sq. ft. though because 1) we believe the small dwellings are the ones being penalized by the ACH metric and 2) this leakage metric would result is less stringent leakage targets at larger dwelling volumes.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This code change will decrease the cost of construction for dwellings under 1600 sq. ft. by setting a air leakage target that is meaningful and achievable.

Proposal # 4564

RE93-19

RE94-19

IECC: R402.4.1.3 (IRC N1102.4.1.3) (New)

Proponent: Robert Schwarz, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

R402.4 Air leakage (Mandatory). The *building thermal envelope* shall be constructed to limit air leakage in accordance with the requirements of Sections R402.4.1 through R402.4.5.

R402.4.1.2 Testing. The *building* or dwelling unit shall be tested and verified as having an air leakage rate not exceeding five air changes per hour in *Climate Zones* 1 and 2, and three air changes per hour in *Climate Zones* 3 through 8. Testing shall be conducted in accordance with RESNET/ICC 380, ASTM E 779 or ASTM E 1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). Where required by the *code official*, testing shall be conducted by an *approved* third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*. Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope*.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures.
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.
3. Interior doors, where installed at the time of the test, shall be open.
4. Exterior or interior terminations for continuous ventilation systems shall be sealed.
5. Heating and cooling systems, where installed at the time of the test, shall be turned off.
6. Supply and return registers, where installed at the time of the test, shall be fully open.

Add new text as follows:

R402.4.1.3 (IRC N1102.4.1.3) Testing Garage Separation. The integrity of the air barrier assembly between dwelling units and attached garages shall pass a two-part test.

1. While conducting the air leakage test as described in Section R402.4.1.2 the air barrier separation between the house and the garage shall be tested to ensure that the house in reference to the garage is ≥ 45 Pascals of pressure when the house is held at 50 Pascals of pressure in relation to outside. All operable garage openings to the outside shall be closed during the test.
2. If test number 1 passes, the test shall be performed a second time with the garage vehicle door open to the ambient outside. The two test results shall not differ by more than 6 percent.

Reason: The energy code, like all code, is about health, safety, comfort, durability, as well as efficiency. The garage is the largest potential source of pollutants and carbon monoxide in the house and it has been codified in table R402.4.1.1 to ensure that the air in the garage is separated from the house. Air from an attached garage can enter the living space of the home if there are bypasses in the air barrier between the two spaces and if the home is at a negative pressure with respect to the garage. Negative pressures may be due to natural forces or to mechanical depressurization of the house with respect to the garage caused by appliances like rangehood fans, clothes dryers, bath fans, crawlspace ventilation or whole house ventilation systems, as well as, unbalanced HVAC systems. Unfortunately, there is no way to be sure that separation has been achieved, in this location, unless the separation is tested. Fortunately testing for separation between the house and garage is simple and is made even more practical due to the requirement to blower door test for every home.

The surest way to keep garage pollutants out of the house is to build a detached garage. Since most houses are designed with attached garages, planning ahead of construction to make sure a continuous air barrier is installed between the house and the garage makes sense. This proposal will promote such planning.

To ensure that there is not a false positive result Building America research has determined that the test requires two steps. First, while the house is at 50 Pascals of pressure with regards to outside during the blower door test a zonal pressure test is performed by installing a tube between the house and the garage. (Usually under the door between the house and the garage) If the garage is clearly outside, the measurement between the house and the garage should also be 50 Pascals of pressure. The closer the measurement is to zero the more connected the garage is to the house. This code proposal requires that the results of the first test be ≥ 45 pascals which is an indication that the air barrier assembly between the house and garage is sound. The first test is performed when all openings between the garage and the outside are closed. Second, this test is repeated with the overhead vehicle door open. If the results of the second test are greater than 6% the connection between the house and the garage tests fails. The rationale for the second test is to guard against false positive results that can occur while performing the first test.

If we continue to require separation between the house and the garage from an energy efficiency perspective, we must also test to ensure it from a health and safety perspective in order to maintain the intent of the IECC. Programs such as the EPA Indoor Air Plus and the DOE Zero Energy Ready Home program have incorporated the protocol described above to test for this separation. In addition, Jurisdictions around the country, such as Fort Collins Colorado have amended the IECC to require this test as they realize the energy and health and safety implications.

People have asked if garage separation is really an issue. Past research, as pointed out in the Building America Program research paper titled “Air Leakage and Air Transfer between Garage and Living Space” says yes. An excerpt of a study done by S.J. Emmerich used in the Building America paper, reports that polluted garage air infiltrated into living quarters was as much as 45% of total house infiltration. See the attached research paper for more evidence of carbon monoxide and other pollutants traveling between attached garages and the house and the bibliography of numerous studies that have documented that pollutants from the garage are capable of migrating into the house.

The problem is that one cannot know for sure if the garage is connected to the house unless one tests. The complexities of the assemblies separating the house and the garage, with dropped ceilings, pipe, ducts, wiring and who knows what else penetrating the buildings thermal envelope and air barrier systems, make it an extremely difficult part of the house to seal. What we do know is that automobiles are the largest source of carbon monoxide in our home and they are parked in attached garages. We also know that other pollutants such as gasoline, pesticides, and paints are stored in attached garages. Therefore, to not test is clearly against the health and safety intent of the code and ultimately places builders and homebuyers at risk.

Resources:

US Department of Energy Building Technologies Office

Building America Program

“Air Leakage and Air Transfer between Garage and Living Space”

Armin Rudd Building Science Corporation

September 2014

Air Sealing and Insulating Garage Walls - Code Compliance Brief **<https://bascc.pnnl.gov/code-compliance/air-sealing-and-insulating-garage-walls-code-compliance-brief>**

Overview:

The intent of this brief is to provide code-specific information about air sealing and insulating garage walls to help ensure that the measure will be accepted as being in compliance with the code. Providing notes for code officials on how to plan reviews and conduct field inspections can help builders or remodelers with proposed designs and installations and provide jurisdictional officials with information for acceptance. Providing the same information to all interested parties (e.g., code officials, builders, designers, etc.) is expected to result in increased compliance and fewer innovations being questioned at the time of plan review and/or field inspection.

As in other parts of the home, sealing and insulating the walls and ceiling of your garage can be an effective way to improve energy efficiency in a home. In addition, properly isolating and air sealing attached garages from the living space is critical for preventing the potential infiltration of carbon monoxide and other contaminants into the home. Open joist bays above the garage that extend into living spaces need to be blocked and air sealed at the garage wall. Seams along the rim joist, top plate, sill plate, and foundation wall should be caulked or sealed. If there is living space above the garage, extra care should be taken to seal all seams and any holes in the subfloor, and any doors between the house and the garage should be weather stripped and have a tight-fitting threshold sweep.

Insulation and air-sealing requirements for garage walls shared with conditioned space are found in the International Energy Conservation Code (IECC) and International Residential Code (IRC). Even though each version of the 2009, 2012, and 2015 IECC/IRC codes has included provisions that the *building thermal envelope*¹ should be durably sealed to limit infiltration, the language related to air barriers and insulation in the 2009 version was somewhat vague and did not specify specific components of the *building thermal envelope*. The 2012 IECC/IRC added more specific language regarding areas of the *building thermal envelope* that should be sealed and expanded upon those areas that are now included in the 2015 IECC/IRC as well. This brief provides an overview of the 2009 through 2015 IRC/IECC code requirements related to air sealing and insulating attached garage walls.

Cost Impact: The code change proposal will increase the cost of construction

The cost implication of this proposal is small as this test must be performed at the same time as the blower door test described in section R4052.4.1.2. The garage separation test will add approximately 15 minutes to the testing that is already being performed so may add between \$25 and \$50. If the test fails it is an indication that already required code air sealing scopes of work are not being performed properly. This should require greater attention to detail rather than additional cost from the air sealing contractor.

Proposal # 4773

RE95-19

IECC: R402.4.1.3 (IRC N1102.4.1.3) (New), R402.4.1.3.1 (IRC N1102.4.1.3.1) (New), R402.4.1.3.2 (IRC N1102.4.1.3.2) (New)

Proponent: Aaron Gary, Tempo Partners, representing Self (aaron.gary@tempopartners.com)

2018 International Energy Conservation Code

Add new text as follows:

R402.4.1.3 (IRC N1102.4.1.3) Sampling options for R2 multifamily dwelling units. For buildings having three or more dwelling units, a minimum of 15% of the dwelling units in each building must be tested as required by Section R402.4.1.2. Prior to beginning sampling for testing, "Initial Testing" is required for each multifamily property. "Initial Testing" shall consist of the 3rd party testing contractor performing the required tests on at least three consecutive dwelling units. Test results from the "Initial Testing" must satisfy minimum code requirements before sampling is permitted. Dwelling units selected for the "Initial Testing" must be within the same building. Dwelling units selected for "Initial Testing" shall not be included in a "sample group" or counted toward the minimum 15% of dwelling units tested. The building official shall randomly select the three dwelling units for "Initial Testing." The building official may delegate the random selection to the designated 3rd party testing contractor.

R402.4.1.3.1 (IRC N1102.4.1.3.1) Sample group Identification and Sampling. The builder shall identify a "sample group" which may be a building, floor, fire area or portion thereof. All of the dwelling units within the "sample group" must be at the same stage of construction and must be ready for testing. The building official shall randomly select at least 15% of dwelling units from each "sample group" for testing. The building official may delegate the random selection to the designated 3rd party testing contractor.

If each tested dwelling unit within a "sample group" meets the minimum code requirements, then all dwelling units in the "sample group" are considered to meet the minimum code requirements.

Before a building may be deemed compliant with the testing as required, each "sample group" must be deemed compliant with the minimum code requirements. The sum total of all of the tested dwelling units across all "sample groups" shall not be less than a minimum of 15% of the dwelling units in a building.

R402.4.1.3.2 (IRC N1102.4.1.3.2) Failure to Meet Code Requirement(s). If any dwelling units within the identified "sample group" fail to meet a code requirement as determined by testing, the builder will be directed to correct the cause(s) of failure, and 30% of the remaining dwelling units in the "sample group" will be randomly selected for testing by the building official, or third-party testing contractor, regarding the specific cause(s) of failure.

If any failures occur in the additional dwelling units, all remaining dwelling units in the sample group must be individually tested for code compliance.

A multifamily property with three failures within a 90-day period is no longer eligible to use the sampling protocol in that community or project until successfully repeating "Initial Testing." Sampling may be reinstated after at least three consecutive dwelling units are individually verified to meet all code requirements.

A Certificate of Occupancy may not may be issued for any building until testing has been performed and deemed to satisfy the minimum code requirements on the dwelling unit(s) identified for testing.

Reason: For many multifamily (R2 classifications) projects, it is very costly and time consuming to test each dwelling unit for projects where there may be dozens of dwelling units in each building. Considering that the same tradesman generally constructs a building, it is reasonable to deem that construction practices are consistent and that if a reasonable sampling of units tested pass then all units would pass. These amendments (originally drafted by the North Texas Council of Governments Energy and Green Advisory Board) or are very similar ordinances, have been accepted across Texas by the EHJs including the City of Dallas, the City of Austin, and the City of San Antonio.

Cost Impact: The code change proposal will decrease the cost of construction

This code change proposal will streamline the cost and time required to conduct on-site verification of Code which will result in lower testing costs and faster construction timelines.

Proposal # 4588

RE95-19

RE96-19

IECC: R402.4 (IRC N1102.4), R402.4.1 (IRC N1102.4.1), R402.4.1.1 (IRC N1102.4.1.1) , R402.4.1.2 (IRC N1102.4.1.2) , R402.4.1.3 (IRC N1102.4.1.3) (New)

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

R402.4 (IRC N1102.4) Air leakage (Mandatory) . The *building thermal envelope* shall be constructed to limit air leakage in accordance with the requirements of Sections R402.4.1 through R402.4.5.

R402.4.1 (IRC N1102.4.1) Building thermal envelope. The *building thermal envelope* shall comply with Sections R402.4.1.1 and ~~R402.4.1.2 through R402.4.1.3.~~ The sealing methods between dissimilar materials shall allow for differential expansion and contraction.

R402.4.1.1 (IRC N1102.4.1.1) Installation (Mandatory). The components of the *building thermal envelope* as indicated in Table R402.4.1.1 shall be installed in accordance with the manufacturer's instructions and the criteria indicated in Table R402.4.1.1, as applicable to the method of construction. Where required by the *code official*, an *approved* third party shall inspect all components and verify compliance.

R402.4.1.2 (IRC N1102.4.1.2) Testing (Mandatory). The *building* or dwelling unit shall be tested ~~and verified as having an air leakage rate not exceeding five air changes per hour in Climate Zones 1 and 2, and three air changes per hour in Climate Zones 3 through 8; for air leakage.~~ The maximum air leakage rate for any building or dwelling unit under any compliance path shall not exceed 5.0 air changes per hour. Testing shall be conducted in accordance with RESNET/ICC 380, ASTM E 779 or ASTM E 1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). Where required by the *code official*, testing shall be conducted by an *approved* third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*. Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope*.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures.
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.
3. Interior doors, where installed at the time of the test, shall be open.
4. Exterior or interior terminations for continuous ventilation systems shall be sealed.
5. Heating and cooling systems, where installed at the time of the test, shall be turned off.
6. Supply and return registers, where installed at the time of the test, shall be fully open.

Add new text as follows:

R402.4.1.3 (IRC N1102.4.1.3) Leakage Rate (Prescriptive). The building or dwelling unit shall have an air leakage rate not exceeding 5.0 air changes per hour in Climate Zones 1 and 2, and 3.0 air changes per hour in Climate Zones 3 through 8, when tested in accordance with Section R402.4.1.2.

Reason: The purpose of the code change proposal is to increase flexibility by modifying the mandatory value for air leakage to permit limited trade-off against other features of the home and establishing a prescriptive value at the same level as the current mandatory value. Specifically, the proposal would allow a trade-off option for air tightness up to 5 ACH50, while maintaining the baseline prescriptive value for trade-offs at 3 ACH50 in climate zones 3-8.

Because the current air leakage requirements are mandatory, builders have limited recourse if a finished home fails to meet the required leakage level or if the size or design features of the home make air tightness more challenging. This proposal will allow air leakage to be traded off up to a designated maximum level through either the performance path or the ERI, as long as builders account for the efficiency losses by improving other building components. If a builder believes that the particular design characteristics or size of a home or dwelling unit will make it more difficult to achieve 3 ACH50, this flexibility will allow the builder to hedge against a failure to meet the prescriptive leakage by implementing modest improvements elsewhere in the home and complying by the performance path or ERI.

This change should improve adoption and enforcement of the code requirements. The proposal responds to complaints that the current mandatory level of air leakage at 3 ACH is too stringent in some cases. It will allow jurisdictions to adopt the 3 ACH requirement with the recognition that if a builder has difficulty meeting it, they have other compliance options. Moreover, this proposal makes the code's air leakage requirements consistent with other requirements where there is a mandatory level at some value above the prescriptive level.

This proposal also clarifies the maximum air leakage rates as 3.0 and 5.0 air changes per hour. While most code users understand the maximum air leakage rates as already being at 3.0 and 5.0 changes per hour, the addition of another digit will pre-empt any “round up” vs. “round-down” arguments from code users, providing additional support for building code officials who are simply trying to enforce the code. This part of the proposal does not change any actual requirements, but rather provides clarification and reduces inconsistency and confusion.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposal is intended to be cost-neutral, but provide increased flexibility and improve compliance and enforcement. In some cases, builders may be able to reduce cost by trading off air leakage for other efficiency improvements.

Proposal # 3993

RE96-19

RE97-19

IECC: R402.4.1.2 (IRC N1102.4.1.2)

Proponent: Aaron Gary, representing Self (aaron.gary@texenergy.org)

2018 International Energy Conservation Code

Revise as follows:

R402.4.1.2 (IRC N1102.4.1.2) Testing. The *building* or dwelling unit shall be tested and verified as having an air leakage rate not exceeding five air changes per hour in *Climate Zones* 1 and 2, and three air changes per hour in *Climate Zones* 3 through 8. Testing shall be conducted in accordance with RESNET/ICC 380, ASTM E 779 or ASTM E 1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). ~~Where required by the code official, testing~~ Testing shall be conducted by an approved third party party that is certified to perform air infiltration testing by a national or state organization. The third-party entity may not be employed, or have financial interest in the company that constructs the building or dwelling unit. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*. Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope*.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures.
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.
3. Interior doors, where installed at the time of the test, shall be open.
4. Exterior or interior terminations for continuous ventilation systems shall be sealed.
5. Heating and cooling systems, where installed at the time of the test, shall be turned off.
6. Supply and return registers, where installed at the time of the test, shall be fully open.

Reason: The International Residential Code (IRC) and International Energy Conservation Code (IECC) includes enhanced emphasis on envelope infiltration and duct leakage. Significant changes in the residential energy requirements include more frequent requirement of performance testing for leakage. Residential Duct systems must be tested unless all ducts and equipment are located within the conditioned space. Envelope testing is required to demonstrate compliance with maximum allowable leakage rate. This language puts the regulatory authority on notice that the testing requires specialized credentials and establishes a conflict of interest baseline.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The code change proposal will not increase or decrease the cost of construction.

Proposal # 4592

RE97-19

RE98-19

IECC: R402.4.1.2 (IRC N1102.4.1.2), TABLE R405.5.2(1) [IRC N1105.5.2(1)]

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

R402.4.1.2 (IRC N1102.4.1.2) Testing. The building or dwelling unit shall be tested and verified as having an air leakage rate not exceeding ~~five~~ 5.0 air changes per hour in Climate Zones 1 and 2, and ~~three~~ 3.0 air changes per hour in Climate Zones 3 through 8. Testing shall be conducted in accordance with RESNET/ICC 380, ASTM E 779 or ASTM E 1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). Where required by the code official, testing shall be conducted by an approved third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the code official. Testing shall be performed at any time after creation of all penetrations of the building thermal envelope. During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures.
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.
3. Interior doors, where installed at the time of the test, shall be open.
4. Exterior or interior terminations for continuous ventilation systems shall be sealed.
5. Heating and cooling systems, where installed at the time of the test, shall be turned off.
6. Supply and return registers, where installed at the time of the test, shall be fully open.

TABLE R405.5.2(1) [IRC N1105.5.2(1)]

SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

Portions of table not shown remain unchanged.

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Air exchange rate	<p>The air leakage rate at a pressure of 0.2 inch w.g. (50 Pa) shall be Climate Zones 1 and 2: 5.0 <u>5.0</u> air changes per hour. Climate Zones 3 through 8: 3.0 <u>3.0</u> air changes per hour.</p> <p>The mechanical ventilation rate shall be in addition to the air leakage rate and shall be the same as in the proposed design, but not greater than $0.01 \times \text{CFA} + 7.5 \times (\text{N}_{br} + 1)$</p> <p>where:</p> <p>CFA = conditioned floor area, ft².</p> <p>N_{br} = number of bedrooms.</p> <p>Energy recovery shall not be assumed for mechanical ventilation.</p>	<p>The measured air exchange rate.^a</p> <p>The mechanical ventilation rate^b shall be in addition to the air leakage rate and shall be as proposed.</p>

For SI: 1 square foot = 0.93 m², 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m², 1 gallon (US) = 3.785 L,

°C = (°F-32)/1.8, 1 degree = 0.79 rad.

- a. Where required by the *code official*, testing shall be conducted by an *approved* party. Hourly calculations as specified in the ASHRAE *Handbook of Fundamentals*, or the equivalent, shall be used to determine the energy loads resulting from infiltration.
- b. The combined air exchange rate for infiltration and mechanical ventilation shall be determined in accordance with Equation 43 of 2001 ASHRAE *Handbook of Fundamentals*, page 26.24 and the “Whole-house Ventilation” provisions of 2001 ASHRAE *Handbook of Fundamentals*, page 26.19 for intermittent mechanical ventilation.

Reason: The purpose of this code change proposal is to clarify the current requirements for maximum tested air leakage rates that are already part

of the IECC and to ensure that buildings achieve the efficiency intended by the code. Specifically, the code proposal adds “.0” to the specified requirements to clarify that values above 3.0 or 5.0 are not allowed. While most users understand based on the current language that the air leakage may not exceed 3 or 5 air changes per hour (depending on climate zone), the addition of another digit will pre-empt any claim that a tested value above these maximums, such as 5.4 ACH, will meet the 5 ACH maximum. By cutting off these “round off” arguments from code users, this change will provide additional support for building code officials who are simply trying to enforce the code. This proposed clarification will not change any substantive requirements of the code but will improve compliance and enforcement and eliminate any confusion.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. It merely serves to clarify a current requirement to avoid confusion and inconsistent enforcement.

Proposal # 3989

RE98-19

RE99-19

IECC: R402.4 (IRC N1102.4), R402.4.1.1 (IRC N1102.4.1.1), R402.4.1.2 (IRC N1102.4.1.2), R402.4.1.3 (IRC N1102.4.1.3) (New), R402.4.1.4 (IRC N1102.4.1.4)(New)

Proponent: Joel Martell, representing National Association of Home Builders (jmartell@nahb.org)

2018 International Energy Conservation Code

Revise as follows:

R402.4 (IRC N1102.4) Air leakage (Mandatory). The *building thermal envelope* shall be constructed to limit air leakage in accordance with the requirements of Sections R402.4.1 through R402.4.5.

R402.4.1.1 (IRC N1102.4.1.1) Installation (Mandatory). The components of the *building thermal envelope* as indicated in Table R402.4.1.1 shall be installed in accordance with the manufacturer's instructions and the criteria indicated in Table R402.4.1.1, as applicable to the method of construction. Where required by the *code official*, an *approved* third party shall inspect all components and verify compliance.

R402.4.1.2 (IRC N1102.4.1.2) Testing (Mandatory). The *building* or dwelling unit shall be tested ~~and verified as having an air leakage rate not exceeding five air changes per hour in Climate Zones 1 and 2, and three air changes per hour in Climate Zones 3 through 8.~~ Testing shall be conducted in accordance with RESNET/ICC 380, ASTM E 779 or ASTM E 1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). Where required by the *code official*, testing shall be conducted by an *approved* third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*. Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope*.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures.
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.
3. Interior doors, where installed at the time of the test, shall be open.
4. Exterior or interior terminations for continuous ventilation systems shall be sealed.
5. Heating and cooling systems, where installed at the time of the test, shall be turned off.
6. Supply and return registers, where installed at the time of the test, shall be fully open.

Add new text as follows:

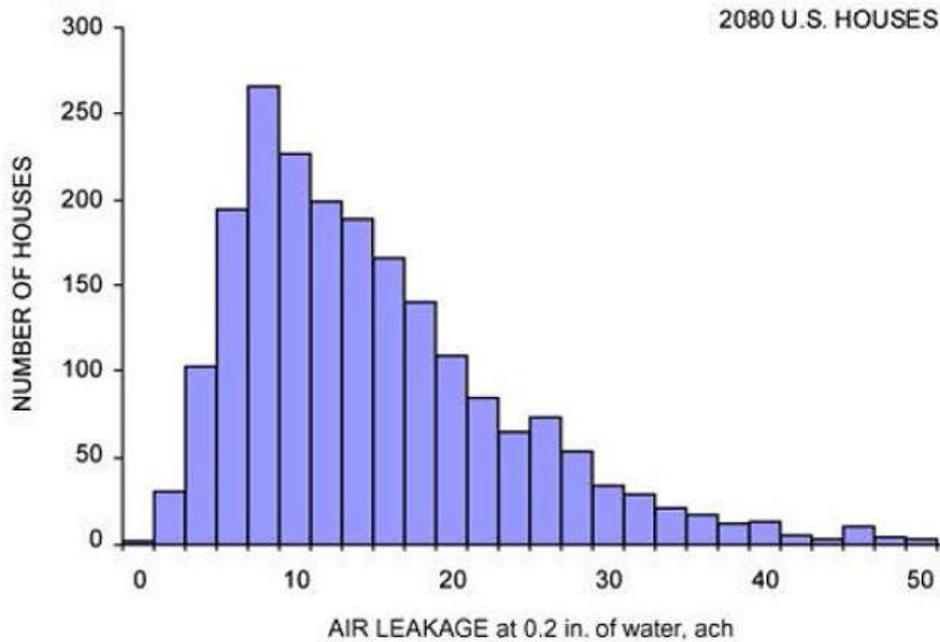
R402.4.1.3 (IRC N1102.4.1.3) Maximum Air Leakage (Mandatory). The maximum Air Leakage permitted shall be 6 ACH in Climate Zones 1 and 2, and 5 ACH in Climate Zones 3 through 8 when tested in accordance with Section R402.4.1.2.

R402.4.1.4 (IRC N1102.4.1.4) Air Leakage Rate (Prescriptive). The building or dwelling unit shall have an air leakage rate not exceeding 5 air changes per hour in Climate Zones 1 and 2, and 3 air changes per hour in Climate Zones 3 through 8, when tested in accordance with Section R402.4.1.2.

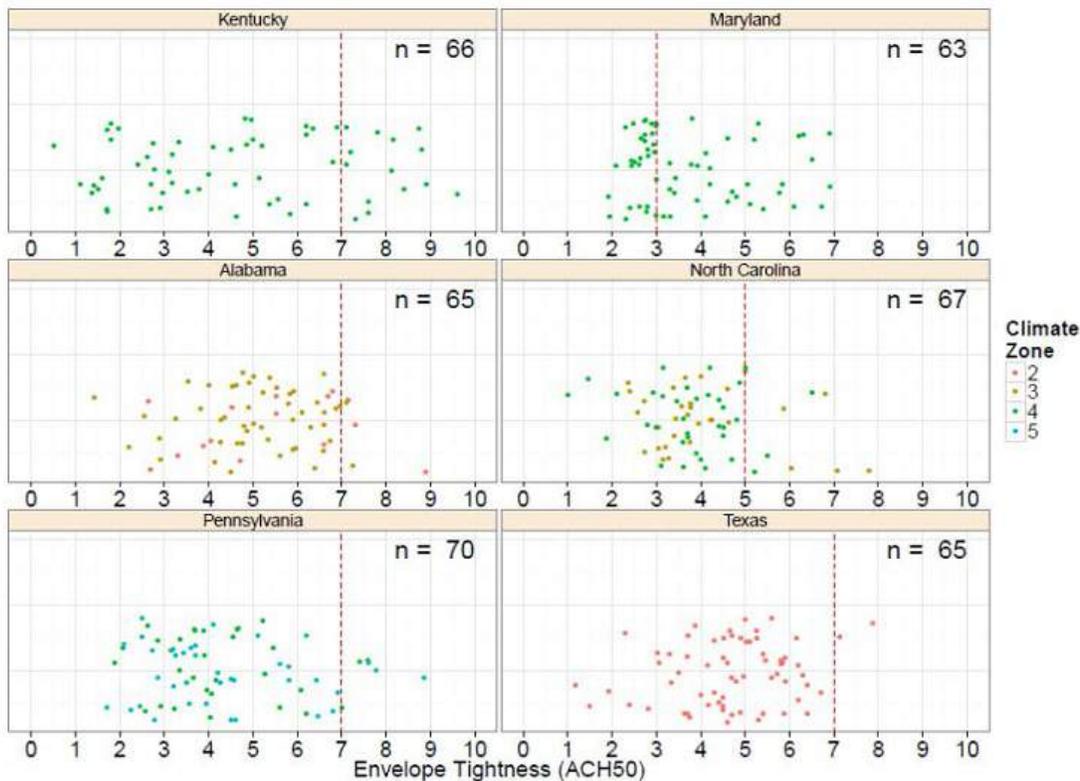
Reason: : These modifications remove the mandatory maximum air-tightness requirement and provide designers and builders the flexibility to trade off building tightness with other performance path measures while also providing a limit to that flexibility. Currently the building tightness requirement is mandatory and the 3 and 5 ACH tightness levels, even under ideal circumstances, are very difficult to achieve. This will provide energy neutral tradeoffs for expensive and sometimes unattainable requirements with other building improvements. This proposal does not change the stringency or efficiency of the code; it only increases the flexibility.

DOE has verified that achieving 3 ACH50 is problematic, even in Maryland who has had a 3 ACH requirement for over 3 years (see chart below).

2013 ASHRAE Handbook—Fundamentals



Envelope Tightness



U.S. DEPARTMENT OF **ENERGY** | Energy Efficiency & Renewable Energy

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal will not change the cost of construction only add flexibility.

RE100-19

IECC: R402.4.1.2 (IRC N1102.4.1.2), R402.2.13 (IRC N1102.2.13), R402.3.5 (IRC N1102.3.5)

Proponent: Darren Meyers, P.E., International Energy Conservation Consultants LLC, representing Self (dmeyers@ieccode.com)

2018 International Energy Conservation Code

Revise as follows:

R402.4.1.2 (IRC N1102.4.1.2) Testing. The *building* or dwelling unit shall be tested and verified as having an air leakage rate not exceeding five air changes per hour in *Climate Zones* 1 and 2, and three air changes per hour in *Climate Zones* 3 through 8. Testing shall be conducted in accordance with RESNET/ICC 380, ASTM E 779 or ASTM E 1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). Where required by the *code official*, testing shall be conducted by an *approved* third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*. Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope*: have been sealed.

Exception: For heated, attached private garages and heated, detached private garages accessory to 1- and 2-family dwellings and townhouses not more than 3 stories above grade plane in height, building envelope tightness and insulation installation shall be considered acceptable where the items in Table R402.4.1.1, applicable to the method of construction, are field verified. Where required by the *code official*, an *approved* third party independent from the installer shall inspect both air barrier and insulation installation criteria. Heated, attached private garage space and heated, detached private garage space shall be *thermally isolated* from all other habitable, *conditioned spaces* in accordance with Sections R402.2.13 and R402.3.5, accordingly.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures.
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.
3. Interior doors, where installed at the time of the test, shall be open.
4. Exterior or interior terminations for continuous ventilation systems shall be sealed.
5. Heating and cooling systems, where installed at the time of the test, shall be turned off.
6. Supply and return registers, where installed at the time of the test, shall be fully open.

R402.2.13 (IRC N1102.2.13) Sunroom insulation. *Sunrooms* enclosing *conditioned space* and heated garages shall meet the insulation requirements of this code.

Exception: For *sunrooms* and heated garages provided with *thermal isolation*, and enclosing conditioned space, the following exceptions to the insulation requirements of this code shall apply:

1. The minimum ceiling insulation *R*-values shall be R-19 in *Climate Zones* 1 through 4 and R-24 in *Climate Zones* 5 through 8.
2. The minimum wall insulation *R*-value shall be R-13 in all *climate zones*. Walls separating a *sunroom* or heated garage with a *thermal isolation* from *conditioned space* shall comply with the *building thermal envelope* requirements of this code.

R402.3.5 (IRC N1102.3.5) Sunroom fenestration. *Sunrooms* and heated garages enclosing *conditioned space* shall comply with the fenestration requirements of this code.

Exception: In *Climate Zones* 2 through 8, for sunrooms and heated garages with *thermal isolation* and enclosing *conditioned space*, the fenestration *U*-factor shall not exceed 0.45 and the skylight *U*-factor shall not exceed 0.70.

New fenestration separating ~~the a~~ sunroom or heated garage with *thermal isolation* from *conditioned space* shall comply with the *building thermal envelope* requirements of this code.

Reason: We, in Illinois and Iowa, have found that the addition of a reasonable, provision regulating "heated garages," results in improved levels of compliance assessment.

Cost Impact: The code change proposal will increase the cost of construction

It is likely that the creation of the thermally-isolated "heated garage" provisions will result in less "illegitimate" applications or "non-applications" for permit and inspection of newly heated, existing garages utilized for either hobby or workshop or rendering during hunting season.

Proposal # 5647

RE100-19

RE101-19

IECC: R402.4.1.2 (IRC N1102.4.1.2)

Proponent: Darren Meyers, P.E., International Energy Conservation Consultants LLC, representing Self (dmeyers@ieccode.com)

2018 International Energy Conservation Code

Revise as follows:

R402.4.1.2 (IRC N1102.4.1.2) Testing. The *building* or dwelling unit shall be tested and verified as having an air leakage rate not exceeding five air changes per hour in *Climate Zones* 1 and 2, and three air changes per hour in *Climate Zones* 3 through 8. Testing shall be conducted in accordance with RESNET/ICC 380, ASTM E 779 or ASTM E 1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). Where required by the *code official*, testing shall be conducted by an *approved* third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*. Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope*: have been sealed.

Exception: For *additions*, *alterations*, *renovations* or *repairs* to existing buildings, *building thermal envelope* tightness and insulation installation shall be considered acceptable when the items in Table R402.4.1.1, applicable to the method of construction, are field verified. Where required by the *code official*, an *approved* third party independent from the installer shall inspect both air barrier and insulation installation criteria.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures.
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.
3. Interior doors, where installed at the time of the test, shall be open.
4. Exterior or interior terminations for continuous ventilation systems shall be sealed.
5. Heating and cooling systems, where installed at the time of the test, shall be turned off.
6. Supply and return registers, where installed at the time of the test, shall be fully open.

Reason: Should a bedroom addition to a farmhouse originally constructed in 1950's rural america be required to be blower door tested to 3.0 ACH50? We think not. Accordingly, a reasonable middle ground is offered.

Cost Impact: The code change proposal will decrease the cost of construction
While interpreted literally, a blower door test is required for new construction, including additions.

Proposal # 5636

RE101-19

RE102-19

IECC: R402.4.1.2.1 (IRC N1102.4.1.2.1) (New)

Proponent: Joel Martell, representing National Association of Home Builders (jmartell@nahb.org)

2018 International Energy Conservation Code

Add new text as follows:

R402.4.1.2.1 (IRC N1102.4.1.2.1) Multi-unit buildings and single family attached buildings Multi-unit buildings and single family attached buildings shall be tested as a single zone, multiple zones, or as individual dwelling units in accordance with ASTM E779.

Reason: This proposal is very clear and straight forward, it helps to clarify testing in multi-unit buildings. The ASTM E779 standard is referenced in R402.4.1.2 and this standard allows for single, or multiple zone testing. This proposal is just adding clarification to the code for a method that is already allowed. Currently the IECC treats low-rise multifamily buildings of three stories or less like single-family homes and multifamily buildings of four stories or more like commercial buildings. Regardless of height, all multifamily buildings have the same airtightness testing complications to address. Large multiple dwelling buildings are often tested as isolated test zones due to the nature of the actual testing procedures and available equipment needed to depressurize large volumes of conditioned space and this proposal would recognize this challenge for those conducting the testing. By approving this proposal, low-rise multifamily buildings, two-unit dwellings and town houses will avoid these complications, but still be held to the same level of performance as high-rise (R-2) residential as well as commercial buildings

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal will not change the cost of construction. It adds clarification to something that is already allowed in the code.

Proposal # 4318

RE102-19

RE103-19

IECC: R402.4.2 (New),

R402.4.6

(New)

Proponent: Marilyn Williams, representing NEMA

2018 International Energy Conservation Code

R402.4.2 Fireplaces. New wood-burning fireplaces shall have tight-fitting flue dampers or doors, and outdoor combustion air. Where using tight-fitting doors on factory-built fireplaces listed and *labeled* in accordance with UL 127, the doors shall be tested and *listed* for the fireplace.

Add new text as follows:

R402.4.6 Electrical and Communication Outlet Boxes (air-sealed boxes). Electrical and communication outlet boxes installed in the *building thermal envelope* shall lbe sealed to limit air leakage between conditioned and unconditioned spaces. Electrical and communication outlet boxes shall be tested in accordance with NEMA OS 4, Requirements for Air-Sealed Boxes for Electrical and Communication Applications, and shall have an air leakage rate of not greater than 2.0 cfm (0.944 L/s) at a pressure differential of 1.57 psf (75 Pa). Electrical and communication outlet boxes shall be marked "NEMA OS 4" or "OS 4" in accordance with NEMA OS 4. Electrical and communication outlet boxes shall be installed per the manufacturer's instructions and with any supplied components required to achieve compliance with NEMA OS 4.

Reason: Similar to Section R402.4.5 for recessed lighting a new section for electrical and communications outlet boxes is being proposed to limit air leakage when installed in the building thermal envelop. "Air-sealed boxes" are identified in Table R402.4.1.1. This new section defines an air-sealed box.

Sealing air-barrier penetrations is not always as simple as applying more insulation, caulk, or expanding foam. Electrical and communication outlet boxes, having design features that effective seal the air-barrier penetrations, also reduce potentially undesirable effects that can result from the use of unspecified sealing techniques.

NEMA OS 4-2016, *Requirements for Air-Sealed Boxes for Electrical and Communication Applications*, was developed by the NEMA Outlet and Switch Box Section. In the preparation of NEMA OS 4, input of users and other interested parties was sought and evaluated.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
An outlet box with an alternative means of sealing needs to be used if a vapor barrier box is not.

Proposal # 4077

RE103-19

RE104-19

IECC: R402.4.6 (IRC N1102.4.6) (New)

Proponent: donald sivigny, State of MN, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Energy Conservation Code

Add new text as follows:

R402.4.6 (IRC N1102.4.6) Replacement fenestration Where a fenestration unit is replaced, the new unit shall meet the applicable requirements for U-factor and SHGC in Table R402.1.1.

Reason: When windows are replaced, many times the replacement window is installed into the existing frame of the existing window. In such a case the existing window frame now becomes part of the wall assembly, and the new frame and window sash are considered a new fenestration product. In such cases this would require the new fenestration product (new frame, sash, glazing etc.) to meet the U-factor requirements of Table R402.1.2 or R402.1.4 of this code. If you are only replacing the glass or one portion of the window, this is not a replacement fenestration, it would then be a repair, and not a replacement

Cost Impact: The code change proposal will increase the cost of construction

Although a replacement window that complies with the newest code will cost more than one that only complies with less stringent, older codes, the cost differential isn't that significant as compared to the energy savings (pay-back) over the life of the up-to-current-code window.

Proposal # 5131

RE104-19

RE105-19

IECC: R402.5 (IRC N1102.5)

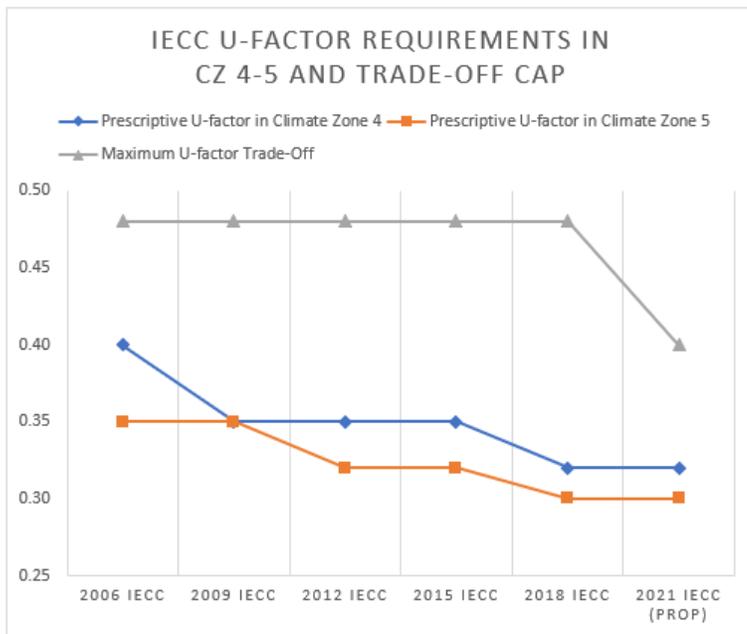
Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

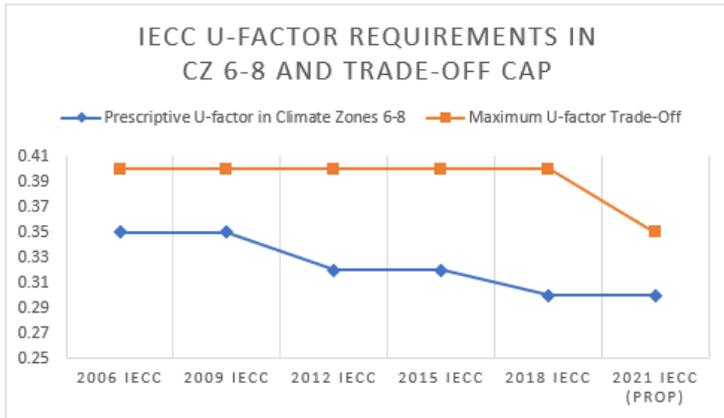
Revise as follows:

R402.5 (IRC N1102.5) Maximum fenestration U-factor and SHGC (Mandatory). The area-weighted average maximum fenestration U-factor permitted using tradeoffs from Section R402.1.5 or R405 shall be ~~0.48~~ 0.40 in *Climate Zones* 4 and 5 and ~~0.40~~ 0.35 in *Climate Zones* 6 through 8 for vertical fenestration, and 0.75 in *Climate Zones* 4 through 8 for skylights. The area-weighted average maximum fenestration SHGC permitted using tradeoffs from Section R405 in *Climate Zones* 1 through 3 shall be ~~0.50~~ 0.40.

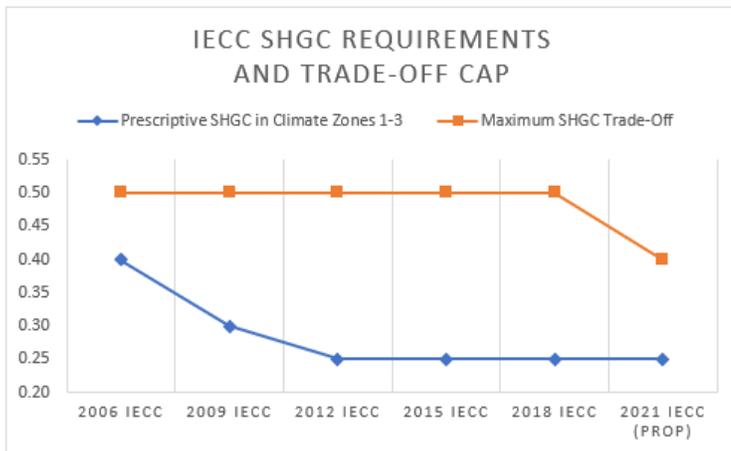
Reason: The purpose of this code change proposal is to update the mandatory maximum fenestration U-factors and Solar Heat Gain Coefficients (SHGC) permitted in the IECC's tradeoff compliance paths consistent with improvements in prescriptive fenestration values made since the maximums were originally included in the code. The fenestration maximums have been in the IECC since the 2006 IECC, and have provided a critical backstop in the event of trade-offs, helping to ensure reasonable energy efficiency and occupant comfort. Over the 12 years and 4 code update cycles that these backstops have been in place, prescriptive fenestration efficiencies have improved substantially, but the maximum U-factors and SHGCs have never been updated. To maintain the effectiveness of these backstops, we recommend that they be updated. The following graphs help to illustrate the growing "gap" between the prescriptive fenestration U-factors and the mandatory trade-off maximum in R402.5. The first graph below shows the improvements in U-factors for climate zones 4-5 over the last several code editions compared to the existing cap, and shows that there is still considerable trade-off flexibility if the trade-off maximum is improved from 0.48 to 0.40. (Note that the cap proposed above is the final data point.)



As shown in the second graph below, the U-factors in climate zones 6-8 follow a similar trend of improvement over the years, while the backstop remains at 0.40. Note that the impact of improving the maximum trade-off U-factor from 0.40 to 0.35 in climate zones 6-8 (as proposed) still leaves substantial trade-off room.



The effect is similar, but even more pronounced for SHGC. As shown in the SHGC graph below, the current SHGC maximum allows builders to essentially double the amount of heat gain (0.25 to 0.50) before hitting the current cap. Improving the SHGC trade-off maximum from 0.50 to 0.40 as we propose above still leaves more trade-off room than was available to builders in 2006 when the cap was originally instituted.



We believe that the improved fenestration maximums will be easily met. In fact, based on data recently collected by the U.S. Department of Energy across 8 states, we expect little or no change in homebuilding practices or any impact on homebuilding costs.

- In climate zones 1-3, of the 477 homes sampled, over 98% *already complied* with the proposed SHGC maximum of 0.40.
- Likewise, in climate zones 4-5, of the 468 homes sampled, over 98% *already complied* with the proposed U-factor maximum of 0.40.
- In climate zones 6-8, although DOE did not collect data for these climate zones as part of the Field Studies, the Energy Star program estimates that 83% of fenestration products shipped in 2016 met or exceeded Energy Star requirements (the Energy Star window criteria in 2016 was equal to or lower than a 0.30 U-factor in climate zones 6-8), which still leaves considerable trade-off room below a maximum U-factor of 0.35. See https://www.energystar.gov/ia/partners/downloads/unit_shipment_data/2016_USD_Summary_Report.pdf?8fd5-1967.

Anyone who has experienced inefficient uncomfortable windows, either during the winter or summer, understands that this discomfort can lead occupants to adjust the thermostat. The energy impact of adjusting the thermostat is large. The following table shows the increased energy use that results from adjusting the thermostat up or down a single degree in a code-compliant house in each climate zone:

Increased Energy Use Resulting from Thermostat Adjustment									
Measure	Weighted	1	2	3	4	5	6	7	8
+1 Degree Heating	4.1%	0.5%	3.0%	4.2%	4.4%	4.7%	4.5%	4.0%	2.9%
-1 Degree Cooling	3.0%	7.8%	5.3%	3.9%	2.6%	1.8%	1.4%	0.7%	0.4%

Obviously, if an uncomfortable occupant adjusts the thermostat 2 or 3 degrees, the impact will be far higher. Improved window maximums will reduce the likelihood of uncomfortable occupants using excessive heating and cooling to mitigate their discomfort.

We expect this to be an easy-to-implement improvement given the current state of practice, but an important update to the code, that will ensure long-term benefits for all homes with little or no additional cost.

Bibliography: ENERGY STAR® Unit Shipment and Market Penetration Report Calendar Year 2016 Summary, Energy Star, *available at* https://www.energystar.gov/ia/partners/downloads/unit_shipment_data/2016_USD_Summary_Report.pdf?8fd5-1967.

Cost Impact: The code change proposal will not increase or decrease the cost of construction because this is only a change to a trade-off backstop and not a code requirement (the prescriptive requirement is already more efficient than the proposed new backstop level), and because such a high percentage of homebuilders are likely already meeting or exceeding this requirement, we expect no real cost impact in most cases.

Proposal # 3985

RE105-19

RE106-19

IECC: R403.1.1 (IRC N1103.1.1)

Proponent: David Collins, SEHPCAC, representing SEHPCAC (SEHPCAC@iccsafe.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Energy Conservation Code

Revise as follows:

R403.1.1 (IRC N1103.1.1) Programmable thermostat. The thermostat controlling the primary heating or cooling system of the dwelling unit shall be capable of ~~controlling the heating and cooling system on a daily schedule to maintain different temperature set points at different times of the day, providing a 5:2 (weekdays:weekends) programmable schedule, and at least 2 programmable schedules per day.~~ This thermostat shall include the capability to set back or temporarily operate the system to maintain *zone* temperatures of not less than 55°F (13°C) to not greater than 85°F (29°C). ~~The thermostat shall be programmed initially by the manufacturer with a heating temperature setpoint of not greater than 70°F (21°C) and a cooling temperature setpoint of not less than 78°F (26°C).~~

Reason: This code change clarifies the intended operational capability of programmable thermostats by distinguishing between weekday and weekend occupancy schedules along with at least 2 programmable schedules per day. The change also accounts for the capabilities of smart thermostatic controls that auto-adjust based on daily and weekly occupancy patterns. Finally, the manufacturer's initial programmed setting requirement is deleted.

This proposal is submitted by the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx> (<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>)

Cost Impact: The code change proposal will increase the cost of construction

This requirement will increase costs for the subset of buildings not currently constructed with weekday:weekend programmable thermostats.

Proposal # 4758

RE106-19

RE107-19

IECC: R403.1.3 (N1103.1.3) (New), R403.10.1 (1103.10.1)

Proponent: Nicholas O'Neil, NW Energy Codes Group, representing NW Energy Codes Group (noneil@energy350.com)

2018 International Energy Conservation Code

Add new text as follows:

R403.1.3 (IRC N1103.1.3) Continuously Burning Pilot Lights The natural gas systems and equipment listed below are not permitted to have continuously burning pilot lights:

1. Fan-type central furnaces.
2. Household cooking appliances.

Exception:Household cooking appliances without electrical supply voltage connections and in which each pilot light consumes less than 150 Btu/hr.

3. Pool heaters.
4. Spa heaters.
5. Fireplaces.

Revise as follows:

R403.10.1 (N1103.10.1) Heaters. The electric power to heaters shall be controlled by a readily *accessible* on-off switch that is an integral part of the heater mounted on the exterior of the heater, or external to and within 3 feet (914 mm) of the heater. Operation of such switch shall not change the setting of the heater thermostat. Such switches shall be in addition to a circuit breaker for the power to the heater. ~~Gas-fired heaters shall not be equipped with continuously burning ignition pilots.~~

Reason: Standing pilot lights are no longer necessary with many gas-fired appliances offering alternative ignition methods. Some models rely completely on intermittent ignition, while others allow standing pilots to operate for a few hours after shutdown and then use electronic ignition to restart. This proposal saves energy by eliminating the wasted energy of a pilot light during the numerous hours per year when the appliance is non-operational.

Cost Impact: The code change proposal will increase the cost of construction

This prohibition is not expected to add significant cost to any gas-fired appliance listed in the proposal. Past efficiency studies have shown \$100 increase in price for fireplaces in particular to move from a standard continuously lit pilot light to an intermittent ignition system.

Proposal # 4941

RE107-19

RE108-19

IECC: R403.2 (IRC N1103.2)

Proponent: Roger Mitchell, Mitchell's Heating and Cooling, representing Self (rogersheating@hotmail.com)

2018 International Energy Conservation Code

Revise as follows:

R403.2 (IRC N1103.2) Hot water boiler ~~outdoor temperature setback, reset.~~ ~~Hot water boilers that supply heat to the building through one or two pipe heating systems shall have an outdoor setback control that decreases the boiler water temperature based on the outdoor temperature. The manufacturer shall equip each gas, oil and electric boiler (other than a boiler equipped with a tankless domestic water heating coil) with automatic means of adjusting the water temperature supplied by the boiler to ensure incremental change of the inferred heat load will cause an incremental change in the temperature of the water supplied by the boiler. This can be accomplished with outdoor reset, indoor reset or water temperature sensing.~~

Reason: The current standard from the DOE allows for a broader scope in control schemes to meet all the control strategies available in the marketplace. The exception for domestic hot water needs to be included to allow the sale of boilers with integrated domestic hot water production. Currently over 40,000 units are sold per year with domestic hot water coils. The standard from the DOE was updated after the Energy Independence act of 2007 with a implementation date of 2012. This change will bring the IECC code in uniformity with the DOE.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Alingment of the standard to the DOE standard will not increase costs because all of the Heating equipment being installed has the proper controls to meet the DOE standard. No additional components will be required if both standards are the same.

Proposal # 3788

RE108-19

RE109-19

IECC: R403.3 (IRC N1103.3), R403.3.1 (IRC N1103.3.1) , R403.3.7 (IRC N1103.3.7)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com); Shaunna Mozingo (sdmozingo@shaunnamozingo.com)

2018 International Energy Conservation Code

Revise as follows:

R403.3 (IRC N1103.3) Ducts. Ducts and air handlers shall be installed in accordance with Sections R403.3.1 through ~~R403.3.7~~ R403.3.6.

~~**R403.3.1 (IRC N1103.3.1) Insulation (Prescriptive).** Supply and return ducts in attics shall be insulated to an *R* value of not less than R-8 for ducts 3 inches (76 mm) in diameter and larger and not less than R-6 for ducts smaller than 3 inches (76 mm) in diameter. Supply and return ducts in other portions of the *building* shall be insulated to not less than R-6 for ducts 3 inches (76 mm) in diameter and not less than R-4.2 for ducts smaller than 3 inches (76 mm) in diameter.~~

Exception: Ducts or portions thereof located completely inside the *building thermal envelope*.

~~**R403.3.7 (IRC N1103.3.7) R403.3.6 (IRC N1103.3.6) Ducts located in conditioned space and insulation.** For ducts Duct work located outside conditioned space, shall be insulated to an *R* -value of not less than R-8. For duct work to be considered as inside a conditioned space, such ducts it shall comply with ~~either one~~ of the following:~~

1. The duct system shall be located completely within the continuous air barrier and within the building thermal envelope.
2. ~~The ducts shall~~ Duct work in ventilated attic spaces shall be buried within ceiling insulation in accordance with Section R403.3.6 and all of the following conditions shall exist:
 - 2.1. The air handler is located completely within the *continuous air barrier* and within the building thermal envelope..
 - 2.2. The duct leakage, as measured either by a rough-in test of the ducts or a post-construction total system leakage test to outside the building thermal envelope in accordance with Section R403.3.4, is less than or equal to 1.5 cubic feet per minute (42.5 L/min) per 100 square feet (9.29 m²) of conditioned floor area served by the duct system..
 - 2.3. The ceiling insulation *R*-value installed against and above the insulated duct is greater than or equal to the proposed ceiling insulation *R*-value, less the *R*-value of the insulation on the duct.
3. Duct work in floor cavities located over unconditioned space shall have a continuous air barrier on all six sides of the floor cavity and insulation installed in accordance with section R402.2.8 with the addition of insulation fully surrounding the duct and uncompressed R-19 insulation below, or duct work installed in a floor cavity that is insulated per the exception in section R402.2.8..
4. Duct work located within exterior walls shall have a continuous air barrier on all six sides of the wall cavity, a minimum R-10 insulation separating the entire duct from the outside sheathing of the cavity, and the remainder of the cavity insulation fully surrounding the duct to the drywall side.

Reason: Ductwork insulation is dependent on its location. This proposal addresses this issue. By removing Section R403.3.1 Insulation, and combining it with section R403.3.7 duct location, the code becomes more understandable and useable for field practitioners. This newly edited section requires that all duct work located outside of conditioned space regardless of size be insulated to an R-8. This minimum R-value duct insulation is widely available and important to have on ducts located outside regardless of the climate zone in which it is installed or the size of the duct. In addition, it is already the required R-value for duct work located outside per the existing section R403.3.1 As Allison Bailes points out in his Energy Vanguard blog post titled, "The invisible problem with duct insulation" The delta T across the insulated surface can be huge when ducts are located outside the conditioned space. (<https://www.energyvanguard.com/blog/invisible-problem-duct-insulation>) In his example ducts located in the attic experienced a delta T of 62°. Although it would be good to raise the minimum required R-value associated with ducts located outside the conditioned envelope this proposal instead incentivizes installation techniques that drive the performance of the duct to be more like that of ducts installed completely inside.

By defining the three possible locations where ductwork can be installed and how to address the insulated assembly so the duct can be considered to be inside conditioned space this proposal increases the energy performance of homes. The three possible locations for duct installation are, one, completely inside the continuous air barrier assemblies, two, completely outside the continuous air barrier assemblies, or three within the continuous air barrier and building thermal envelope assemblies. In the last code cycle, the addition of section R403.3.6 Ducts buried within ceiling insulation addressed the insulation installation issue for ducts located outside of the continuous air barrier assemblies. This code cycle, the hope is that ducts located within the continuous air barrier and building thermal envelope assemblies will be addressed.

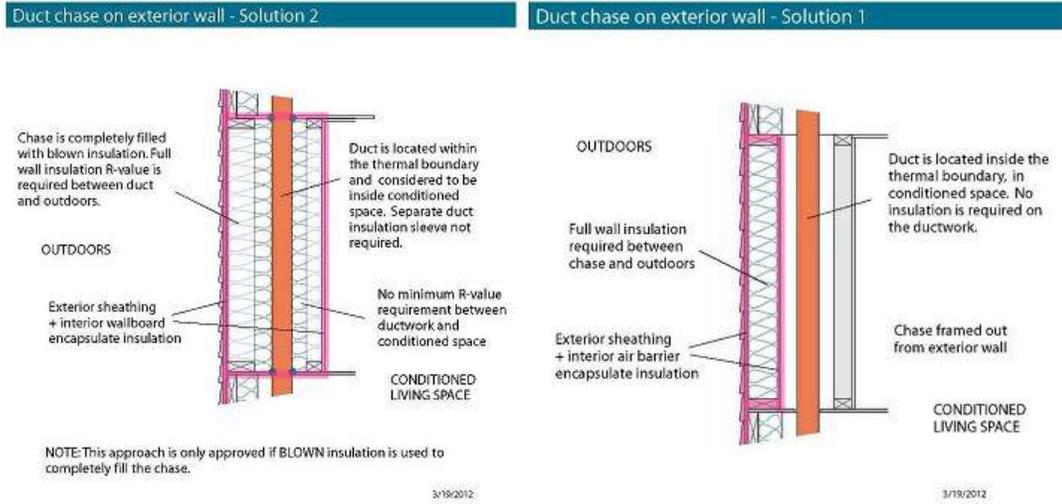
The last detail to point out is an energy code compliance issue when using section R405 Simulated Performance Alternative and section R406 Energy Rating Index compliance paths. These pathways include duct location in the software modeling. It has not been clear until the 2018 IECC how to model buried ductwork and the hope now is that the additional language in this proposal will clarify how to model duct work that is installed within the continuous air barrier and building thermal envelope assemblies. If it is installed per this code change proposal is can be considered to be within conditioned space.

See example diagrams for examples of how insulation of duct work installed within the building thermal envelope assembly could be achieved in

order to locate them within the conditioned space.

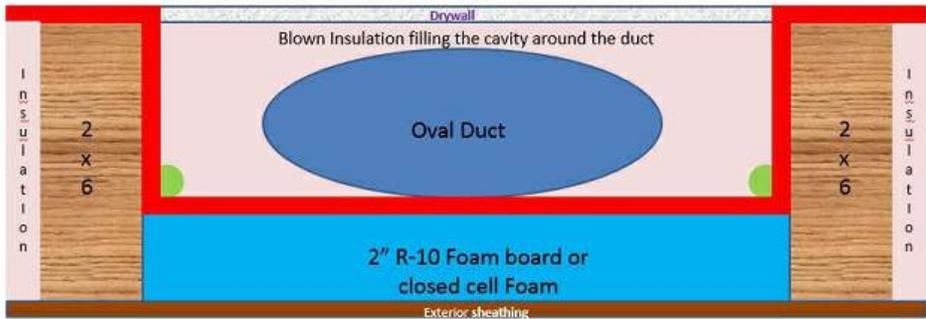
The following diagrams illustrate example installations of duct work in garage floor systems or in exterior walls that would be considered to be within the conditioned space.

Example of Ducts in Exterior walls that would be considered within the conditioned space



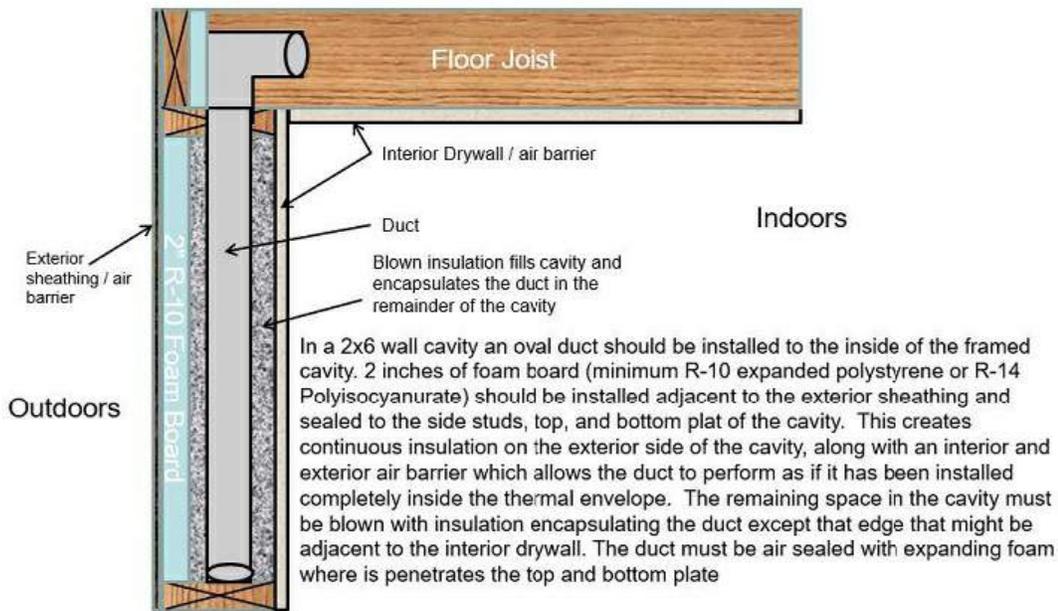
Duct riser in a 2x6 exterior wall

- Line of the interior air barrier now brings duct into conditioned space
- Foam board must be sealed in place at connections to wood framing. Foam board should be installed at the rim joist were the duct riser transitions to with an elbow to a boot or floor run.
- It is usual to upsize to a 7" oval to accommodate the flow of a 6" round design run.
- Seal duct penetration through top and bottom plat

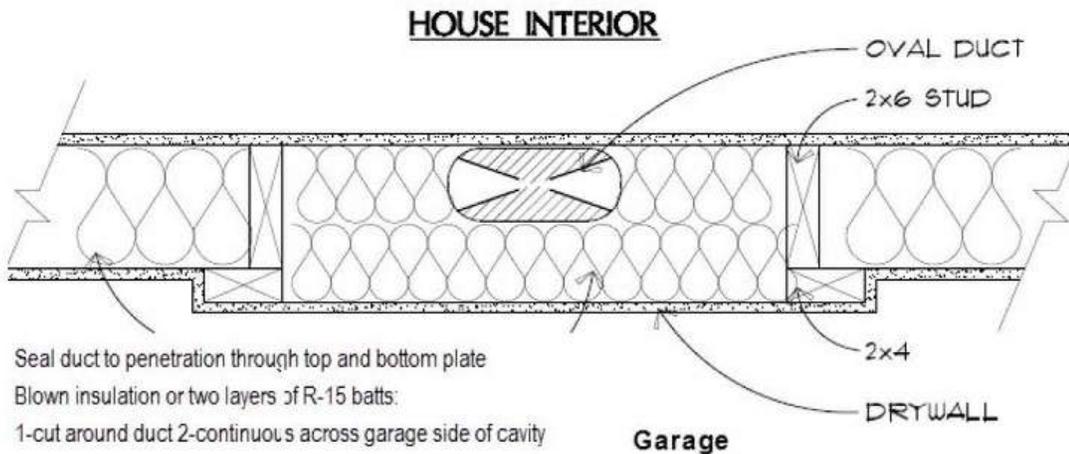


Supply Duct Riser in an Exterior Wall – Solution 3

For situations where a wall cannot be bumped out into the conditioned space of the home:

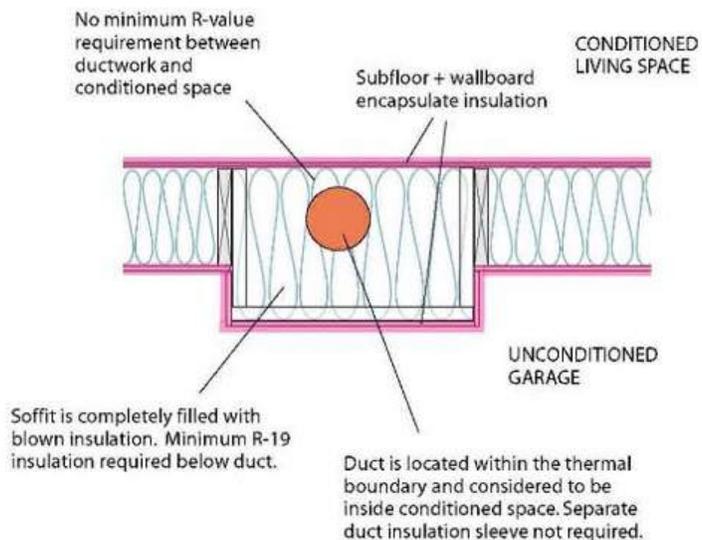


Example of Duct in wall between house and garage



Example of Duct in floor system that would be considered within the conditioned space.

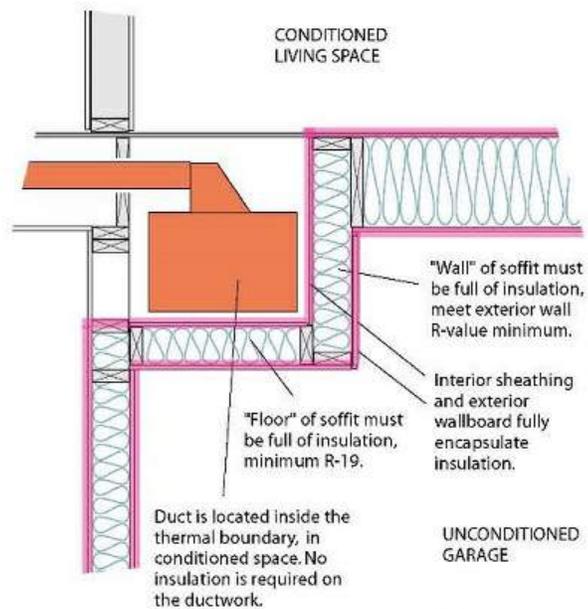
Ductwork in floor over garage



NOTE: This approach is only approved if BLOWN insulation is used to completely fill the soffit.

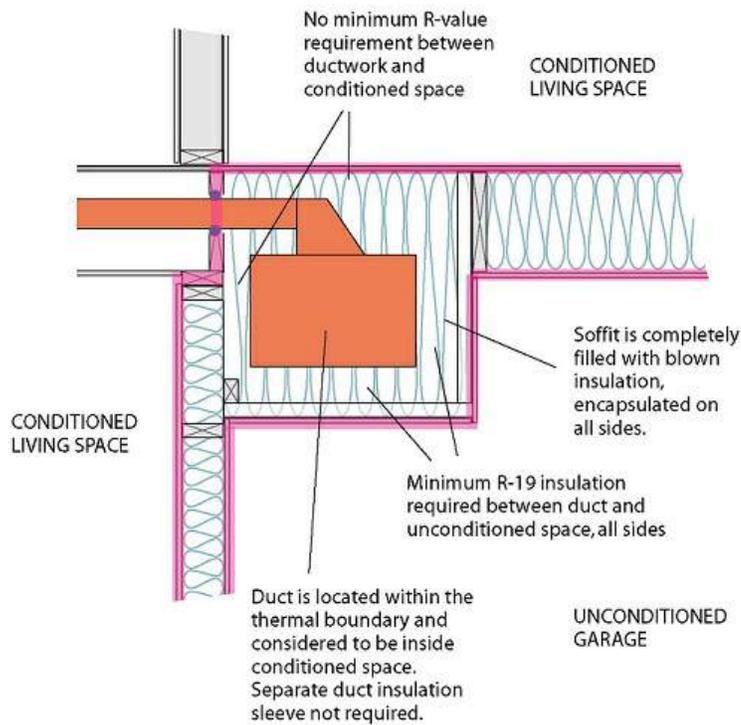
3/19/2012

Ductwork in garage soffit, adjoining conditioned space, living space above - Solution 2



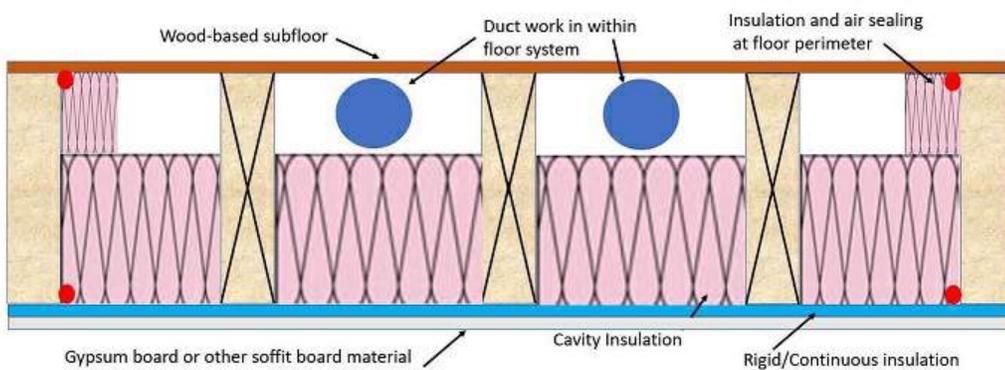
3/19/2012

Ductwork in garage soffit, adjoining conditioned space, living space above - Solution 1



NOTE: This approach is only approved if BLOWN insulation is used to completely fill the soffit.

3/19/2012



Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal provides new installation guidance and a definition of when a duct is considered to be inside conditioned space that will increase the energy efficiency of a house with better insulated ducts when installed within the continuous air barrier and building thermal envelope assemblies. Ductwork must be insulated and installed per manufacturer instruction. Also, insulation currently must fully surround obstructions like ductwork that is installed in a cavity. So, no additional cost should be expected with the approval of this proposal.

Proposal # 5243

RE110-19

IECC: R403.3.2 (IRC N1103.3.2)

Proponent: David Bixby, Air Conditioning Contractors of America, representing Air Conditioning Contractors of America

2018 International Energy Conservation Code

R403.3.2 (IRC N1103.3.2) Sealing (Mandatory). Ducts, air handlers and filter boxes shall be sealed. Joints and seams shall comply with either the International Mechanical Code or International Residential Code , as applicable.

Exception: Ducts or portions thereof located completely inside the *building thermal envelope* .

Reason: When ductwork is located inside a building's thermal envelope, any duct leakage from unsealed ductwork enters an already conditioned space within the building thermal envelope. Therefore, no energy loss occurs that is directly related to the sealed and/or unsealed air leakage through the building envelope and not by an unsealed duct in a conditioned space. Although sealing ductwork located inside the building's thermal envelope provides better comfort for the homeowner, it has no impact on energy efficiency or economic benefits. When discussing building energy efficiency and economic benefits, a homeowner should focus on reducing building leaks, better insulation, windows, and doors, as these are areas where building energy efficiency is lost at the building envelope, not by sealing ductwork in a conditioned space.

Cost Impact: The code change proposal will decrease the cost of construction

The proposal will potentially eliminate the need to seal ducts under the conditions specified in the exception, thus reducing the cost of construction in those situations.

Proposal # 4284

RE110-19

RE111-19

IECC: R403.3.1 (IRC N1103.3.1), R403.3.1.1 (IRC N1103.3.1.1) (New), R403.3.1.2 (IRC N1103.3.1.2) (New), R405.2 (IRC N1105.2), R406.2 (IRC N1106.2)

Proponent: David Collins, representing SEHPCAC (SEHPCAC@iccsafe.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Energy Conservation Code

Revise as follows:

R403.3 (IRC N1103.3) Ducts. Ducts and air handlers shall be installed in accordance with Sections R403.3.1 through R403.3.7.

R403.3.1 (IRC N1103.3.1) Insulation (~~Prescriptive~~). ~~Ducts shall be insulated in accordance with Sections R403.3.1.1 or R403.3.1.2. Supply and return ducts in attics shall be insulated to an R-value of not less than R-8 for ducts 3 inches (76 mm) in diameter and larger and not less than R-6 for ducts smaller than 3 inches (76 mm) in diameter. Supply and return ducts in other portions of the building shall be insulated to not less than R-6 for ducts 3 inches (76 mm) in diameter and not less than R-4.2 for ducts smaller than 3 inches (76 mm) in diameter.~~

Exception: ~~Ducts or portions thereof located completely inside the building thermal envelope.~~

Add new text as follows:

R403.3.1.1 (IRC N1103.3.1.1) Supply and return ducts not completely in thermal envelope (Mandatory). Ducts not completely inside the building thermal envelope shall be insulated to an R-value of not less than R-6

R403.3.1.2 (IRC N1103.3.1.2) Supply and return ducts in the building (Prescriptive) Supply and return ducts partially or fully inside the building shall be insulated as follows:

1. Supply and return ducts in attics shall be insulated to an R-value of not less than R-8 for ducts 3 inches (76 mm) in diameter and larger and not less than R-6 for ducts smaller than 3 inches (76 mm) in diameter.
2. Supply and return ducts in other portions of the building shall be insulated to not less than R-6 for ducts 3 inches (76 mm) in diameter and not less than R-4.2 for ducts smaller than 3 inches (76 mm) in diameter.

Exception: Ducts or portions of ducts located completely inside the building thermal envelope in accordance with section R403.3.7.

Revise as follows:

R405.2 (IRC N1105.2) Mandatory requirements. Compliance with this section requires that the mandatory provisions identified in Section R401.2 be met. ~~Supply and return ducts not completely inside the building thermal envelope shall be insulated to an R-value of not less than R-6.~~

R406.2 (IRC N1106.2) Mandatory requirements. Compliance with this section requires that the provisions identified in Sections R401 through R404 indicated as "Mandatory" and Section R403.5.3 be met. The *building thermal envelope* shall be greater than or equal to levels of efficiency and *Solar Heat Gain Coefficients* in Table 402.1.1 or 402.1.3 of the 2009 International Energy Conservation Code .

Exception: ~~Supply and return ducts not completely inside the building thermal envelope shall be insulated to an R-value of not less than R-6.~~

Reason: This proposal consolidates all duct insulation requirements within one section.

The requirements for ducts not completely inside of the thermal envelope of the proposed R403.3.1.1 are currently identified as mandatory in both R405.2 and in R406.2, (in a confusing exception) and are labeled as such in this proposal.

The current Sec. R403.3.1 prescriptive insulation requirements for ducts partially or fully inside the building are separated into the proposed R403.3.1.2 (1) requirements for ducts in attics and R403.3.1.2 (2) ducts within other portions of the building.

The current exception to insulation requirements for ducts located completely inside the thermal envelope is maintained but a reference to the applicable section, R403.3.7, is provided for clarity.

Consolidation of requirements will make the code easier to use and enforce.

Note that companion proposals submitted by the SEHPCAC eliminate the use of the 'mandatory' (non-tradeable) and 'prescriptive' (tradeable) labels in favor of tabular identification of 'mandatory' sections. ICC staff have stated that if both proposals are approved the 'mandatory' label will be editorially deleted in favor of the new R405.2 and R406.2 tabular listings. Since all 'mandatory' sections would be identified in those new tables no sections will need to be separately identified as 'prescriptive' and those labels can also be removed.

This proposal is submitted by the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green

Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx> (<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>)

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The is a reorganization of current provisions for greater clarify and enhanced enforcement. There are no proposed changes to the requirements.

Proposal # 4459

RE111-19

RE112-19

IECC: R403.3.3 (IRC N1103.3.3), R403.3.4 (IRC N1103.3.4)

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

R403.3 (IRC N1103.3) Ducts. Ducts and air handlers shall be installed in accordance with Sections R403.3.1 through R403.3.7.

R403.3.1 (IRC N1103.3.1) Insulation (Prescriptive). Supply and return ducts in attics shall be insulated to an *R*-value of not less than R-8 for ducts 3 inches (76 mm) in diameter and larger and not less than R-6 for ducts smaller than 3 inches (76 mm) in diameter. Supply and return ducts in other portions of the *building* shall be insulated to not less than R-6 for ducts 3 inches (76 mm) in diameter and not less than R-4.2 for ducts smaller than 3 inches (76 mm) in diameter.

Exception: Ducts or portions thereof located completely inside the *building thermal envelope*.

R403.3.2 (IRC N1103.3.2) Sealing (Mandatory). Ducts, air handlers and filter boxes shall be sealed. Joints and seams shall comply with either the International Mechanical Code or International Residential Code, as applicable.

R403.3.2.1 (IRC N1103.3.2.1) Sealed air handler. Air handlers shall have a manufacturer's designation for an air leakage of not greater than 2 percent of the design airflow rate when tested in accordance with ASHRAE 193.

Revise as follows:

R403.3.3 (IRC N1103.3.3) Duct testing (Mandatory). Ducts shall be pressure tested to determine air leakage by one of the following methods:

1. Rough-in test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the system, including the manufacturer's air handler enclosure if installed at the time of the test. Registers shall be taped or otherwise sealed during the test.
2. Postconstruction test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. Registers shall be taped or otherwise sealed during the test.

Exceptions Exception:

- ~~1. A duct air leakage test shall not be required where the ducts and air handlers are located entirely within the *building thermal envelope*.~~
- ~~2. A duct air-leakage test shall not be required for ducts serving heat or energy recovery ventilators that are not integrated with ducts serving heating or cooling systems.~~

A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*.

R403.3.4 (IRC N1103.3.4) Duct leakage (Prescriptive). The total leakage of the ducts, where measured in accordance with Section R403.3.3, shall be as follows:

1. Rough-in test: The total leakage shall be less than or equal to 4 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m²) of conditioned floor area where the air handler is installed at the time of the test. Where the air handler is not installed at the time of the test, the total leakage shall be less than or equal to 3 cubic feet per minute (85 L/min) per 100 square feet (9.29 m²) of conditioned floor area.
2. Postconstruction test: Total leakage shall be less than or equal to 4 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m²) of conditioned floor area.
3. Test for ducts within thermal envelope: Where all ducts and air handlers are located entirely within the building thermal envelope, total leakage shall be less than or equal to 8.0 cubic feet per minute (226.6 L/min) per 100 square feet (9.29 m²) of conditioned floor area.

Reason: The purpose of this code change proposal is to help ensure occupant comfort, proper heating and cooling system performance, and resulting long-term energy savings by requiring a duct leakage test for all new homes, including homes with all ducts inside conditioned space. This action will also help reduce the likelihood of builder callbacks for poorly-functioning, uncomfortable HVAC systems. The IECC currently exempts homes from duct testing requirements where the air handler and all ducts are located inside conditioned space. Although moving all ducts inside conditioned space may have a positive impact on energy efficiency overall, this practice alone cannot guarantee that the ducts will be tight enough to deliver conditioned air to all occupied areas of the home. Uncomfortable occupants commonly adjust thermostat settings to counteract the effect of poor delivery of conditioned air, leading to huge losses in energy efficiency. And these homes are at far greater risk for builder callback. This proposal will improve building quality and keep occupants more comfortable by requiring a duct test for all new homes, although the allowable

leakage rate will be set at twice the prescriptive rate when all ducts are located inside conditioned space.

Duct leakage rates can be extremely high when ducts are not tested. We do not believe that builders intentionally cut corners in duct sealing when they know that the system will not be tested. However, without an objective test as a means of quality assurance, even careful builders may not be aware of missed connections or poor sealing. In a recent DOE field study of residential homes in Kentucky, homes received duct leakage tests even where all supply and return ducts were located inside conditioned space. The results were striking – **of the 24 homes tested (that would have qualified for the test exemption under the IECC), all 24 homes had higher leakage rates than the 2018 IECC requirement. Tested duct leakage for these homes averaged 18.5 cfm/sq.ft., with individual homes ranging from 6.26 cfm/sq.ft. to as high as 40.36 cfm/sq.ft.** See <https://www.energycodes.gov/compliance/energy-code-field-studies>. We note that 40 other homes in the same study were required to be tested (because at least some ducts were located outside conditioned space), and these homes achieved leakage rates of 9.7 cfm/sq.ft., on average – roughly half the leakage rate of homes that qualified for the exemption. Obviously, this is a small sample size, but the Field Studies found similar results in Pennsylvania, where “exempt” homes (with all ducts inside conditioned space) averaged almost 31 cfm/sq.ft. leakage, while homes required to be tested averaged almost 18 cfm/sq.ft. leakage.

Results of DOE Field Study Data Collection on Duct Tightness				
	Ducts in Conditioned Space (Exempt from Test)		Ducts Outside Conditioned Space (Testing Required)	
Kentucky	# Samples	24	# Samples	40
	Max Test Result	40.36	Max Test Result	18.90
	Min Test Result	6.26	Min Test Result	3.10
	Avg Test Result	18.46	Avg Test Result	9.71
Pennsylvania	# Samples	18	# Samples	52
	Max Test Result	77.10	Max Test Result	69.00
	Min Test Result	12.60	Min Test Result	2.44
	Avg Test Result	30.95	Avg Test Result	17.95

Although the results vary across the states sampled, these results point to a shortcoming in the IECC’s “complete exemption” approach to homes with all ducts inside conditioned space.

Although most energy modeling software does not capture the occupant-level impact of poorly-sealed ducts, anyone who has lived or worked in a building with leaky ducts understands that discomfort can lead occupants to adjust the thermostat. The energy impact of adjusting the thermostat is huge. The following table shows the increased energy use that results from adjusting the thermostat up or down a single degree in a code-compliant house in each climate zone.

Increased Energy Use Resulting from Thermostat Adjustment									
Measure	Weighted	1	2	3	4	5	6	7	8
+1 Degree Heating	4.1%	0.5%	3.0%	4.2%	4.4%	4.7%	4.5%	4.0%	2.9%
-1 Degree Cooling	3.0%	7.8%	5.3%	3.9%	2.6%	1.8%	1.4%	0.7%	0.4%

Obviously, if an uncomfortable occupant adjusts the thermostat 2 or 3 degrees, the impact will be far higher, and could essentially negate many of the efficiency gains made in the IECC over the last decade.

The concept of requiring a test for all new homes is not new. DOE’s Building America Program recommends that “[e]ven in conditioned space, ducts should be insulated to reduce the risk of condensation and mold. They should be tightly sealed and tested for leakage.” See https://www.energy.gov/sites/prod/files/2014/01/f6/1_1g_ba_innov_ductsconditionedspace_011713.pdf. Likewise, the International Association of Certified Home Inspectors recommends that ducts be located entirely within conditioned space and tested to ensure air tightness. Air leakage rates at air handlers, even when all ducts are located in conditioned space, can lead to significant reduction in comfort, leading homeowners to adjust the thermostat and significantly increase energy use. See <https://www.nachi.org/inspecting-hvac-cabinet-seams-air-leakage-sealing.htm>.

Bibliography: *Insulation*, U.S. Dep’t of Energy, <https://www.energy.gov/energysaver/weatherize/insulation> (last accessed Dec. 30, 2018). U.S. Dep’t of Energy, *Methodology for Evaluating Cost-Effectiveness of Residential Energy Code Changes (Aug. 2015)*, available at <https://www.energycodes.gov/residential-energy-and-cost-analysis-methodology>.

Cost Impact: The code change proposal will increase the cost of construction. This proposal will require duct testing and meeting a modest duct tightness level in the limited subset of homes that are currently exempt from the test requirement in the IECC. However, we believe the added value in quality control for builders and the likely positive impact on occupant comfort

and energy savings will easily outweigh the cost of the test and any remedial efforts to improve duct tightness.

Proposal # 4006

RE112-19

RE113-19

IECC: R403.3.3 (IRC N1103.3.3)

Proponent: Aaron Gary, representing Self (aaron.gary@texenergy.org)

2018 International Energy Conservation Code

Revise as follows:

R403.3.3 (IRC N1103.3.3) Duct testing (Mandatory). Ducts shall be pressure tested to determine air leakage by one of the following methods:

1. Rough-in test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the system, including the manufacturer's air handler enclosure if installed at the time of the test. Registers shall be taped or otherwise sealed during the test.
2. Postconstruction test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. Registers shall be taped or otherwise sealed during the test.

Exceptions:

1. A duct air-leakage test shall not be required where the ducts and air handlers are located entirely within the *building thermal envelope*.
2. A duct air-leakage test shall not be required for ducts serving heat or energy recovery ventilators that are not integrated with ducts serving heating or cooling systems.

A written report of the results of the test shall be signed by the approved third party conducting the test, that has been certified to perform duct testing by a national or state organization, and provided to the *code official*. The approved third party may not be employed or have any financial interest in the company the constructing the building.

Reason: The International Residential Code (IRC) and International Energy Conservation Code (IECC) includes enhanced emphasis on envelope infiltration and duct leakage. Significant changes in the residential energy requirements include more frequent requirement of performance testing for leakage. Residential Duct systems must be tested unless all ducts and equipment are located within the conditioned space. Envelope testing is required to demonstrate compliance with maximum allowable leakage rate. This language puts the regulatory authority on notice that the testing requires specialized credentials and establishes a conflict of interest baseline.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This code proposal does not change the requirement for duct testing to be conducted and therefore should not increase or decrease the cost of construction. It does however change who conducts the test such that the installation contractor is not self-certifying compliance with Code. This change aligns section R403.3 for duct leakage testing with Section R402.4 Air Leakage such that both would require that testing be conducted by an approved third party.

Proposal # 4593

RE113-19

RE114-19

IECC: R403.3.3 (IRC N1103.3.3), Chapter 6RE (IRC Chapter 44) (New)

Proponent: Ryan Meres, RESNET, representing RESNET (ryan.meres@gmail.com)

2018 International Energy Conservation Code

Revise as follows:

R403.3.3 (IRC N1103.3.3) Duct testing (Mandatory). Ducts shall be pressure tested in accordance with ANSI/RESNET/ICC 380 or ASTM E1554 to determine air leakage by one of the following methods:

1. Rough-in test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the system, including the manufacturer's air handler enclosure if installed at the time of the test. Registers shall be taped or otherwise sealed during the test.
2. Postconstruction test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. Registers shall be taped or otherwise sealed during the test.

Exceptions:

1. A duct air-leakage test shall not be required where the ducts and air handlers are located entirely within the *building thermal envelope*.
2. A duct air-leakage test shall not be required for ducts serving heat or energy recovery ventilators that are not integrated with ducts serving heating or cooling systems.

A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*.

Add new text as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken PA 19428-2959

E1554/E1554M-13::

Standard Test Methods for Determining Air Leakage of Air Distribution Systems by Fan Pressurization

Reason: Section 403.3.3, Duct testing, currently provides no guidance for testing duct systems to determine if they meet the maximum duct leakage rate. The current code language sets a duct leakage metric and essentially leaves it up to those that are testing the system to determine how to arrive at the results. The lack of guidance can lead to inconsistent test results from house to house. This code change proposal solves this problem by requiring testing to conform to ANSI/RESNET/ICC Standard 380 - *Standard for Testing Airtightness of Building Enclosures, Airtightness of Heating and Cooling Air Distribution Systems, and Airflow of Mechanical Ventilation Systems* OR ASTM E1554. Standard 380 provides a standardized methodology that is currently in use throughout the industry. The methodology will provide consistent results that can be replicated by testing organizations and enforcement personnel.

RESNET/ICC Standard 380 has been developed to provide a consensus national standard for consistent measurement of several air-flow related residential building metrics. It builds off of existing American National Standards to provide standard procedures essential to the evaluation of the energy performance of residential buildings energy.

ASTM Standard E1554-13, was most recently re-approved in 2018 and describes 4 different test methods (A, B, C, and D) for performing a duct leakage test. Method A requires multi-point testing of both the enclosure and the distribution system at a range of 5 to 50 Pa in 5 Pa increments using both pressurization AND depressurization of the building enclosure AND distribution system. Method B requires a physical separation of the supply and return distribution systems and that each are tested separately at a 25 Pa pressure difference, while measuring the pressure difference between any buffer zones and the outside. This procedure requires several iterations of each test (supply, return, buffer zone). Method C measures distribution system leakage to the outside using a 25 Pa pressure difference across the building enclosure with reference to the outside using a location sheltered from wind and sunshine. The distribution system is tested at a 25 Pa pressure difference with reference to the outside and the recording of inside temperature, outside temperature, and barometric pressure at the start and end of each test. This method requires testing under pressurization, while Standard 380 allows pressurization or depressurization (field conditions may require depressurization in order to maintain seals on the supply outlets and return inlets). Method D measures total distribution system leakage at a 25 Pa pressure difference with reference to the outside without using a fan (blower door) to create a 25 Pa pressure difference across the building enclosure to isolate leakage to the outside.

Although Standard 380 is a more industry-recognized standard, either Standard 308 or ASTM E1554 provide a consistent methodology for testing the air leakage of duct systems.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The protocol for duct testing described in Standard 380 is consistent with the testing protocols presented in RESNET certifications for HERS raters and also with the Duct and Envelope Testing (DET) training sessions that are being deployed in several states to meet the testing needs of the IECC. This protocol is considered industry standard and will not increase the time for testing ductwork, so the cost of testing will not increase, but will lead to more compliant duct systems for duct testing professionals that may not be following a protocol. The protocol does not change the target duct air leakage rate so there are no additional costs to seal the duct system to make it code compliant. ASTM E1554 is offered as an alternative because it is another standard for testing duct systems for leakage.

Analysis: A review of the standard proposed for inclusion in the code, ASTM E1554/E1554M-2013, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 4900

RE114-19

RE115-19

IECC: R403.3.3 (IRC N1103.3), R403.3.4 (IRC N1103.3.4)

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

R403.3 Ducts. Ducts and air handlers shall be installed in accordance with Sections R403.3.1 through R403.3.7.

R403.3.1 Insulation (Prescriptive). Supply and return ducts in attics shall be insulated to an *R*-value of not less than R-8 for ducts 3 inches (76 mm) in diameter and larger and not less than R-6 for ducts smaller than 3 inches (76 mm) in diameter. Supply and return ducts in other portions of the *building* shall be insulated to not less than R-6 for ducts 3 inches (76 mm) in diameter and not less than R-4.2 for ducts smaller than 3 inches (76 mm) in diameter.

Exception: Ducts or portions thereof located completely inside the *building thermal envelope*.

R403.3.2 Sealing (Mandatory). Ducts, air handlers and filter boxes shall be sealed. Joints and seams shall comply with either the International Mechanical Code or International Residential Code, as applicable.

R403.3.2.1 Sealed air handler. Air handlers shall have a manufacturer's designation for an air leakage of not greater than 2 percent of the design airflow rate when tested in accordance with ASHRAE 193.

Revise as follows:

R403.3.3 (IRC N1103.3) Duct testing (Mandatory). ~~Ducts~~ The ductwork in a building or dwelling unit shall be pressure tested to determine for air leakage. The maximum total leakage rate for ducts in any building or dwelling unit under any compliance path shall not exceed 8.0 cfm (226.5 L/min) per 100 square feet (9.29 m²) of conditioned floor area. Testing shall be conducted at the rough-in stage or post-construction by one of the following methods:

1. Rough-in test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the system, including the manufacturer's air handler enclosure if installed at the time of the test. Registers shall be taped or otherwise sealed during the test.
2. Postconstruction test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. Registers shall be taped or otherwise sealed during the test.

Exceptions:

1. A duct air-leakage test shall not be required where the ducts and air handlers are located entirely within the *building thermal envelope*.
2. A duct air-leakage test shall not be required for ducts serving heat or energy recovery ventilators that are not integrated with ducts serving heating or cooling systems.

A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*.

R403.3.4 (IRC N1103.3.4) Duct leakage (Prescriptive). The total leakage of the ducts, where measured in accordance with Section R403.3.3, shall be as follows:

1. Rough-in test: The total leakage shall be less than or equal to ~~4~~ 4.0 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m²) of conditioned floor area where the air handler is installed at the time of the test. Where the air handler is not installed at the time of the test, the total leakage shall be less than or equal to ~~3~~ 3.0 cubic feet per minute (85 L/min) per 100 square feet (9.29 m²) of conditioned floor area.
2. Postconstruction test: Total leakage shall be less than or equal to ~~4~~ 4.0 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m²) of conditioned floor area.

Reason: The purpose of this code change proposal is to help ensure long-term energy savings, occupant comfort and promote good building quality by establishing a maximum level of duct leakage permitted as a trade-off backstop for duct tightness. We propose a backstop that would still permit substantial flexibility – double the allowable leakage rate as the prescriptive requirement -- but that would establish a “worst case scenario” for all tested homes in all compliance paths.

There is currently no upper limit on duct leakage in the IECC. In the 2012 IECC, all ducts (except those in conditioned space) were required on a mandatory basis to meet the prescriptive levels. The mandatory nature of the requirement was removed in 2015, allowing duct tightness to be fully traded off for other efficiency measures. We believe some trade-off is acceptable, but that a minimum level of duct tightness is necessary to ensure some reasonable level of duct performance occurs in the home. When ducts are excessively leaky, there is no assurance that conditioned air is

provided where it is needed for adequate comfort. The failure to properly distribute conditioned air is likely to result in excess energy usage when the occupants adjust the thermostat to counter an inadequate distribution of conditioned air. Many of the intended benefits of high-performance homes are negated if occupants are uncomfortable and adjust the thermostat in response.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposal is intended to be cost-neutral, since it does not change the prescriptive requirement, but will ensure that at least some reasonable attention has been paid to duct tightness. Because the new backstop will only apply in homes that are already required to have ducts tested, the only potential cost would come in a situation where a builder has traded away the efficiency of the duct system for an improvement elsewhere in the home at a lower cost such that the home would not even meet the weaker duct tightness level proposed here. However, in such cases, we believe owners and occupants of homes will benefit substantially from having an outer limit on duct leakage.

Proposal # 4003

RE115-19

RE116-19

IECC: R403.3.3 (IRC N1103.3.3), R403.3.3.1 (IRC N1103.3.3.1) (New), R403.3.3.2 (IRC N1103.3.3.2) (New), R403.3.4 (IRC N1103.3.4)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

SECTION R403 (IRC N1103) SYSTEMS

R403.3.3 (IRC N1103.3.3) Duct testing (Mandatory). Ducts shall be pressure tested to determine both total duct leakage and leakage to the outdoors. ~~air leakage by one of the following methods:~~

- ~~1. Rough-in test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the system, including the manufacturer's air handler enclosure if installed at the time of the test. Registers shall be taped or otherwise sealed during the test.~~
- ~~2. Postconstruction test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. Registers shall be taped or otherwise sealed during the test.~~

Exceptions:

- ~~1. A duct air leakage test shall not be required where the ducts and air handlers are located entirely within the *building thermal envelope*.~~
- ~~2. A duct air leakage test shall not be required for ducts serving heat or energy recovery ventilators that are not integrated with ducts serving heating or cooling systems. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*.~~

Add new text as follows:

R403.3.3.1 (IRC N1103.3.3.1) Total duct leakage rough-in test or post construction test: The total leakage shall be less than or equal to 4 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m²) of conditioned floor area served, (4cfm/100sqft), when the air handler is installed at the time of the test. When the air handler is not installed at the time of the test, the total leakage shall be less than or equal to 3 cubic feet per minute (85 L/min) per 100 square feet (9.29 m²) of conditioned floor area; (3cfm/100sqft). Registers shall be taped or otherwise sealed during the test.

Exceptions:

1. If the HVAC duct work system is serving less than 1500 square feet of conditioned floor area, the allowable total duct leakage target shall be 60 cfm regardless of the calculated 4 cfm/100 sqft minimum performance target.
2. A total duct leakage measurement of 80 cfm or less may replace the requirement to test for duct leakage to outside the building's thermal envelope (R403.3.3.2) if compliance can be obtained through the modeling software calculations used to verify compliance with Section R405 or Section R406 for duct leakage to outside penalty or tradeoff.

R403.3.3.2 (IRC N1103.3.3.2) Duct leakage to outside the buildings thermal envelope post construction test. Leakage to outside the building thermal envelope shall be less than or equal to 4 cubic feet minute (113.3 L/min) per 100 square feet (9.29 m²) of conditioned floor area served, (4cfm/100sqft), when tested at a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure, with a blower door and duct leakage testing device. Registers shall be taped or otherwise sealed during the test.

Exceptions:

1. A duct leakage to outside test shall not be required where the ducts and air handlers are documented, at a rough stage of construction, to be located entirely within the building's air barrier and thermal envelope. For systems that are not tested, a distribution systems efficiency of (0.96) for leakage to outside shall be permitted to be used when modeling for confirmed compliance with Sections R405 and R406
2. If the HVAC duct work system is serving less than 1500 square feet of conditioned floor area the allowable duct leakage to outside shall be 60 CFM or less.

Revise as follows:

R403.3.4 (IRC N1103.3.4) Duct leakage (Prescriptive). ~~The total leakage of the ducts, where measured in accordance with Section R403.3.3, shall be as follows:~~

1. ~~Rough in test: The total leakage shall be less than or equal to 4 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m²) of conditioned floor area where the air handler is installed at the time of the test. Where the air handler is not installed at the time of the test, the total leakage shall be less than or equal to 3 cubic feet per minute (85 L/min) per 100 square feet (9.29 m²) of conditioned floor area.~~
2. ~~Postconstruction test: Total leakage shall be less than or equal to 4 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m²) of conditioned floor area.~~

Reason:

- Although requiring two duct leakage tests, this proposal actually focuses on total duct leakage. If the total HVAC duct system is tight the built-in exceptions would allow the system not to have to have the second duct leakage to outside test. In addition, if the duct can be verified to be within the Building's Thermal Envelope and continuous air barrier assembly the duct would not have to be tested and could you a default distribution system efficiency. In this way great flexibility has been incorporated into this proposal.
- Currently having both mandatory and prescriptive requirements is confusing. Duct leakage testing is needed and needs to just be required to ensure efficiency, durability, safety, and comfort. Just as it is impossible to visually verify if a home's air barrier system is air tight it is impossible to know if the duct system is tight unless it is tested.
- Both of the current testing paths, prescriptive and mandatory, use the wrong matrix from an energy perspective. In order to ensure the intent of the IECC is maintained regardless of the compliance path, it makes sense to keep the total duct leakage requirement as it deals with the efficiency of the HVAC system from a use perspective. If the master bedroom, for example, is not receiving the quantity of air required by the HVAC design due to leaky ducts, then the thermostat will be adjusted and inefficiencies will be created.
- Adding a Duct leakage to outside (LTO) testing requirement specifically addresses the energy lose component of duct leakage which is also the intent of the IECC. Since duct leakage is associated with two distinct means of inefficiencies, behavior and measured, both tests should be required.
- The 4 cfm/100sqft of floor area target currently penalizes small units, so we have introduced a fix that was first developed by the Energy Star program. Currently the total duct leakage target is based on the amount of conditioned floor area. In this proposal a 'floor' has been added to the duct leakage target for small homes. By 'floor', we mean a lower limit that doesn't decrease as the space gets smaller and smaller.
- Energy Stars target floor is 40 CFM. We have used 80 CFM as it is a more reasonable target for small systems in our current state of installation and sealing expertise. In addition, it is our experience that there is a minimal modeling penalty associated with 80 CFM of duct leakage to outside.

Bibliography: Energy Conservatory

Duct Leakage to Outside Testing Instructions

<http://energyconservatory.com>

Cost Impact: The code change proposal will increase the cost of construction

Currently Total duct leakage testing is required. Duct leakage to outside is also required for IECC code sections R405 simulated performance and R406 ERI pathways. Duct leakage to outside is a tradeable feature and is an input in the modeling software used to demonstrate compliance with the code when using sections R405 and R406. Therefore, the code in essence is currently requiring both tests when these compliance options are used. **Price would increase for those who are using the prescriptive path** but should remain the same for those using the simulated performance path or the ERI path for compliance.

Proposal # 5281

RE116-19

RE117-19

IECC: R403.3.3 (IRC N1103.3.3), R403.3.4 (IRC N1103.3.4)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com); Shaunna Mozingo (sdmozingo@shaunnamozingo.com)

2018 International Energy Conservation Code

Revise as follows:

SECTION R403 (IRC N1103) SYSTEMS

R403.3.3 (IRC N1103.3.3) Duct testing (Mandatory). Ducts shall be pressure tested to determine air leakage by one of the following methods ~~and shall not leak more than 4 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m²) of conditioned floor area served, (4cfm/100sqft), when the air handler is installed at the time of the test. When the air handler is not installed at the time of the test, the total leakage shall be less than or equal to 3 cubic feet per minute (85 L/min) per 100 square feet (9.29 m²) of conditioned floor area: (3cfm/100sqft). Registers shall be taped or otherwise sealed during the test.~~

1. Rough-in test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the system, including the manufacturer's air handler enclosure if installed at the time of the test. Registers shall be taped or otherwise sealed during the test.
2. Postconstruction test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. Registers shall be taped or otherwise sealed during the test.

Exceptions:

1. A duct air-leakage test shall not be required ~~where the ducts and air handlers are located entirely within the building thermal envelope.~~
2. ~~A duct air leakage test shall not be required~~ for ducts serving heat or energy recovery ventilators that are not integrated with ducts serving heating or cooling systems.
2. If the HVAC duct system is serving less than or equal to 1,500 square feet of conditioned floor area, the allowable duct leakage shall be 60 cubic feet per minute or less.

A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*.

Delete without substitution:

R403.3.4 Duct leakage (Prescriptive). The total leakage of the ducts, where measured in accordance with Section R403.3.3, shall be as follows:

1. ~~Rough-in test: The total leakage shall be less than or equal to 4 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m²) of conditioned floor area where the air handler is installed at the time of the test. Where the air handler is not installed at the time of the test, the total leakage shall be less than or equal to 3 cubic feet per minute (85 L/min) per 100 square feet (9.29 m²) of conditioned floor area.~~
2. ~~Postconstruction test: Total leakage shall be less than or equal to 4 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m²) of conditioned floor area.~~

Reason: Since the 2006 IECC it has been a mandatory requirement to seal ductwork. The language has changed very little and in Section R403.3.2 of the 2018 IECC it now says, "Ducts, air handlers and filter boxes shall be sealed. Joints and seams shall comply with either the *International Mechanical Code* or *International Residential Code*, as applicable." A separate section is addressing building cavities by stating that, "*Building framing cavities shall not be used as ducts or plenums*" in order to ensure tight, efficient, and well performing HVAC systems. This short historical perspective reminds us that duct leakage has been an important energy conservation issue for quite some time; at least since 2006. However, it was not until the 2009 IECC that mandatory duct leakage testing entered the code. From that point forward the importance of duct leakage on the efficiency and performance of the house has not change, but more and more confusion has been introduced into the code. Currently, this confusion shows itself primarily in the relationship between testing organizations, HVAC contractors and builders, because there is a requirement to test, but there is no testing threshold target for the performance paths by which to hold a system to. Therefore, when using the performance paths, one mistakenly believes that yes, a system must be tested test, but no it does not have to be tight. This inconsistency between section R403.3.2 Sealing and R403.3.3 Duct testing is at the hart of this code change.

The 4 CFM/100 square feet of conditioned floor area leakage threshold is currently only a prescriptive threshold target. This makes some sense as duct leakage is a tradable performance metric in the software tools used to demonstrate compliance using sections R405 and R406. However, it also makes **no** sense as the IECC currently requires a total duct leakage test while sections R405 and R406 require a duct leakage to outside test to assess the performance trade off. To add to the confusion, a field testing organization cannot report to the HVAC contractor and builder if a home has passed the duct leakage testing requirements of the code when using performance compliance options because the software tools must be fully

populated with data that is observed at both rough and final stages of construction in order to accurately determine tradeoffs.

This code change proposal simplifies the requirement and enforcement of the requirement. Just as whole house air leakage testing has specific blower door threshold targets, creating one minimum and specific threshold target for duct leakage allows for better and more streamline code adoption and enforcement. From a prescriptive compliance perspective, we know that if the home is equal to or better than the air leakage and duct leakage performance thresholds that it is meeting the minimum efficiency requirements of the code. From a performance perspective we also need to know if the home is meeting the minimum threshold requirements and then additional compliance flexibility is achieved when or if the home performs better. The unintended consequence of introducing a mandatory and prescriptive duct leakage test has only led to mass confusion in the field and a miss interpretation of the requirements.

I believe that the intent of the current 2018 IECC is that the duct leakage testing threshold is the 4% target. However, interpretation abounds. If this proposal is adopted, testing organizations would be able to quickly determine if the home is passing or failing with out argument that tighter systems are not required. Field interpretation from the HVAC contractor and builder side has not been that a specific leakage threshold target must be achieved or that the system must be sealed as Section R403.3.2 Sealing (Mandatory) requires. Instead the field interpretation is often that the system must be tested, but can be extremely leaky. This code change proposal fixes this miss interpretation.

This proposal continues by requiring that the HVAC duct system be tested to a specific minimum target threshold regardless of the location of the duct work. There are two reasons for this change. First, a significant amount of energy savings is achieved when the total leakage of the system is reduced. Remember that the code is currently only testing for total leakage, but only on HVAC systems that have a portion of the duct located outside of the building thermal envelope. When HVAC duct systems are located within the buildings thermal envelop, we are seeing significant total duct leakage that far exceed the 4 CFM/100 square feet of conditioned floor area threshold target, yet the system is in compliance with the code.

BTU's being delivered inside the building's thermal envelop does not equate to a home that is comfortable and efficient unless the correct quantity of BTU's that were designed to be delivered to the specific location occurs. Significant total duct leakage within the thermal envelop by definition ensures that the designed BTU's are not being delivered to their design location therefore causing comfort and efficiency issues. The occupant adjusts the thermostat in an attempt to deliver the required BTU's to the location where they are needed thus casing the system to run more often and less efficiently. The popularity of AeroSeal duct sealing in existing homes is a direct indication of this problem as homeowners seek a solution to leaky inefficient duct work that should have been addressed during construction.

<https://aeroseal.com/>

<https://aeroseal.com/residential/how-aeroseal-works/>

<https://www.youtube.com/watch?v=06DlipDW0GU>

The second reason to require duct leakage testing regardless of where the duct is located is due to cost saving that can be achieved. By just requiring the test to be performed, there will be a move to testing systems at a rough stage of construction to ensure that system testing failures do not impact construction cycle time or the closing of the home. This is the correct stage of construction for conducting the test, as if needed, the system can be economically fixed and retested before drywall has been installed.

Lastly, by holding duct systems to a 4 CFM/100 square feet of conditioned floor area threshold target the likely hood of needing a second test for duct leakage to outside when using R405 and R406 compliance options is low. Total duct leakage numbers in the 4% range can most often be used in software modeling to replace the duct leakage to outside number to demonstrate compliance when duct leakage to outside has not been tested. In other words the HVAC duct system will not leak more to outside than represented by the total duct leakage tested number, so if that number is used to represent duct leakage to outside and the home passes the compliance metrics of sections R405 or R406 then all is good and the home meets the intent of the code.

Cost Impact: The code change proposal will increase the cost of construction

There will be a small cost impact because all duct systems will be required to be tested. However, regardless of where the ducts are located the IECC already requires that the system be sealed in section R403.3.2. It is not possible to visually verified if the duct system is tight just as it is not possible to visually see if a house is air tight, so testing should be required. Energy savings beyond the actual loss of BTU's to the outside will be achieve, but this will require builders and or HVAC contractors to pay testing organizations or third party approved agencies to verify the duct leakage of the system.

Proposal # 5270

RE117-19

RE118-19

IECC: R403.3.3 (IRC N1103.3.3)

Proponent: Mike Moore, Newport Ventures, representing Broan-NuTone (mmoore@newportventures.net)

2018 International Energy Conservation Code

Revise as follows:

R403.3.3 (IRC N1103.3.3) Duct testing (Mandatory). Ducts shall be pressure tested to determine air leakage by one of the following methods:

1. Rough-in test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the system, including the manufacturer's air handler enclosure if installed at the time of the test. Registers shall be taped or otherwise sealed during the test.
2. Postconstruction test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. Registers shall be taped or otherwise sealed during the test.

Exceptions:

1. A duct air-leakage test shall not be required where the ducts and air handlers are located entirely within the *building thermal envelope*.
2. A duct air-leakage test shall not be required for ducts serving ~~heat or energy recovery ventilators~~ ventilation systems that are not integrated with ducts serving heating or cooling systems.

A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*.

Reason: Regardless of the ventilation system type specified, this section is not meant to verify leakage associated with ventilation systems (exhaust, supply, or balanced/HRV/ERV) that are separate from the ducts serving heating or cooling systems.

Cost Impact: The code change proposal will decrease the cost of construction
This proposal will remove duct leakage verification testing that would otherwise unintentionally be applied to ventilation systems.

Proposal # 5118

RE118-19

RE119-19

IECC: R403.3.3 (IRC N1103.3.4), R403.3.3 (IRC N1103.3.4)

Proponent: Joel Martell, representing National Association of Home Builders (jmartell@nahb.org)

2018 International Energy Conservation Code

Revise as follows:

R403.3.3 (IRC N1103.3.3) Duct testing (Mandatory). Ducts shall be pressure tested to determine air leakage by one of the following methods:

1. Rough-in test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the system, including the manufacturer's air handler enclosure if installed at the time of the test. Registers shall be taped or otherwise sealed during the test.
2. Postconstruction test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. Alternatively, a duct leakage test to outside conditioned space with a pressure differential of 0.1 w.g. (25 Pa) with reference to the outside across the entire system including the manufacturers's air handler enclosure. Registers shall be taped or otherwise sealed during the test.

Exceptions:

1. A duct air-leakage test shall not be required where the ducts and air handlers are located entirely within the *building thermal envelope*.
2. A duct air-leakage test shall not be required for ducts serving heat or energy recovery ventilators that are not integrated with ducts serving heating or cooling systems.

A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*.

R403.3.4 (IRC N1103.3.4) Duct leakage (Prescriptive). The total leakage of the ducts, where measured in accordance with Section R403.3.3, shall be as follows:

1. Rough-in test: The total leakage shall be less than or equal to 4 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m²) of conditioned floor area where the air handler is installed at the time of the test. Where the air handler is not installed at the time of the test, the total leakage shall be less than or equal to 3 cubic feet per minute (85 L/min) per 100 square feet (9.29 m²) of conditioned floor area.
2. Postconstruction test: Total leakage or leakage to outside conditioned space shall be less than or equal to 4 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m²) of conditioned floor area.

Reason: Allowing the option for measurement of duct leakage to the outside will give both HVAC installers and homeowners an accurate measurement of duct leaks to the exterior of the building. This is the only true testing method that measures energy loss as the method is measuring the leakage outside the thermal envelope not from inside conditioned space. Duct leakage to the outdoors is an accepted duct testing method in the industry and was allowed under Section 403.2.2 of the 2009 IECC and approved for the 2015 IECC by the committee, but withdrawn by the proponent. Proposed changes provide clarity as to what distribution system efficiency should be applied to the Standard Reference Design and how the ducts should be modeled in the performance path.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal will not change the cost of construction. It will provide a testing method that measures the true energy loss of ducts.

Proposal # 4293

RE119-19

RE120-19

IECC: R403.3.4 (IRC N1103.3.4)

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

R403.3.4 (IRC N1103.3.4) Duct leakage (Prescriptive). The total leakage of the ducts, where measured in accordance with Section R403.3.3, shall be as follows:

1. Rough-in test: The total leakage shall be less than or equal to ~~4~~ 4.0 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m²) of conditioned floor area where the air handler is installed at the time of the test. Where the air handler is not installed at the time of the test, the total leakage shall be less than or equal to ~~3~~ 3.0 cubic feet per minute (85 L/min) per 100 square feet (9.29 m²) of conditioned floor area.
2. Postconstruction test: Total leakage shall be less than or equal to ~~4~~ 4.0 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m²) of conditioned floor area.

Reason: The purpose of this code change proposal is to clarify the current requirements for maximum duct leakage that are already part of the IECC and to ensure that buildings achieve the efficiency intended by the code by adding an additional digit. Specifically, the code proposal adds “.0” to the specified duct leakage rate to clarify that a value above 4.0 cfm (or 3.0 cfm where the air handler is not installed) is not allowed. While we believe that the best interpretation of the current standard is that the duct leakage may not exceed 4.0, the addition of another digit will pre-empt any claim that a tested value above these maximums, such as 4.4, will meet the maximum. By preempting these “round off” arguments from code users, this change will provide additional support for building code officials who are simply trying to enforce the code. This proposed clarification will not change any substantive requirements of the code but will improve compliance and enforcement and eliminate any confusion.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. It merely serves to clarify a current requirement to avoid confusion and inconsistent enforcement.

Proposal # 3995

RE120-19

RE121-19

IECC: R403.3.4.1 (IRC N1103.3.4.1) (New), R403.3.4.1.1 (IRC N1103.3.4.1.1) (New), R403.3.4.1.2 (IRC N1103.3.4.1.2) (New)

Proponent: Aaron Gary, representing Self (aaron.gary@texenergy.org)

2018 International Energy Conservation Code

Add new text as follows:

R403.3.4.1 (IRC N1103.3.4.1) Sampling options for R2 multifamily dwelling units. For buildings having three or more dwelling units, a minimum of 15% of the dwelling units in each building must be tested as required by Section R403.3.3. Prior to beginning sampling for testing, "Initial Testing" is required for each multifamily property. "Initial Testing" shall consist of the 3rd party testing contractor performing the required tests on at least three consecutive dwelling units. Test results from the "Initial Testing" must satisfy minimum code requirements before sampling is permitted. Dwelling units selected for the "Initial Testing" must be within the same building. Dwelling units selected for "Initial Testing" shall not be included in a "sample group" or counted toward the minimum 15% of dwelling units tested. The building official shall randomly select the three dwelling units for "Initial Testing." The building official may delegate the random selection to the designated 3rd party testing contractor.

R403.3.4.1.1 (IRC N1103.3.4.1.1) Sample group Identification and Sampling The builder shall identify a "sample group" which may be a building, floor, fire area or portion thereof. All of the dwelling units within the "sample group" must be at the same stage of construction and must be ready for testing. The building official shall randomly select at least 15% of dwelling units from each "sample group" for testing. The building official may delegate the random selection to the designated 3rd party testing contractor.

If each tested dwelling unit within a "sample group" meets the minimum code requirements, then all dwelling units in the "sample group" are considered to meet the minimum code requirements.

Before a building may be deemed compliant with the testing as required, each "sample group" must be deemed compliant with the minimum code requirements. The sum total of all of the tested dwelling units across all "sample groups" shall not be less than a minimum of 15% of the dwelling units in a building.

R403.3.4.1.2 (IRC N1103.3.4.1.2) Failure to Meet Code Requirement(s). If any dwelling units within the identified "sample group" fail to meet a code requirement as determined by testing, the builder will be directed to correct the cause(s) of failure, and 30% of the remaining dwelling units in the "sample group" will be randomly selected for testing by the building official, or third-party testing contractor, regarding the specific cause(s) of failure.

If any failures occur in the additional dwelling units, all remaining dwelling units in the sample group must be individually tested for code compliance.

A multifamily property with three failures within a 90-day period is no longer eligible to use the sampling protocol in that community or project until successfully repeating "Initial Testing." Sampling may be reinstated after at least three consecutive dwelling units are individually verified to meet all code requirements.

A Certificate of Occupancy may not may be issued for any building until testing has been performed and deemed to satisfy the minimum code requirements on the dwelling unit(s) identified for testing.

Reason: For many multifamily (R2 classifications) projects, it is very costly and time consuming to test each dwelling unit for projects where there may be dozens of dwelling units in each building. Considering that the same tradesman generally constructs a building, it is reasonable to deem that construction practices are consistent and that if a reasonable sampling of units tested pass then all units would pass. These amendments (originally drafted by the North Texas Council of Governments Energy and Green Advisory Board) or are very similar ordinances, have been accepted across Texas by the EHJs including the City of Dallas, the City of Austin, and the City of San Antonio.

Cost Impact: The code change proposal will decrease the cost of construction

This code change proposal will streamline the cost and time required to conduct on-site verification of Code which will result in lower testing costs and faster construction timelines

Proposal # 4589

RE121-19

RE122-19

IECC: R403.3.6.1 (IRC N1103.3.6.1)

Proponent: David Collins, SEHPCAC, representing SEHPCAC (SEHPCAC@iccsafe.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Energy Conservation Code

Revise as follows:

R403.3.6.1 (IRC N1103.3.6.1) Effective *R*-value of deeply buried ducts (Mandatory**).** Where using a simulated energy performance analysis, sections of ducts that are: installed in accordance with Section R403.3.6; located directly on, or within 5.5 inches (140 mm) of the ceiling; surrounded with blown-in attic insulation having an *R*-value of R-30 or greater and located such that the top of the duct is not less than 3.5 inches (89 mm) below the top of the insulation, shall be considered as having an effective duct insulation *R*-value of R-25.

Reason: This section provides to installation details related to a calculation methodology to be used in specific circumstances. There is no value or metric available for trade-offs in the performance path.

As such SEHPCAC believes this is a mandated, non-tradeable methodology for calculating R-value, and should be labeled mandatory.

Note that the SEHPCAC has a proposal to eliminate the use of the labels "prescriptive" and "mandatory" in favor of a tabular method of identifying non-tradeable requirements. If that proposal is successful ICC staff have stated that sections being individually approved to be labeled as 'mandatory' will instead have their respective section numbers added to the new C407.2 table of requirements that are non-tradeable in the performance path

This proposal is submitted by the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx> (<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>)

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This does not change the design or construction requirements it makes mandatory the standard R-value calculation methodology

Proposal # 4480

RE122-19

RE123-19

IECC: R403.4.1 (IRC N1103.4.1)

Proponent: Howard Ahern, representing self (howard.ahern@airexmfg.com)

2018 International Energy Conservation Code

Revise as follows:

R403.4.1 (IRC N1103.4.1) Protection of piping insulation (Mandatory). Piping insulation exposed to weather shall be protected from damage, including that caused by sunlight, moisture, equipment maintenance and wind. The protection shall provide shielding from solar radiation that can cause degradation of the material. Adhesive tape shall be prohibited.

Reason: The protection of pipe insulation should be a Mandatory requirement just as the requirement to insulate pipes of the heating or cooling system. As the commercial IECC requires protection as mandatory this residential, section needs to as well. Energy saving for insulating piping of heating and cooling systems is well researched and documented. Protecting this energy saving is crucial.

Example of saving from protecting the insulation can be measured in Dr Kourmohammadi PE, Ph.D. CPD, CIPE, CFPE LEED AP

“Insulation materials cannot endure physical impact or are fragile to many elements, i.e.

weather. Weather impact on insulation is very high. The sun enhances the transforms the

insulation from thermoplast (soft) foam to thermoset (brittle) foam property. The property

change also impacts the thermal conductivity of the material and consequently its

performance. Protective covers become the sacrificial lamb and provide the stability in

properties of the insulation.

Maintenance of pipes insulation is often non-existence. Aged insulation is generally

brittle, poorly reinstalled, and subject to damage to the weather.”

Paper on Protective covers which calculated the BTU and Electrical energy saving of exposed Freon lines for residential and multifamily purposes .

Freon lines exposed 3 ft to 5 ft

0.15/kwhr cost of electricity (peak demand cost can be at

0.25\$/kwhr)

10 hours operation

365 days

¾” Freon line

½” insulation property 0.020227 Btu/(hr F ft)

For the California region it amounted to a \$1.00 per foot annual savings

Example of cost saving average 5ft per unit in California with a population of 39 million and

If only half of the population for example had a heating and /Cooling system with an average of 5ft exposed piping with degraded or no insulation , Protected pipe insulation would amount to an yearly electrical saving of \$975,000,000

This is electrical saving and does not include the saving to home and building owners from not having a costly expenses of replacing insulation for maintenance

Bibliography: Impact and Advantages of
Removable Insulation Protective Covers

Dr. "Saum" K. Nourmohammadi, PEx3, Ph.D. CPD, CIPE, CFPE,

LEED AP

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This change will not increase the cost of construction as protection is required by this section and by pipe insulation manufactures

Proposal # 5240

RE123-19

RE124-19

IECC: R403.3.5 (IRC N1103.3.5)

Proponent: Ron Clements, Chesterfield County, representing Chesterfield County (clementsro@chesterfield.gov)

2018 International Energy Conservation Code

Delete without substitution:

~~**R403.3.5 Building cavities (Mandatory).** *Building framing cavities shall not be used as ducts or plenums.*~~

Reason: Duct system construction methods and materials is outside the scope of IRC chapter 11. Duct system construction is within the scope of IRC chapter 16. Section M1601.1.1 #7 allows the use of stud wall cavities for return air. This is a code correlation issue. If stud cavities should not be used under any circumstance then M1601.1.1 should be amended.

Cost Impact: The code change proposal will decrease the cost of construction

If approved this code change will allow use of wall cavity spaces as return duct plenums, which saves money that would need to be spent on return duct work.

Proposal # 5613

RE124-19

RE125-19

IECC: R403.5.2 (IRC N1103.5.2)

Proponent: David Collins, SEHPCAC, representing SEHPCAC (SEHPCAC@iccsafe.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Energy Conservation Code

Revise as follows:

R403.5.2 (IRC N1103.5.2) Demand recirculation water systems (Mandatory). ~~Demand~~ Where installed. ~~demand~~ *recirculation water systems* shall have controls that comply with both of the following:

1. The controls shall start the pump upon receiving a signal from the action of a user of a fixture or appliance, sensing the presence of a user of a fixture or sensing the flow of hot or tempered water to a fixture fitting or appliance.
2. The controls shall limit the temperature of the water entering the cold water piping to not greater than 104°F (40°C).

Reason: There are no values or metrics for energy performance associated with Sec. R403.5.2. This means there is no value that can be used for trade-offs in the performance path.

Because the provisions of R403.5.2 cannot be feasibly modeled or traded they should be labeled as mandatory.

The words "where installed" were added to make clear that Demand Recirculation Systems themselves are not required to be installed, but that where they are installed there is no value in trading the provisions in the performance path.

Note that the SEHPCAC has a proposal to eliminate the use of the labels "prescriptive" and "mandatory" in favor of a tabular method of identifying non-tradeable requirements. If that proposal is successful ICC staff have stated that sections being individually approved to be labeled as 'mandatory' will instead have their respective section numbers added to the new C407.2 table of requirements that are non-tradeable in the performance path.

This proposal is submitted by the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx> (<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>)

Cost Impact: The code change proposal will increase the cost of construction

The code change may increase construction costs for a subset of buildings that may have been designed using the Total Building Performance or EIR compliance methods that included Demand recirculation water systems without the specified controls.

Proposal # 4484

RE125-19

RE126-19

IECC: R202 (IRC N1101.6), R403.5.1 [IRC N1103.5.1] (New), TABLE R403.5.1 [IRC N1103.5.1] (New)

Proponent: Lauren Urbanek, representing Natural Resources Defense Council (lurbanek@nrdc.org)

2018 International Energy Conservation Code

Add new text as follows:

R403.5.1 (IRC N1103.5.1) Water heating equipment. Service water heating equipment shall be one or more of the following types:

1. Storage gas water heater with a uniform energy factor (UEF) that meets the requirements of Table R403.5.1.
2. Storage electric water heater utilizing not less than 1.0 kW of on-site renewable energy.
3. Heat pump water heater with a UEF not less than of 2.0.
4. Tankless water heater.
5. Grid-enabled water heater.
6. Solar water heating system having a solar fraction of not less than 0.5.

TABLE R403.5.1 (IRC N1103.5.1)
MINIMUM UNIFORM ENERGY FACTOR (UEF) FOR STORAGE GAS WATER HEATERS

FIRST HOUR RATING ^a	MINIMUM UEF
Very Small	0.24
Low	0.50
Medium	0.64
High	0.68

a. The first hour rating of a water heater is determined by the federal test procedure. It is listed on the Energy Guide label affixed to the water heater.

SECTION R202 (N1101.6) GENERAL DEFINITIONS

Add new definition as follows:

GRID-ENABLED WATER HEATER. An electric water heater that includes controls that enable activation for use as part of an electric thermal storage or demand response program.

SOLAR FRACTION. The fraction of total annual water heating energy met by a solar water heater.

Reason: This proposal improves the energy efficiency of the prescriptive path of the code while continuing to offer builders the same level of flexibility they already enjoy. Builders may still install any type of water heater that works for the home and location, including storage gas or electric water heaters. While it is true that not every home may be able to utilize every option listed, there is an option that is appropriate for any home. This proposal also modifies only the prescriptive path, which leaves builders the flexibility of the performance and ERI paths.

This proposal is structured so that it does not trigger provisions of the National Appliance Energy Conservation Act (NAECA). See attached for a legal memorandum.

Residential envelopes have been getting tighter and better over the last few years. As a result, domestic water heating energy is emerging as a significant end-use from the efficiency stand-point. There are multiple ways of improving the efficiency of generating hot water in homes.

The US Department of Energy's analysis for the standard that took effect in 2015 found that high-efficiency gas storage water heaters cost less upfront to install in new construction than standard efficiency models, due to lower venting costs of the high-efficiency equipment[1]. Furthermore, this efficiency level is cost-effective for customers compared to a standard model, saving more than \$200 in energy costs. This means that customers will save money on their bills by installing a more efficient gas storage water heater *and* will pay less to purchase the efficient model than the less-efficient model. Gas furnaces that meet the Uniform Energy Factors specified in this proposal are widely available. Uniform Energy Factors are specified, per the DOE federal test procedure, based on the equipment's First Hour Rating, which is clearly labeled on the yellow Energy Guide label affixed to each

Storage electric water heaters may be installed, when coupled with solar energy. The purpose of this requirement is to offset the electricity used to heat the water, saving money for the consumer. In addition, solar energy is a strong selling point for a new home.

DOE analysis found that heat pump water heaters that replace electric storage water heaters are wildly cost-effective in all climate zones, in spite of their higher equipment costs. Homeowners will save more than \$500 in energy costs compared to even an efficient electric storage water heater.

Tankless water heaters were cost-effective in the warmer climate zones, but were not as cost-effective in the colder climate zones.

As part of DOE's appliance and equipment standards initiative, stakeholders expressed the importance of electric resistance water heaters to electric thermal storage (ETS) programs, so those grid-enabled water heaters are also incorporated into this proposal. Utilities use ETS programs, sometimes also known as load shifting or demand response programs, to manage peak demand load by limiting the times when certain appliances are operated. In certain water-heater based ETS programs, a utility typically controls a water heater remotely to allow operation only when electricity demand is during off-peak hours. During that off-peak operation, the electricity consumed is stored by the water heater as thermal energy for use during peak hours when the utility prevents the water heater from using electricity.

A solar water heating system can be designed in a variety of different ways. They can directly heat the water using the sun, can indirectly transfer heat from the sun to water in a storage tank, or can use pumps and valves to move water from collectors to a storage tank. They can have either gas or electric backup heating capabilities. This proposal requires at least half of the total energy delivered to the water heater to be generated through solar energy.

[1] U.S. Department of Energy, Energy Efficiency and Renewable Energy Office. Water Heater Technical Support Document Analytical Tools. Retrieved on January 11, 2019 from <https://www.regulations.gov/document?D=EERE-2006-STD-0129-0046>.

LEGAL MEMORANDUM CONCERNING NRDC'S PROPOSED R403.5.1 AND THE
NATIONAL APPLIANCE ENERGY CONSERVATION ACT

Introduction

The Natural Resources Defense Council (NRDC) proposes the addition of R403.5.1 to Chapter 4 of the 2018 International Efficiency Conservation Code (IECC).¹ The proposed addition prescribes six types of water heaters which may be installed by builders in order to comply with the prescriptive compliance pathway of IECC Chapter 4. Some commenters on similar past proposals expressed concern that such a provision would be preempted by the National Appliance Energy Conservation Act, which amended the Energy Policy Conservation Act and set up the energy efficiency standards program for appliances, including water heaters. This is not the case. The proposed code addition comports with the federal statutory provision for building codes because it does not require installation of water heaters that exceed the current federal minimum level.

Legal Analysis

As explained in greater detail below, the issue is whether these proposed additions would effectively require builders to use products that are more efficient than required by federal efficiency standards and thus would trigger preemption. Because they do not there is no preemption concern here.

The National Appliance Energy Conservation Act provides that state building codes may include provisions concerning the efficiency of appliances covered by federal efficiency standards if they meet seven specified requirements.² Commenters in the past expressed concern that the provision would not meet two of these requirements: Sections 6297(f)(3)(B) and 6297(f)(3)(E). The basic requirement of these two provisions is that the building code not require use of an appliance more efficient than the level set by the Department of Energy under the Act.

The first of these focuses on the code as a whole. It states, in relevant part, that the code may not "require that the covered product have an energy efficiency exceeding the applicable energy conservation standard" The second provision concerns building codes that offer optional combinations of items.³ Our proposed changes easily satisfy this provision because, as discussed below,

¹ This memorandum is submitted as an attachment to NRDC's July 21, 2016 proposed amendment.

² 42 U.S.C. § 6297(f)(3).

³ It is not clear whether the optional "combinations of items" applies to the prescriptive pathway at all. 42 U.S.C § 6297(f)(3)(E). Assuming that it does, we believe the relevant "combination" would be the combination of each of the different water heater options and the rest of the prescriptive options. The proposed standard avoids preemption because it includes multiple optional combinations that include minimum efficiency water heaters and only two that require higher efficiency appliances.

four of the six options do not involve products that exceed existing federal standards. (A fifth option may not require a standard-exceeding product depending on the first hour rating of the water heater.)

The presence of some more efficient options does not trigger preemption. In interpreting these provisions, the Ninth Circuit Court of Appeals has recognized that “a builder is not ‘required’ to select a [more efficient] option . . . simply because there is an economic incentive to do so.”⁴

The proposed amendment would be not preempted because it allows installation in new residential buildings of minimum-efficiency water heaters. The statutory preemption test focuses on the “covered product,” which is defined in this case as water heaters.⁵ Thus, a building code is not preempted so long as it does not require installation of a covered product – in this case a water heater – that is above the minimum efficiency level. The proposed amendment plainly does not do so for several reasons. First, the performance path (Section 405) and the Energy Rating Index path (Section 406) focus on overall energy use and include no water heater requirements at all.

Second, even just considering the prescriptive pathway, the proposed amendment still does not require use of a water heater that exceeds minimum federal standards. The proposed amendment allows builders to select any of the six prescribed types of water heaters, at least two of which clearly do not exceed the federal requirements: tankless water heaters (R403.5.1.4) and grid-enabled water heaters (R403.5.1.5). For tankless water heaters, the proposed code amendment contains no minimum efficiency standard and thus the federal standards would apply.⁶ For grid-enabled water heaters, the proposed code complies with the federal provision.⁷ As such, builders can comply with the standard by using water heaters that meet, but do not exceed, federal efficiency standards. Indeed, even if these minimum efficiency options were not available, the prescriptive path would still not “require” use of higher efficiency water heaters since any type of water heater can be used under the prescriptive approach if combined with other options such as a solar water heater.⁸

The proposed amendment is also similar to existing building code provisions. The prescriptive compliance path in California’s 2016 building code, for instance, requires installation of either gas/propane instantaneous water heaters or gas/propane storage type water heaters in new residential dwellings.⁹ California’s prescriptive compliance path allows use of certain minimum efficiency water heaters but does not allow use of every type of minimum efficiency water heater. Like the proposed

⁴ *Building Industry Ass’n of Wash. v. Wash. State Bldg. Code Council*, 683 F.3d 1144, 1151 (9th Cir. 2012).

⁵ 42 U.S.C. § 6292(a)(4).

⁶ Energy Conservation Program for Consumer Products: Definitions and Standards for Grid-Enabled Water Heaters, Final Rule, 80 Fed. Reg. 48004-01 (August 11, 2015).

⁷ *Id.*

⁸ See *Building Industry Ass’n of Wash.*, 683 F.3d at 1151.

⁹ 2016 Building Energy Efficiency Standards for Residential and Nonresidential Buildings, Section 150.1(c)(8)(A), available at <http://www.energy.ca.gov/title24/2016standards/index.html>.

code, the California code allows builders to choose an alternate compliance path, which allows use of any water heater.¹⁰

Conclusion

The core requirement for a building code to avoid preemption is that it not require above-minimum efficiency appliances. This requirement is met by the NRDC proposal because the proposal offers multiple ways that minimum efficiency water heaters can be used under both the prescriptive and performance pathways.

¹⁰ See International Energy Conservation Code, R401.2, available at <http://codes.iccsafe.org/app/book/toc/2015/I-Codes/2015%20IECC%20HTML/index.html>.

Bibliography: U.S. Department of Energy, Energy Efficiency and Renewable Energy Office. Water Heater Technical Support Document Analytical Tools. Retrieved on January 11, 2019 from <https://www.regulations.gov/document?D=EERE-2006-STD-0129-0046>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal provides a list of options for a builder to choose from. In some instances the builder may choose an option which increases construction costs, but there are many options that will not increase costs. For instance, the US Department of Energy's analysis for the water

heater standard that took effect in 2015 found that high-efficiency gas storage water heaters cost less upfront to install in new construction than standard efficiency models, due to lower venting costs of the high-efficiency equipment.

Proposal # 5421

RE126-19

RE127-19

IECC: R403.5.3 (IRC N1103.5.3)

Proponent: David Collins, SEHPCAC, representing SEHPCAC (SEHPCAC@iccsafe.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Energy Conservation Code

Revise as follows:

R403.5.3 (IRC N1103.5.3) Hot water pipe insulation (Prescriptive). Insulation for service hot water piping with a thermal resistance, *R*-value, of not less than R-3 shall be applied to the following:

1. Piping $\frac{3}{4}$ inch (19.1 mm) and larger in nominal diameter located inside the conditioned space.
2. Piping serving more than one dwelling unit.
3. Piping located outside the *conditioned space*.
4. Piping from the water heater to a distribution manifold.
5. Piping located under a floor slab.
6. Buried piping.
7. Supply and return piping in circulation and recirculation systems other than cold water pipe return demand recirculation systems.

Reason: The change clarifies the intent of the requirements which require all piping in items 2 through 7 to be insulated regardless of pipe diameter. The exemption in item 7 is further clarified by not requiring insulation on the "cold water pipe return" in a demand recirculation system. This proposal is submitted by the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx> (<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>)

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is a clarification only, not an additional design or construction requirement.

Proposal # 4759

RE127-19

RE128-19

IEEC: R403.5.3 (IRC N1103.5.3)

Proponent: David Collins, SEHPCAC, representing SEHPCAC (SEHPCAC@iccsafe.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Energy Conservation Code

Revise as follows:

R403.5.3 (IRC N1103.5.3) Hot water pipe insulation (Prescriptive Mandatory). Insulation for hot water piping with a thermal resistance, *R*-value, of not less than R-3 shall be applied to the following:

1. Piping $\frac{3}{4}$ inch (19.1 mm) and larger in nominal diameter.
2. Piping serving more than one dwelling unit.
3. Piping located outside the *conditioned space*.
4. Piping from the water heater to a distribution manifold.
5. Piping located under a floor slab.
6. Buried piping.
7. Supply and return piping in recirculation systems other than demand recirculation systems.

Reason: Because the provisions of R403.5.3 cannot be feasibly modeled or traded; and because of there is no design reason to attempt to model it, R403.5.3 should be labeled as mandatory.

Note that the SEHPCAC has a proposal to eliminate the use of the labels "prescriptive" and "mandatory" in favor of a tabular method of identifying non-tradeable requirements. If that proposal is successful ICC staff have stated that sections being individually approved to be labeled as 'mandatory' will instead have their respective section numbers added to the new C407.2 table of requirements that are non-tradeable in the performance path.

This proposal is submitted by the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx> (<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>)

Cost Impact: The code change proposal will increase the cost of construction

Although SEHPCAC has been assured pipe insulation is industry practice, this code change may increase construction costs for a subset of buildings that were not insulating pipes.

Proposal # 4485

RE128-19

RE129-19

IECC: R403.5.4 (IRC N1103.5.4)

Proponent: David Collins, SEHPCAC, representing SEHPCAC (SEHPCAC@iccsafe.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Energy Conservation Code

Revise as follows:

R403.5.4 (IRC N1103.5.4) Drain water heat recovery units (Mandatory). Drain water heat recovery units shall comply with CSA B55.2. Drain water heat recovery units shall be tested in accordance with CSA B55.1. Potable water-side pressure loss of drain water heat recovery units shall be less than 3 psi (20.7 kPa) for individual units connected to one or two showers. Potable water-side pressure loss of drain water heat recovery units shall be less than 2 psi (13.8 kPa) for individual units connected to three or more showers.

Reason: Because the provisions of R403.5.4 cannot be feasibly modeled or traded; and because of there is no design reason to attempt to model it, R403.5.4 should be labeled as mandatory (non-tradeable).

Note that the SEHPCAC has a proposal to eliminate the use of the labels "prescriptive" and "mandatory" in favor of a tabular method of identifying non-tradeable requirements. If that proposal is successful ICC staff have stated that sections being individually approved to be labeled as 'mandatory' will instead have their respective section numbers added to the new C407.2 table of requirements that are non-tradeable in the performance path

This proposal is submitted by the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx> (<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>)

Cost Impact: The code change proposal will increase the cost of construction

Although SEHPCAC has been assured this is standard industry practice, the code change may increase construction costs for a subset of buildings that may have been designed to include drain water heat recovery but not in accordance with the specified standard.

Proposal # 4487

RE129-19

RE130-19

IECC: R403.6.2 (IRC N1103.6.2) (New)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robb@nrglogic.com)

2018 International Energy Conservation Code

Add new text as follows:

R403.6.2 (IRC N1103.6.2) Testing. Mechanical ventilation systems shall be tested and verified to provide the minimum ventilation flow rates required by Section R403.6. Testing shall be performed according to the ventilation equipment manufacturer's instructions, or by using a flow hood or box, flow grid, or other airflow measuring device at the mechanical ventilation fan's inlet terminals or grilles, outlet terminals or grilles, or in the connected ventilation ducts. Where required by the code official, testing shall be conducted by an approved third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the code official.

Exception: Kitchen range hoods that are ducted to the outside with 6" or larger duct and one or less 90° elbow or equivalent in the duct run are exempt from this requirement to test air flow.

Reason: As we continue to be guided by sound building science to build tight homes as required by the IECC to achieve better predictability and control of air flow, thermal flow, and moisture flow spot/local and whole house ventilation becomes an even more crucial aspect of ensuring that the full intent of the IECC is met. This includes durability, safety, healthy, flexibility in how we build, as well as, efficiency of the structure. If we do not more actively ensure that the systems in our homes are not only there, but are also performing as intended we have missed the mark with regards to the intent of the code and creating dwellings that are durable, safe, healthy, and efficient. The testing experience gained through the verification of the EnergyStar program has clearly demonstrated that ventilation fans are installed but are not performing as required by the code. Fan rated flow does not equate to the flow that is actually produced once a fan has been installed. The quality of the installation of the duct from the fan to the termination of the duct to the outside, as well as, the quality of the termination device ultimately governs the amount of air that any fan can push. Simple cost-effective testing is available to ensure that the systems in our homes are not only there but have been installed in such a way that they work as intended by the code.

Allison Bailes Energy Vanguard blog post titled, "The 2 Main Problems With Kitchen Ventilation" which can be found here <https://www.energyvanguard.com/blog/2-main-problems-kitchen-ventilation> Offers additional rational regarding the consequences of poor ventilation from research conducted by Brett Singer and others at Lawrence Berkeley Laboratory. If you are interested there are additional links at the end of his post to related articles that further discuss this issue. I offer this background information to demonstrate that beyond the physical failure of measured fan flow to meet the requirements of code, that there is an extensive study being produced on the effects of improper ventilation. Requiring testing of spot/local and whole house ventilation system will move the building industry into compliance with the code by offering direct feedback on the fan choice and the installation. In the most flexible way possible this feedback will guide fan choice and installation techniques that will become compliant with the code.

Cost Impact: The code change proposal will increase the cost of construction

The cost implications of this code change are small. Qualified testing personnel are already available and at the building performing blower door and duct leakage tests. Adding simple flow measurements of ventilation systems at the same time a blower door test occurs, for example, is not only practical but cost-effective. An increase in cost of \$25-\$50 is well worth the reduction in builder risk, occupant health, and efficiency issues that are associated with poor implementation of code required moisture and pollutant management.

Proposal # 5249

RE130-19

RE131-19

IECC: R403.6 (IRC N1103.6) (New), R403.6.1 (IRC N1103.6.1) (New), R403.6.1 (IRC N1103.6.1)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com); Shaunna Mozingo (sdmozingo@shaunnamozingo.com)

2018 International Energy Conservation Code

Add new text as follows:

R403.6 (IRC N1103.6) Mechanical Ventilation (Mandatory). The building shall be provided with ventilation that meets the requirements of the International Residential Code or International Mechanical Code, as applicable, or with other approved means of ventilation. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

R403.6.1 (IRC N1103.6.1) Heat recovery ventilation (Prescriptive). The building shall be provided with a heat recovery or energy recovery ventilation system in climate zones 7 and 8. The system shall be balanced with a minimum sensible heat recovery efficiency of 65% at 32° F (0° C) and at rated airflow.

Revise as follows:

~~R403.6.1 (IRC N1103.6.1)~~ **R403.6.1.2 (IRC N1103.6.1.2) Whole-house mechanical ventilation system fan efficacy.** Fans used to provide whole-house mechanical ventilation shall meet the efficacy requirements of Table R403.6.1.

Exception: Where an air handler that is integral to tested and *listed* HVAC equipment is used to provide whole-house mechanical ventilation, the air handler shall be powered by an electronically commutated motor.

Reason: How does the proposed measure compare to what's required in current codes? The national model energy code for residential buildings, the International Energy Conservation Code (IECC), does not require heat recovery ventilation, though it does establish minimum efficacy ratings for HRV fans if a home has one. All new homes are currently required to have mechanical ventilation based on the International Residential Code (IRC), with continuous fresh air requirements ranging from 30 to 165 CFM depending on the home's conditioned floor area and number of bedrooms. For dwelling units between 1200 ft² and 4500 ft², with two to four bedrooms, the range is 45 to 90 CFM.

Why is heat recovery a better approach to ventilation than alternatives?

In years past, the overall leakiness of building envelopes provided sufficient fresh air for occupants, but brought with it substantial energy penalties and comfort issues from widely varying ventilation rates depending on outdoor temperature and wind speed. As construction practices have gained better control of envelope leakage, mechanical ventilation systems have become a necessity and are required by modern building codes. In sufficiently cold climates, heat recovery can enhance comfort—as occupants are not subjected to uncomfortably cold supply air—and may be cost effective in their recovery of heat that would otherwise be exhausted.

HRVs have experienced significant growth in the residential market in recent years. This market is projected to continue growing at 11% per year per MarketsandMarkets (2018). North America is the largest market in the world for HRVs.

ERVs are not considered in this paper because their performance and cost effectiveness is more dependent on local humidity and on the interplay of heating and cooling performance. These factors do not map as cleanly to the high-level climate zones typically used in state and local building energy codes.

How is system performance demonstrated in the field?

HRVs come in several forms, ranging from systems integrated into the HVAC distribution system, to separate systems with their own ductwork, to simple unducted heat exchangers. System performance is easy to verify based on the unit's nameplate performance ratings and straightforward inspection of the installation.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The cost of HRV equipment ranges from about \$500 to a few thousand dollars, depending on the manufacturer, capacity, configuration, and the base design of the home. The present analysis assumes a total measure cost of \$1,500 for a single-point HRV system. NREL (2018) gives a cost of \$1,300, inclusive of equipment and installation. Russell, Sherman and Rudd (2007) found a similar cost of \$1,350 including installation. Fixr.com (2018), a home remodeling website, gives a range of \$1,200 to \$1,550, inclusive of materials and installation. Moore (2018) suggests a typical cost of \$1,500. This analysis uses a primary first cost of \$1,500 for an HRV in a typical dwelling unit as a best estimate that includes installation. It is acknowledged that real costs can vary greatly, especially if the cost of installation is minimized, as when the home was already designed to integrate ventilation into the distribution system. In that case, the HRV cost can be quite low. To show the sensitivity of HRV cost effectiveness to first cost, a secondary cost of \$500 was evaluated in addition to the primary cost of \$1,500.

Cost-effectiveness: At a first cost of \$1,500, the life-cycle cost of an HRV is negative (i.e., life-cycle savings is positive) in climate zones 7 and 8, as shown in Table 2 of the attached PNL Residential Heat Recovery Ventilation Technical Brief

Proposal # 4877

RE132-19 Part I

PART I — IECC: R403.6 (IRC N1103.6)

PART II — IRC@: R303.4

Proponent: Mike Moore, representing Broan-NuTone (mmoore@newportventures.net)

2018 International Energy Conservation Code

Revise as follows:

R403.6 (IRC N1103.6) Mechanical ventilation (Mandatory). ~~The *building*~~ Buildings and dwelling units shall be provided with mechanical ventilation that complies with the requirements of the International Residential Code or International Mechanical Code, as applicable, or with other *approved* means of ventilation. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

Proposal # 5317

RE132-19 Part I

RE132-19 Part II

IRC@: R303.4

Proponent: Mike Moore, representing Broan-NuTone (mmoore@newportventures.net)

2018 International Residential Code

Revise as follows:

R303.4 Mechanical ventilation. ~~Where the air infiltration rate of a dwelling unit is 5 air changes per hour or less where tested with a blower door at a pressure of 0.2 inch w.c (50 Pa) in accordance with Section N1102.4.1.2, the dwelling unit~~ Dwelling units complying with Section N1102.4.1 shall be provided with whole-house mechanical ventilation in accordance with Section M1505.4.

Reason: Changes to R303.4

Section N1102.4 establishes MANDATORY requirements for air sealing of the building envelope, including mandatory requirements to follow the air barrier and insulation installation criteria in Table N1102.4.1.1 and the mandatory blower door testing and verification requirements in Section N1102.4.1.2. Further, all dwelling units complying with Section N1102.4 require a blower door test with results that achieve 5 ACH50 or less. Thus, all dwelling units complying with Section N1102.4 already require whole-house mechanical ventilation. This change simplifies Section R303.4 and future-proofs the intent of the section by ensuring that tight dwelling units will continue to be provided with whole-house mechanical ventilation, regardless of the metric used to verify that the dwelling units are tight (e.g. there are several proposals being heard in Group B that would move from the metric of ACH50 to a metric of cfm50/ft2).

These changes are aligned with Group A action on proposal M20. M20 was approved and removed the specific reference to 5 ACH50 as the air leakage metric that triggers a mechanical ventilation requirement in Section 401.2 of the IMC as follows:

401.2 Ventilation required. Every occupied space shall be ventilated by natural means in accordance with Section 402 or by mechanical means in accordance with Section 403. ~~Strikeout the following text: Where the air infiltration rate in a dwelling unit is less than 5 air changes per hour when tested with a blower door at a pressure of 0.2-inch water column (50 Pa) in accordance with Section R402.4.1.2 of the International Energy Conservation Code, the dwelling unit shall be ventilated by ... End strikeout section~~ Dwelling units complying with the air leakage requirements of the International Energy Conservation Code or ASHRAE 90.1 shall be ventilated by mechanical means in accordance with Section 403.

Changes to Section 403.6

In keeping with IRC Section R303.4 and IMC Section 401.2, the heading of section 403.6 requires "mechanical" ventilation for buildings complying with the IECC-Residential. To clarify that this is the intent of this section and is coordinated with the IRC and IMC (which contain mechanical ventilation requirements for buildings and dwelling units), the words "mechanical" and "dwelling units" are proposed for inclusion within the text of R403.6.

These changes are aligned with Group A action on proposal M20. M20 was approved and removed the specific reference to 5 ACH50 as the air leakage metric that triggers a mechanical ventilation requirement in Section 401.2 of the IMC as follows:

401.2 Ventilation required. Every occupied space shall be ventilated by natural means in accordance with Section 402 or by mechanical means in accordance with Section 403. ~~Strikeout the following text: Where the air infiltration rate in a dwelling unit is less than 5 air changes per hour when tested with a blower door at a pressure of 0.2-inch water column (50 Pa) in accordance with Section R402.4.1.2 of the International Energy Conservation Code, the dwelling unit shall be ventilated by ... End strikeout section~~ Dwelling units complying with the air leakage requirements of the International Energy Conservation Code or ASHRAE 90.1 shall be ventilated by mechanical means in accordance with Section 403.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal is a clarification of current requirements of the IRC, IMC, and IECC and does not increase or decrease the cost of construction.

Proposal # 5696

RE132-19 Part II

RE133-19

IECC: TABLE R403.6.1 (IRC N1103.6.1)

Proponent: Eric Makela, representing New Buildings Institute (ericm@newbuildings.org); Mike Moore, Newport Ventures, representing Broan-NuTone (mmoore@newportventures.net)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R403.6.1 (IRC N1103.6.1)
WHOLE-HOUSE MECHANICAL VENTILATION SYSTEM FAN EFFICACY^a**

FAN LOCATION	AIR FLOW RATE MINIMUM(CFM)	MINIMUM EFFICACY(CFM/WATT)	AIR FLOW RATE MAXIMUM(CFM)
HRV or ERV	Any	1.2 cfm/watt	Any
Range hoods	Any	2.8 cfm/watt	Any
In-line fan	Any	2.8 3.8 cfm/watt	Any
Bathroom, utility room	10	1.4 2.8 cfm/watt	< 90
Bathroom, utility room	90	2.8 3.5 cfm/watt	Any

For SI: 1 cfm = 28.3 L/min.

- a. When tested in accordance with HVI Standard 916.

Reason: Whole-house ventilation fan efficacies were introduced in the code in 2012 for low-rise residential buildings and have not been updated since. The current residential fan efficacies are from an older version of Energy Star.

This proposal will update the requirements to the latest Energy Star requirement Version 4.0. The fan efficacy values are very conservative based on what is currently on the market. Although they are substantially better than current requirements, they are still lower than the average efficiency of fans in the Home Ventilating Institute’s fan database. These requirements are below the average efficiency for each fan type on the market and reflect hundreds of available options, but higher than the standard set in the residential code. For example, according to the HVI database of fans, the average efficiency of bath fans is around 8 CFM/W.

A proposal has also been submitted to add similar requirements for similar low-capacity fans in the commercial section of the code.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposal is not expected to increase the cost of construction. Cost for the kinds of fans covered by this requirement are driven primarily by flow rate, finishes, design and noise and whether they include other features like lights or heaters and not efficiency. Fans that meet this requirement can be obtained for less than other fans that do not. A survey of pricing from a major retailer revealed that the lowest cost bathroom fans from major manufacturers that currently comply with Table R403.6.1 would also comply with the proposed increase in efficacy, resulting in no cost increase.

Lowest cost exhaust fans for major manufacturers meeting current IECC fan efficacy requirement at 0.1” w.c. and IRC flow rate requirement at 0.25” w.c, flow < 90 cfm:

Fan	Efficacy at 0.1” w.c.	Flow at 0.25” w.c.
AirKing BFQ75	3.0	70
DeltaBreeze SLM70	4.7	54
Broan AE80B	3.0	60

Pricing for these fans ranged between \$35-\$53 retail. Note that the fan efficacy for each of these lowest-cost fans that are currently compliant with the IECC and IRC would also comply with the proposed revision in fan efficacy to 2.8 cfm/W, so there is no additional cost.

Lowest cost exhaust fans for major manufacturers meeting current IECC fan efficacy requirement at 0.1” w.c. and IRC flow rate requirement at 0.25” w.c, flow ≥ 90 cfm:

Fan	Efficacy at 0.1” w.c.	Flow at 0.25” w.c.
AirKing AK110LS	3.9	90
DeltaBreeze VFB25AEH	5.9	105

Broan-NuTone AEN110	4.7	92
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Pricing for these fans ranged between \$89-\$105 retail. Note that the fan efficacy for each of these lowest-cost fans that are currently compliant with the IECC and IRC would also comply with the proposed revision in fan efficacy to 3.5 cfm/W, so there is no additional cost.

Source www.homedepot.com, pricing as of 1/9/2019.

Proposal # 5180

RE133-19

RE134-19

IECC: R403.6.1 (IRC N1103.6.1), TABLE R403.6.1 (IRC N1103.6.1)

Proponent: Aaron Gary, representing Self (aaron.gary@texenergy.org)

2018 International Energy Conservation Code

Revise as follows:

R403.6.1 (IRC N1103.6.1) ~~Whole-house~~ Whole-dwelling mechanical ventilation system fan efficacy. Fans used to provide whole-house mechanical ventilation shall meet the efficacy requirements of Table R403.6.1.

~~**Exception:** Where an air handler that is integral to tested and listed HVAC equipment is used to provide whole-house mechanical ventilation, the air handler shall be powered by an electronically commutated motor.~~

TABLE R403.6.1 (IRC N1103.6.1)
WHOLE-HOUSE WHOLE-DWELLING MECHANICAL VENTILATION SYSTEM FAN EFFICACY^a

FAN LOCATION	AIR FLOW RATE MINIMUM(CFM)	MINIMUM EFFICACY(CFM/WATT) ^b	AIR FLOW RATE MAXIMUM(CFM)
HRV or ERV	Any	1.2 cfm/watt	Any
Range hoods	Any	2.8 cfm/watt	Any
In-line fan	Any	2.8 cfm/watt	Any
Bathroom, utility room	10	1.4 cfm/watt	< 90
Bathroom, utility room	90	2.8 cfm/watt	Any
<u>Air-handler that is integrated to tested and listed HVAC equipment</u>	<u>Any</u>	<u>1.2 cfm/watt</u>	<u>Any</u>

For SI: 1 cfm = 28.3 L/min.

- a. When tested in accordance with HVI Standard 916.
- b. Design outdoor airflow rate / watts of fan used

Reason: Typical Integrated whole-dwelling mechanical ventilation systems, even those that are using ECM motors, use significantly more energy than the other fan locations allowed under R403.6.1. Analyses using ERI approved software calculate the increase in annual energy usage for an integrated while-dwelling mechanical ventilation system to be up to 10x when compared to an independent in-line fan. As such requiring integrated mechanical ventilation system to perform equally to at least the most energy inefficient of the other styles of systems in this table could result in significant energy savings.

Footnote b. clarifies how the CFM/watt should be calculated by specifying that the CFM of Outdoor mechanical ventilation air should be used for this calculation and not the total airflow of the system delivering the air. Some ventilation systems use a single fan to deliver mixed outdoor and with indoor "return" air. For this calculation only the outdoor airflow should be used in lieu of the total airflow of the fan. This is a common misunderstanding we encounter associated C403.7.4 as well.

Cost Impact: The code change proposal will increase the cost of construction

For buildings that are already using an independent fan strategy (exhaust, supply, or balanced) or an integrated fan strategy that utilizes a small enough horsepower motor, this proposal will not increase or decrease the cost of construction. For buildings that are currently using standard AHU/Furnace fan motors as their mechanical ventilation fan, the cost of construction may increase as they will need to adjust their mechanical ventilation design strategy in order to comply.

Proposal # 4556

RE134-19

RE135-19

IECC: R403.6.1 (IRC N1103.6.1), TABLE R403.6.1 (IRC N1103.6.1)

Proponent: Aaron Gary, representing Self (aaron.gary@texenergy.org)

2018 International Energy Conservation Code

Revise as follows:

R403.6.1 (IRC N1103.6.1) ~~Whole-house~~ Whole-dwelling mechanical ventilation system fan efficacy. Fans used to provide ~~whole-house~~ whole dwelling mechanical ventilation shall meet the efficacy requirements of Table R403.6.1.

Exception: Where an air handler that is integral to tested and *listed* HVAC equipment is used to provide whole-house mechanical ventilation, the air handler shall be powered by an electronically commutated motor.

TABLE R403.6.1 (IRC N1103.6.1)
WHOLE-HOUSE ~~WHOLE-DWELLING~~ MECHANICAL VENTILATION SYSTEM FAN EFFICACY^a

FAN LOCATION	AIR FLOW RATE MINIMUM(CFM)	MINIMUM EFFICACY(CFM/WATT)	AIR FLOW RATE MAXIMUM(CFM)
HRV or ERV	Any	1.2 cfm/watt	Any
Range hoods	Any	2.8 cfm/watt	Any
In-line fan	Any	2.8 cfm/watt	Any
Bathroom, utility room	10	1.4 cfm/watt	< 90
Bathroom, utility room	90	2.8 cfm/watt	Any

For SI: 1 cfm = 28.3 L/min.

- a. When tested in accordance with HVI Standard 916.

Reason: "Whole-house" is too limiting a phrase as this Code governs, and these systems are installed, in dwellings other than houses with apartments that are 3-stories and lower being the most common. Further the term dwelling is used in the IMC in relation to ventilation systems in lieu of house.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Revision is clarifying in nature and does not change the requirements of the Code.

Proposal # 4621

RE135-19

RE136-19

IECC; TABLE R403.6.1 (IRC N1103.6.1)

Proponent: Mike Moore, Newport, representing Broan-NuTone (mmoore@newportventures.net)

2018 International Energy Conservation Code

Revise as follows:

TABLE R403.6.1 (IRC N1103.6.1)
WHOLE-HOUSE MECHANICAL VENTILATION SYSTEM FAN EFFICACY^a

FAN LOCATION	AIR FLOW RATE MINIMUM(CFM)	MINIMUM EFFICACY(CFM/WATT)	AIR FLOW RATE MAXIMUM(CFM)
HRV or ERV	Any	1.2 cfm/watt	Any
Range hoods	Any	2.8 cfm/watt	Any
In-line fan	Any	2.8 cfm/watt	Any
Bathroom, utility room	10	1.4 cfm/watt	< 90
Bathroom, utility room	90	2.8 cfm/watt	Any

For SI: 1 cfm = 28.3 L/min.

- a. When tested in accordance with HVI Standard 916. Fan efficacy for HRV, ERV, balanced, and in-line fans shall be taken at a static pressure ≥ 0.2 in. w.c. Fan efficacy for range hoods, bathroom, and utility room fans shall be taken at a static pressure ≥ 0.1 in. w.c.

Reason: Fan efficacy varies as a function of static pressure, so it is necessary to identify the minimum static pressure required for determining the rating. These pressures are aligned with industry practice and ENERGY STAR's requirements for reporting fan efficacy.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal clarifies a current requirement of the code. There is no expected change in construction costs.

Proposal # 5311

RE136-19

RE137-19

IECC: TABLE R403.6.1 (IRC N1103.6.1)

Proponent: Mike Moore, representing Broan-NuTone (mmoore@newportventures.net)

2018 International Energy Conservation Code

Revise as follows:

TABLE R403.6.1 (IRC N1103.6.1)
WHOLE-HOUSE MECHANICAL VENTILATION SYSTEM FAN EFFICACY^a

<u>SYSTEM TYPE-FAN LOCATION</u>	<u>AIR FLOW RATE MINIMUM(CFM)</u>	<u>MINIMUM EFFICACY(CFM/WATT)</u>	<u>AIR FLOW RATE MAXIMUM(CFM)</u>
HRV or ERV or balanced	Any	1.2 cfm/watt	Any
Range hoods	Any	2.8 cfm/watt	Any
In-line supply or exhaust fan	Any	2.8 cfm/watt	Any
Other exhaust fan Bathroom, utility room Bathroom, utility room	$\neq < 90$	1.4 cfm/watt	$\neq 90$
	≥ 90	2.8 cfm/watt	Any

For SI: 1 cfm = 28.3 L/min.

- a. When tested in accordance with HVI Standard 916.

Reason: Changes proposed to this table are for clarification and simplification. First, the table should not be based on the location of the fan but on the type of fan being installed. For example, an HRV or ERV is not a location, but a system type. Balanced fans without heat recovery are currently omitted from the table, and should be listed along side HRVs and ERVs, which are also balanced systems. Because balanced fans are grouped with HRVs and ERVs, the use of the term "in-line fan" should be clarified to include supply and exhaust in-line systems (also not a location, but a system type). Finally, if a "bathroom" fan is installed in a hallway to provide ventilation (a typical installation location for whole-house mechanical ventilation systems), the current table is silent on the minimum efficacy required, because it does not address "hallway" fans. So, this proposal combines typical bathroom, utility room, range hood, and hallway exhaust fans into the category of "other exhaust fans"; no changes are made to the fan efficacies for these products (note that the minimum flow rate for intermittent range hoods permitted by the IRC is 100 cfm, corresponding to a minimum efficacy of 2.8 cfm/W under the original and proposed versions of the table). The last column can be deleted by changing the "Air Flow Rate Minimum" column heading to "Air Flow Rate".

Cost Impact: The code change proposal will not increase or decrease the cost of construction
These changes are for clarification and simplification purposes and do not increase or decrease the cost of construction.

Proposal # 5413

RE137-19

RE138-19

IECC: R403.6.1 (IRC N1103.6.1)

Proponent: Mike Moore, Newport Ventures, representing Broan-NuTone (mmoore@newportventures.net)

2018 International Energy Conservation Code

Revise as follows:

R403.6.1 (IRC N1103.6.1) Whole-house mechanical ventilation system fan efficacy. ~~Fans~~ Discrete fans used to provide whole-house mechanical ventilation shall meet the efficacy requirements of Table R403.6.1.

~~**Exception:** Where an air handler that is integral to tested and listed HVAC equipment is used to provide whole-house mechanical ventilation, the air handler shall be~~ Space heating or cooling air handlers shall not supply whole-house ventilation except when operating to provide heating or cooling, unless the air handler fan is powered by an electronically commutated motor and the project complies with R401.2.2 or R401.2.3.

Reason: The prescriptive path is configured to provide builders with options among items that provide roughly equivalent performance. In the case of ventilation, a central fan integrated system (i.e., a supply duct connected to the return trunk of the central air handler that relies on the air handler motor to deliver outdoor air) has much higher energy use than an exhaust-only system and should be modeled in the performance or ERI path to account for energy use associated with operation beyond "free" heating or cooling cycles. The major software programs are able to model such systems and account for their energy use. Following is a table showing the annual energy cost of operating a central fan integrated system versus a minimally code compliant exhaust-only system for a typical single-family home with a ventilation rate of 75 cfm. Annual energy cost of the CFI system ranges from \$84 to \$241 more than the exhaust-only system. Simulations were conducted in REM/Rate and are available here: <https://www.dropbox.com/sh/yw3r9kwq9it4axg/AAD0N4lnij57N4qo2Tt60xcKa?dl=0>.

Climate Zone	1	2	3	4	5	6	7	8
Additional Annual Energy Cost of CFI System Versus Code-Minimum Exhaust System	\$241	\$183	\$135	\$95	\$84	\$100	\$107	\$131

Assumptions for the "typical" home:

- Single family, detached, 2018 IECC compliant
- 2376 ft2, 4 bed (CZ 1-3); 3564 ft2, 4 bed (CZ 4-8)
- DUV: 75 cfm
- Air sealing: 5 ACH50 (CZ 1-2); 3 ACH50 (CZ 3-8)
- Heating/cooling: 80 AFUE furnace, 13 or 14 SEER AC, BLDC motor (ECM)

Software: REM/Rate v15.5

Energy prices: \$0.1284/kWh; \$1.307/therm

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Where central fan integrated systems are prescribed in homes not currently complying with the performance or ERI path, additional costs will be required to comply with such paths. If the builder wishes to remain within the prescriptive path, other options include: specifying central fan integrated systems that use an exhaust fan to provide ventilation when there is a call for ventilation but no call for heating or cooling (such systems are commercially available for ~\$140 premium versus a CFI system), or specifying an exhaust or balanced ventilation system instead of a CFI system. Specification of an exhaust ventilation systems instead of a CFI system would be expected to reduce the first cost of the ventilation system.

Proposal # 5680

RE138-19

RE139-19

IECC: R403.6.1 (IRC N1103.6.1) (New)

Proponent: Mike Moore, Newport Ventures, representing Broan-NuTone (mmoore@newportventures.net)

2018 International Energy Conservation Code

Revise as follows:

R403.6 (IRC N1103.6) Mechanical ventilation (Mandatory). The *building* shall be provided with ventilation that complies with the requirements of the International Residential Code or International Mechanical Code, as applicable, or with other *approved* means of ventilation. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

Add new text as follows:

R403.6.1 (IRC N1103.6.1) Heat or Energy Recovery Ventilation (Prescriptive). Dwelling units shall be provided with a heat recovery or energy recovery ventilation system in climate zones 7 and 8. The system shall be balanced with a minimum sensible heat recovery efficiency of 65% at 32°F (0°C) at a flow greater than or equal to the design airflow.

Reason: A recent study conducted by Pacific Northwest National Laboratory showed HRVs and ERVs to be cost effective in climate zones 7 and 8, with annual energy savings from \$138 to \$233 on an initial investment of ~\$1500 installed (corresponding to a first cost premium of ~\$840 versus an exhaust only system and one entry-level bath fan; yielding simple paybacks of 4-6 years). This proposal is aligned with recent changes across most of Canada to require heat recovery ventilation for dwelling units. This proposal would require heat or energy recovery ventilators only for those dwelling units following the prescriptive path in the coldest climate zones, which represents a conservative improvement to the code.

Bibliography: Taylor, T. 2018. Residential Heat Recovery Ventilation Technical Brief. Pacific Northwest National Laboratory. PNNL-28354. <https://www.osti.gov/servlets/purl/1488935>.

Cost Impact: The code change proposal will increase the cost of construction

The first cost of construction (including costs for appliance, equipment, and installation) is expected to increase by ~\$830 compared to an exhaust-only system. Based on PNNL's projected energy savings, this will be recovered quickly, within 4-6 years. Assuming the \$830 is financed in a traditional, 30-year mortgage at 4%, the annual energy savings of \$138-\$233 would generate \$90 - \$185 per year in cash flow for the home owner.

Proposal # 5673

RE139-19

RE140-19

IECC: R403.6.12 (IRC N1103.6.2) (New)

Proponent: Mike Moore, Newport Ventures, representing Broan-NuTone (mmoore@newportventures.net)

2018 International Energy Conservation Code

R403.6.1 (IRC N1103.6.1) Whole-house mechanical ventilation system fan efficacy. Fans used to provide whole-house mechanical ventilation shall meet the efficacy requirements of Table R403.6.1.

Exception: Where an air handler that is integral to tested and *listed* HVAC equipment is used to provide whole-house mechanical ventilation, the air handler shall be powered by an electronically commutated motor.

Add new text as follows:

R403.6.2 (IRC N1103.6.2) Testing. Whole-house mechanical ventilation systems and outdoor air mechanical ventilation systems shall be tested and verified to provide the minimum ventilation flow rates required by Section R403.6. Testing shall be performed according to the ventilation equipment manufacturer's instructions, or by using a flow hood, flow grid, or other airflow measuring device at the mechanical ventilation fan's inlet terminals or grilles, outlet terminals or grilles or in the connected ventilation ducts. Where required by the code official, testing shall be conducted by an approved third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the code official.

Reason: If installed incorrectly, whole-house mechanical ventilation systems can fail to deliver the minimum outdoor air needed to provide acceptable indoor air quality. A recent study in Florida* found that only three of 21 whole house mechanical ventilation systems had a flow rate near the design level. Because these systems perform a vital function in supporting building durability and occupant health, these systems should be verified for flow when installed. This requirement and text are aligned with ASHRAE 62.2, Ventilation and Acceptable Indoor Air Quality in Residential Buildings.

Bibliography: *Sonne et al. (2015). Investigation of the Effectiveness and Failure Rates of Whole-House Mechanical Ventilation Systems in Florida. FSEC-CR-2002-15.<http://www.fsec.ucf.edu/en/publications/pdf/FSEC-CR-2002-15.pdf>.

Cost Impact: The code change proposal will increase the cost of construction

Will increase the cost of construction where testing is not currently provided. Testing the airflow of a whole house mechanical ventilation system should take about 15-20 minutes. Assuming a skilled labor rate of \$35/hr, the incremental cost for the test is estimated at \$9-\$12. The test can be completed by the same technician performing the blower door test. Also, there is no requirement for a third party to conduct the test, which can help moderate costs.

Proposal # 5420

RE140-19

RE141-19

IECC: R403.6.2 (IRC N1103.6.3) (New)

Proponent: Aaron Gary, representing Self (aaron.gary@texenergy.org)

2018 International Energy Conservation Code

Add new text as follows:

R403.6.2 (IRC N1103.6.3) Testing (Mandatory) The fans used to provide whole-dwelling mechanical ventilation shall be tested according to the manufacturer's instructions or RESNET/ICC 380. Testing shall be conducted by an approved third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the code official.

Reason: Much blood has been spilled debating the appropriate amount of outdoor air that should be introduced into a dwelling via mechanical ventilation. While all this focus has been applied to the design calculations, much less has been turned to the actual air that is delivered by these systems. In my experience as a 3rd party verifier and HVAC contractor, the amount of air that is actually being delivered is as crucial as selecting the right design and equipment.

The commissioning of these systems is simply not required by Code and therefore it is not happening for a majority of Code dwellings. When more outdoor air is provided than intended it can overwhelm the right-sized (R403.7) heating and cooling equipment's ability to process this air. The impact is human comfort complaints, potential moisture issues in humid climates, and lost energy efficiency.

Further, 3rd party verification and testing of the mechanical ventilation system is already part of the ERI path through its inclusion in ANSI/RESNET/ICC 301. It is not required however in the Prescriptive or Performance paths.

Cost Impact: The code change proposal will increase the cost of construction

This proposal will increase the cost of construction for dwellings following the Prescriptive and Performance paths through the IECC not through additional or change in prodcut but by requiring additional testing similar to Air Leakage testing (R402.4) and Duct Leakage testing (R403.3.3). This proposal will not increase the cost of construction for dwellings following the ERI path through the IECC as this test is already mandatory under ANSI/RESNET/ICC 301.

Proposal # 5545

RE141-19

RE142-19

IECC: R403.6.2 (IRC N1103.6.2) (New)

Proponent: Darren Meyers, P.E., International Energy Conservation Consultants LLC, representing Self (dmeyers@ieccode.com)

2018 International Energy Conservation Code

Add new text as follows:

R403.6.2 (IRC N1103.6.2) Airflow measurement. The airflow rate required is the quantity of outdoor ventilation air supplied and/or indoor air exhausted by the whole-house mechanical ventilation system installed, and shall be measured using a calibrated flow hood, flow grid, or other airflow measuring device. Ventilation airflow of systems with multiple operating modes shall be tested in all modes of operation designed to meet Section R403.6. Where required by the code official, testing shall be conducted by an approved third party. A written report of the results of the test, indicating the verified airflow rate, shall be signed by the party conducting the test and provided to the code official.

Reason: The proposal adds a provision establishing the "measurement" of airflow associated with the central energy-using system of the home, its heating ventilation and air-conditioning system. The language, while derived from the provisions of ASHRAE Standard 62.2-2016, is written in useable, understandable and enforceable, mandatory language.

Bibliography: 2017a. "Kentucky Residential Energy Code Field Study: Baseline Report." Richland, WA: Pacific Northwest National Laboratory.
2018. "Improving Residential Energy Code Compliance in KY and GA." Chicago, IL: Midwest Energy Efficiency Partnership.

2014. "Evaluation of Illinois Baseline Building Code Compliance." Sacramento, CA: ADM Associates, Inc.

2014. "International Residential Code - Mechanical Ventilation as Required by Iowa 2012 IECC, Section 403.5." Des Moines, IA: Iowa Department of Public Safety State Fire Marshal Division.

2011. "Measuring a Baseline Compliance Rate for Residential and Non-Residential Buildings in Illinois Against the 2009 International Energy Conservation Code." Troy, IL: Association of Professional Energy Consultants, Inc.

Cost Impact: The code change proposal will increase the cost of construction

IECC_LLC has experience with the implementation training and technical support activities associated with State Energy Offices, State Fire Marshall's Offices and Departments of Housing, Buildings and Construction for 2009 and 2012 IECC adoptions in Iowa, the 2009 and 2012 IECC adoptions in Kentucky, the 2012, 2015 and 2018 adoptions in Illinois and more recently the 2015 and 2018 adoptions throughout the greater Nashville, TN metro community. In conducting these activities, it is common to solicit, discuss and evaluate the pricing structures available in the residential housing sector. The building diagnostic services discussed include a code-mandated blower door pressure test, a code-mandated duct pressure leakage test (pending location of ductwork), as well as services less commercialized in the residential housing sector; infrared thermography and HVAC ventilation system airflow validation. It is common that when a code mandated test is "bundled" with one of the other home diagnostic services these price points are discounted.

Proposal # 5575

RE142-19

RE143-19

IECC: R403.7 (IRC N1103.7), ACCA Chapter 6 (IRC Chapter 44)

Proponent: David Bixby, representing Air Conditioning Contractors of America

2018 International Energy Conservation Code

Revise as follows:

R403.7 (IRC N1103.7) Equipment sizing and efficiency rating (Mandatory). Heating and cooling equipment shall be sized in accordance with ACCA Manual S based on *building* loads calculated in accordance with ACCA Manual J or other *approved* heating and cooling calculation methodologies. New or replacement heating and cooling equipment shall have an efficiency rating equal to or greater than the minimum required by federal law for the geographic location where the equipment is installed. Minimum criteria for the proper design, equipment selection, installation, and commissioning of HVAC systems shall comply with ACCA 5 QI.

Add new standard(s) as follows:

ACCA

Air Conditioning Contractors of America
2800 Shirlington Road, Suite 300
Arlington, VA 22206

ANSI/ACCA 5 QI -2010: HVAC Quality Installation Specifications

Reason: ANSI/ACCA 5 QI Standard (*HVAC Quality Installation Specification*) covers the initial HVAC system design, including system sizing, equipment selection, duct sizing, start-up and commissioning. It was developed by a broad coalition of industry stakeholders and is available for free download (www.acca.org/quality).

In September 2014, the U.S. National Institute of Standards and Technology (NIST) published, "*Sensitivity Analysis of Installation Faults on Heat Pump Performance*." This report presents evidence that non-compliance with the ANSI/ACCA 5 QI Standard results in quantifiable increases in energy usage and operating costs. The NIST report demonstrated that the increased energy consumption can be greater than 50% when multiple deficiencies (e.g., duct leakage, low refrigerant charge, equipment oversizing, airflow, etc.) are encountered. While the industry focuses on equipment efficiency, the real efficiency of the system (installed efficiency) is determined by its proper design, installation, and commissioning.

The ACCA 5 QI Standard has been adopted by the Consortium for Energy Efficiency (CEE; a consortium of utilities with programmatic efforts in energy efficiency) as its definition for the minimum requirements for HVAC installations. In addition, the "*HVAC Commissioning Checklist*" for EPA Energy Star® certified homes, Green Building Communities, and HERS Rating is embodied in the requirements of the ANSI/ACCA 5 QI protocol, thereby insuring the performance of HVAC systems in new homes.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Cost of construction will be unaffected other than the extra time to properly design, size and install an HVAC system according to minimum industry accepted practices.

Proposal # 4813

RE143-19

RE144-19

IECC: R403.12 (IRC N1103.12)

Proponent: David Collins, SEHPCAC, representing SEHPCAC (SEHPCAC@iccsafe.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Energy Conservation Code

Revise as follows:

R403.12 (IRC N1103.12) Residential pools and permanent residential spas (Mandatory). Residential swimming pools and permanent residential spas that are accessory to detached one- and two-family dwellings and townhouses three stories or less in height above grade plane and that are available only to the household and its guests shall be in accordance with APSP 15.

Reason: This section provides a reference to a specific standard with no alternative provided. The section provides no metrics or values that can be used for calculations for trade-offs. Additionally, both R403.10 and R403.11, which address similar subjects, are labeled mandatory and there is no reason for this to be inconsistent.

Note, the SEHPCAC has a proposal to eliminate use of the labels "prescriptive" and "mandatory" in favor of a tabular method of identifying non-tradeable requirements. If that proposal is successful ICC staff have stated that sections being individually approved as "mandatory" will instead have their respective section numbers added to the new C407.2 table of requirements that are non-tradeable in the performance path.

This proposal is submitted by the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx> (<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>)

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This code change proposal does not add to nor detract from design or construction requirements.

Proposal # 4704

RE144-19

RE145-19

IECC: R202, R404.1, R404.2 (New)

Proponent: Lauren Urbaneck, representing Natural Resources Defense Council (lurbaneck@nrdc.org)

2018 International Energy Conservation Code

Add new definition as follows:

DIMMER. (IRC N1101.6). A control device that is capable of continuously varying the light output and energy use of light sources.

Revise as follows:

HIGH-EFFICACY LAMPS. (IRC N1101.6). Compact fluorescent lamps, light-emitting diode (LED) lamps, T-8 or smaller diameter linear fluorescent lamps, or other lamps Any lamps with an efficacy of not less than the following: 70 lumens per watt.

- ~~1. 1-60 lumens per watt for lamps over 40 watts.~~
- ~~2. 2-50 lumens per watt for lamps over 15 watts to 40 watts.~~
- ~~3. 3-40 lumens per watt for lamps 15 watts or less.~~

Add new definition as follows:

OCCUPANT SENSOR CONTROL. (IRC N1101.6). An automatic control device or system that detects the presence or absence of people within an area and causes lighting, equipment or appliances to be regulated accordingly.

Revise as follows:

R404.1 (IRC N1104.1) Lighting equipment (Mandatory). ~~Not less than 90 percent of the~~ All permanently installed lighting fixtures shall contain only high-efficacy lamps.

Add new text as follows:

R404.2 (IRC N1104.2) Lighting Controls (Mandatory). Permanently installed lighting fixtures shall be controlled with either a dimmer, an occupant sensor control, or other control that is installed or built into the fixture.

Exception: Lighting controls shall not be required for the following:

- Bathrooms
- Hallways
- Exterior lighting fixtures
- Lighting designed for safety or security

Reason: The purpose of this code change proposal is to increase lighting efficiency to better align with the current lighting market and upcoming changes to lighting standards.

DOE projects that light-emitting diode (LED) lighting will represent about half of the market share in 2020, and nearly 85% of the market share by 2030[1]. Goldman Sachs projects an even faster uptake of LEDs, projecting a full market penetration by the early 2020s[2]. The current definition of a “high efficacy lamp” in the energy code is outdated: it was added to the code in 2009, when LED market share was close to zero, and has not been updated since then. In fact, the definition no longer represents the “high efficacy” share of the market. New lighting standards will take effect in 2020 that will eliminate all bulbs on the market with efficiencies lower than 45 lumens per watt. Therefore, by the time the 2021 code is published, some of the bulbs currently defined by the IECC as “high efficacy” will be illegal to sell. Given these market and standard changes, the definition must be updated to remain relevant.

Once the updated federal standard takes effect, the baseline, least-efficient bulb on the market will no longer be an incandescent or even a halogen, but a compact fluorescent light bulb. In many cases, LEDs are close in price to – or even cheaper than - CFL alternatives while being a clearly superior product. CFLs contain mercury, are slow to come to full light, and few models are dimmable. In contrast, LEDs come in a wide range of light outputs, bulb shapes, color temperatures, socket types, do not contain mercury, and the vast majority of models are dimmable. Virtually all LEDs on the market today meet the 70 lumens per watt requirement specified in this proposal.

The table below summarizes a recent Home Depot search for a dimmable 60-watt equivalent bulb, one that gives off approximately 800 lumens of light. The LED bulb is significantly more efficient and longer-lasting than the CFL or halogen option. Recent searches found that sale prices of LED bulbs are often even lower than a halogen equivalent. Note that the CFL bulb is not dimmable; there was no equivalent dimmable CFL option. A separate search for dimmable CFL bulbs[3] shows that they are in the range of at least \$7 per bulb and not widely available. The halogen option will not be legal to sell starting January 1, 2020.

Lighting Technology	Brand	Cost per Bulb	Lumens Per Watt	Estimated Annual Energy Cost	Lifetime	Dimmable?
LED	Philips[4]	\$1.54 (sale price)	84	\$0.84	22 years	Yes
		\$3.08 (full price)				
CFL	EcoSmart[5]	\$1.49	64	\$1.69	9 years	No
Halogen	Westinghouse[6]	\$2.10	18.1	\$5.06	0.9 years	Yes

The proposal also requires lighting controls, in the form of either a dimmer, occupancy control, or other such control (such as an automatic daylight sensor). Both dimmers and occupancy controls will save even more energy. Dimmers can reduce energy use by about 20%, while occupancy sensors reduce wasted energy by around 30%[7]. These controls are essentially permanent, with an extremely long lifetime. Connected occupancy controls, such as those in use with a home automation system, can add value and convenience to homeowners, as well.

[1] U.S. Department of Energy Building Technologies Office. "Solid State Lighting." September 2014. Retrieved on January 10, 2019 from <https://www1.eere.energy.gov/buildings/publications/pdfs/ssl/energysavingsforecast14-summ.pdf>

[2] Goldman Sachs. "The Low Carbon Economy." November 28, 2016. Retrieved on January 10, 2019 from <https://www.goldmansachs.com/insights/pages/new-energy-landscape-folder/report-the-low-carbon-economy/report-2016.pdf>

[3] Home Depot (January 10, 2019). Retrieved from <https://www.homedepot.com/b/Lighting-Light-Bulbs-CFL-Bulbs/Dimmable/N-5yc1vZbmatZ1z0u4xv>

[4] Home Depot (January 10, 2019). Retrieved from <https://www.homedepot.com/p/Philips-60-Watt-Equivalent-A19-Dimmable-LED-ENERGY-STAR-Light-Bulb-Soft-White-with-Warm-Glow-4-Pack-479576/303967548>

[5] Home Depot (January 10, 2019). Retrieved from <https://www.homedepot.com/p/EcoSmart-60-Watt-Equivalent-Spiral-Non-Dimmable-CFL-Light-Bulb-Soft-White-4-Pack-ESBM8144/205487792>

[6] Home Depot (January 10, 2019). <https://www.homedepot.com/p/Westinghouse-42-Watt-Eco-Halogen-A19-Soft-White-Medium-Base-Light-Bulb-4-Pack-3687600/300620938>

[7] Powers, Alexis. "Congratulate Yourself on Achieving One Easy Energy-Saving Resolution." U.S. Department of Energy, Energy Saver blog. Retrieved on January 10, 2019 from <https://www.energy.gov/energysaver/articles/congratulate-yourself-achieving-one-easy-energy-saving-resolution>

Bibliography: [1] U.S. Department of Energy Building Technologies Office. "Solid State Lighting." September 2014. Retrieved on January 10, 2019 from <https://www1.eere.energy.gov/buildings/publications/pdfs/ssl/energysavingsforecast14-summ.pdf>

[2] Goldman Sachs. "The Low Carbon Economy." November 28, 2016. Retrieved on January 10, 2019 from <https://www.goldmansachs.com/insights/pages/new-energy-landscape-folder/report-the-low-carbon-economy/report-2016.pdf>

[3] Home Depot (January 10, 2019). Retrieved from <https://www.homedepot.com/b/Lighting-Light-Bulbs-CFL-Bulbs/Dimmable/N-5yc1vZbmatZ1z0u4xv>

[4] Home Depot (January 10, 2019). Retrieved from <https://www.homedepot.com/p/Philips-60-Watt-Equivalent-A19-Dimmable-LED-ENERGY-STAR-Light-Bulb-Soft-White-with-Warm-Glow-4-Pack-479576/303967548>

[5] Home Depot (January 10, 2019). Retrieved from <https://www.homedepot.com/p/EcoSmart-60-Watt-Equivalent-Spiral-Non-Dimmable-CFL-Light-Bulb-Soft-White-4-Pack-ESBM8144/205487792>

[6] Home Depot (January 10, 2019). <https://www.homedepot.com/p/Westinghouse-42-Watt-Eco-Halogen-A19-Soft-White-Medium-Base-Light-Bulb-4-Pack-3687600/300620938>

[7] Powers, Alexis. "Congratulate Yourself on Achieving One Easy Energy-Saving Resolution." U.S. Department of Energy, Energy Saver blog. Retrieved on January 10, 2019 from <https://www.energy.gov/energysaver/articles/congratulate-yourself-achieving-one-easy-energy-saving-resolution>

Cost Impact: The code change proposal will increase the cost of construction

This proposal will increase the cost of construction due to the increased cost of dimmer switches or occupancy controls. However, there is little, if any, incremental cost to move from CFL to LED bulbs even today, and the costs of this technology will continue to decrease. Given the change in technology and the improved federal standards, by the time the 2021 code is adopted, there may be no incremental cost to purchase a LED bulb.

RE146-19

IECC: R202 (IRC N1101.6), R404.2 (IRC N1104.2) (New), R404.2.1 (IRC N1104.2.1) (New), R404.2.2 (IRC N1104.2.2) (New)

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Add new definition as follows:

ELECTRIC VEHICLE. An automotive-type vehicle for on-road use, such as passenger automobiles, buses, trucks, vans, neighborhood electric vehicles, and electric motorcycles, primarily powered by an electric motor that draws current from a building electrical service, EVSE, a rechargeable storage battery, a fuel cell, a photovoltaic array, or another source of electric current.

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE). The conductors, including the ungrounded, grounded, and equipment grounding conductors, and the electric vehicle connectors, attachment plugs, and all other fittings, devices, power outlets, or apparatus installed specifically for the purpose of transferring energy between the premises wiring and the electric vehicle.

Add new text as follows:

R404.2 (IRC N1104.2) Electric vehicle ready parking (Mandatory). Where parking is provided, electric vehicle ready parking spaces shall be provided in compliance with Sections R404.2.1 and R404.2.2. Where more than one parking facility is provided on a site, electric vehicle ready parking spaces shall be calculated separately for each parking facility.

Exception: This section does not apply to parking spaces used exclusively for trucks or delivery vehicles.

R404.2.1 (IRC N1104.2.1) Electric vehicle ready parking spaces. Not less than two percent, but not less than one, parking spaces shall be electric vehicle ready parking and shall comply with Section R404.2.2.

Exception: Single-family and two-family dwelling units shall provide a not less than one electric vehicle ready parking space.

R404.2.2 (IRC N1104.2.2) Electric vehicle service equipment (EVSE) ready circuit. Each electric vehicle ready parking space shall be provided with a minimum 40-ampere branch circuit to accommodate a future dedicated Level 2 EVSE. The circuit shall terminate in a NEMA 6-50 or NEMA 14-50 receptacle or a suitable electrical connector rated for 240 volts or greater service. The circuit shall have no other outlets. The service panel shall provide sufficient capacity and space to accommodate the circuit and over-current protective device. A permanent and visible label stating "EV READY" shall be posted in a conspicuous place at both the service panel and the circuit termination point.

Reason: As of January 1, 2019, more than one million EVs are on U.S. roads. EEI and IEI estimate that the number of plug-in EVs will increase to about seven million by 2025. See EEI and IEI, "Plug-in Electric Vehicle Sales Forecast Through 2025 and the Charging Infrastructure Required," available at

[http://www.edisonfoundation.net/iei/publications/Documents/IEI_EEI%20PEV%20Sales%20and%20Infrastructure%20thru%202025_FINAL%20\(2\).pdf](http://www.edisonfoundation.net/iei/publications/Documents/IEI_EEI%20PEV%20Sales%20and%20Infrastructure%20thru%202025_FINAL%20(2).pdf).

BNEF and Energy Innovation have recently released projections that show accelerated growth in EVs as a percentage of new car sales beginning around the middle of the next decade. See BNEF, "Electric Vehicle Outlook: 2018," available at <https://bnef.turtl.co/story/evo2018?teaser=true>, and Energy Innovation, "The Future of Electric Vehicles in the U.S.," available at https://energyinnovation.org/wp-content/uploads/2017/10/2017-09-13-Future-of-EVs-Research-Note_FINAL.pdf. By 2040 BNEF estimates that EVs will account for 58% of all new car sales by 2040. See BNEF, "Electric Vehicles to Accelerate to 54% of New Car Sales by 2040," available at <https://about.bnef.com/blog/electric-vehicles-accelerate-54-new-car-sales-2040/>. A major driver of this steep EV sales trend will be a dramatic decrease in battery costs of more than 70 percent by 2030. See BNEF, "Electric Vehicle Outlook 2018."

The increase in EV sales will be accompanied by an increase in demand for on-site residential EV charging capacity. Up to 5.5 million chargers, which will be mostly installed in homes, will be required by 2025 to support a fleet of seven million EVs. See EEI and IEI, "Plug-in Electric Vehicle Sales Forecast Through 2025 and the Charging Infrastructure Required." In the near term this will likely involve the installation of Level 2 chargers, which require an additional 240-volt circuit. The cost of retrofitting a home to accommodate a Level 2 charger, which can recover the full range of a typical EV in 10 hours or less, will be a financial burden on homeowners. Adding a requirement for EV-ready parking spaces to the code will facilitate future Level 2 charger installations, which will eventually become practically ubiquitous, at a much lower cost.

Increased adoption of EVs will have a positive effect on overall U.S. household energy spending and carbon emissions. In terms of energy savings, EV fuel economy is, on average, more than three times more efficient than conventional gasoline-fueled counterparts. Even when compared over the full lifecycle of fuel production and use, the average EV consumes less than half the energy per vehicle mile traveled. See InsideEVs, "Efficiency Compared: Battery-Electric 73%, Hydrogen 22%, ICE 13%," available at <https://insideevs.com/efficiency-compared-battery-electric-73-hydrogen->

22-ice-13/, and Argonne National Laboratory, "Greenhouse Gases, Regulated Emissions, and Energy use in Transportation Model," available at <https://greet.es.anl.gov/index.php>. NRDC and EPRI found that if 50 percent of personal vehicle miles traveled were powered by electricity in 2050, the U.S. would realize annual emissions reductions of 550 million metric tons of carbon dioxide. See NRDC, "Study: Electric Vehicles Can Dramatically Reduce Carbon Pollution from Transportation, and Improve Air Quality," available at <https://www.nrdc.org/experts/luke-tonachel/study-electric-vehicles-can-dramatically-reduce-carbon-pollution>. The ideal solution would get this code change in place by the time adoption rates are expected to accelerate, which would help facilitate adoption of EVs and therefore lead to more efficient energy consumption and lower household carbon emissions.

Bibliography: Argonne National Laboratory, "Greenhouse Gases, Regulated Emissions, and Energy use in Transportation Model," available at <https://greet.es.anl.gov/index.php>. Last accessed January 9, 2019.

InsideEVs, "Efficiency Compared: Battery-Electric 73%, Hydrogen 22%, ICE 13%," October 2, 2017, available at <https://insideevs.com/efficiency-compared-battery-electric-73-hydrogen-22-ice-13/>. Last accessed January 9, 2019.

Bloomberg New Energy Finance, "Electric Vehicle Outlook: 2018," available at <https://bnef.turtl.co/story/evo2018?teaser=true>. Last accessed January 9, 2019.

Bloomberg New Energy Finance, "Electric Vehicles to Accelerate to 54% of New Car Sales by 2040," July 6, 2017, available at <https://about.bnef.com/blog/electric-vehicles-accelerate-54-new-car-sales-2040/>. Last accessed January 9, 2019.

Edison Electric Institute and Institute for Electric Innovation, "Plug-in Electric Vehicle Sales Forecast Through 2025 and the Charging Infrastructure Required," June 2017, pgs. 1 and 9, available at [http://www.edisonfoundation.net/iei/publications/Documents/IEI_EEI%20PEV%20Sales%20and%20Infrastructure%20thru%202025_FINAL%20\(2\).pdf](http://www.edisonfoundation.net/iei/publications/Documents/IEI_EEI%20PEV%20Sales%20and%20Infrastructure%20thru%202025_FINAL%20(2).pdf). Last accessed January 9, 2019.

Energy Innovation, "The Future of Electric Vehicles in the U.S.," September 27, 2017, pg. 3, available at https://energyinnovation.org/wp-content/uploads/2017/10/2017-09-13-Future-of-EVs-Research-Note_FINAL.pdf. Last accessed January 9, 2019.

NRDC, "Study: Electric Vehicles Can Dramatically Reduce Carbon Pollution from Transportation, and Improve Air Quality," available at <https://www.nrdc.org/experts/luke-tonachel/study-electric-vehicles-can-dramatically-reduce-carbon-pollution>. Last accessed January 9, 2019.

Realtor.com, "Electric Car Charger Installation in Your Home: True Costs—and What You Need to Know," November 2, 2017, available at <https://www.realtor.com/advice/home-improvement/installing-electric-vehicle-charger/>. Last accessed January 9, 2019.

Cost Impact: The code change proposal will increase the cost of construction

The additional branch circuit and associated wiring and conduit required to make parking spaces EV-ready will incrementally increase the cost of construction. But the cost of a retrofit to add the electrical panel capacity for a common Level 2 charger will be much higher—up to \$2,000. See Realtor.com, "Electric Car Charger Installation in Your Home: True Costs—and What You Need to Know," available at <https://www.realtor.com/advice/home-improvement/installing-electric-vehicle-charger/>.

Proposal # 5228

RE146-19

RE147-19

IECC: R404.2 (IRC N1104.2) (New), R404.2.1 (IRC N1104.2.1) (New), R404.2.2 (IRC N1104.2.2) (New), R404.2.3 (IRC N1104.2.3) (New)

Proponent: Lauren Urbanek, representing Natural Resources Defense Council (lurbanek@nrdc.org)

2018 International Energy Conservation Code

Add new text as follows:

R404.2 (IRC N1104.2) Electric readiness (Mandatory) Systems using gas or propane water heaters, dryers, or conventional cooking equipment to serve individual dwelling units shall comply with the requirements of Sections R404.2.1 and R404.2.2. All water heating systems shall comply with Section R404.2.3.

R404.2.1 (IRC N1104.2.1) Receptacle. A dedicated 125-volt, 20-amp electrical receptacle that is connected to the electric panel with a 120/240 volt 3 conductor, 10 AWG copper branch circuit, shall be provided within 3 feet from each gas or propane water heater, dryer, and conventional cooking equipment, accessible with no obstructions.

R404.2.2 (IRC N1104.2.2) Electrification-ready circuits. Both ends of the unused conductors shall be labeled with the word "SPARE" and be electrically isolated. A single pole circuit breaker space shall be reserved in the electrical panel adjacent to each circuit breaker for the branch circuit and labeled with the words "FUTURE 240V USE."

R404.2.3 (IRC N1104.2.3) Water heater space. An indoor space that is at least 3 feet by 3 feet by 7 feet high shall be available within 3 feet of the water heater.

Exception: The water heater space requirement does not need to be met where a heat pump water heater is installed.

Reason: This proposal enhances customer choice by making it easy for homeowners to choose either electric or gas appliances and water heating equipment. By ensuring that a home built with gas or propane can easily accommodate future electric appliances and equipment, this proposal protects homeowners from future costs, should natural gas become less affordable or even unavailable over the life of the building.

As the electric grid becomes cleaner, and high-efficiency electric heat pump technology increasingly offers utility bill and pollution reduction benefits over gas, more customers may want to transition from natural gas to electric space and water heating. Federal, state, and local environmental and public health policies may also encourage, or even require the transition in some areas over the life of the building. Electric-ready requirements will protect customers from potential high retrofit costs.

Cost Impact: The code change proposal will increase the cost of construction

The cost of meeting these electric-ready requirements when the house is being built, walls are open, and the trades are already on-site, is marginal. In comparison, the cost of retrofitting a building for these requirements can be orders of magnitude higher and act as a barrier for the homeowner to choose electric appliances. Not making new buildings electric-ready would leave homeowners exposed to potentially high retrofit costs in the future and will greatly inhibit customer choice.

Proposal # 5253

RE147-19

RE148-19

IECC: R404.1.1 (IRC N1104.1.1) (New)

Proponent: Eric Makela, representing New Buildings Institute (ericm@newbuildings.org)

2018 International Energy Conservation Code

Add new text as follows:

R404.1.1 (IRC N1104.1.1) Exterior lighting. Connected exterior lighting for Group R-2, R-3 and R-4 buildings shall comply with Section C405.4 of the International Energy Conservation Code—Commercial Provisions.

Exceptions:

1. Solar-powered lamps not connected to any electrical service.
2. Luminaires controlled by a motion sensors.

Reason: The IECC does not have any specific requirements for exterior lighting for residential buildings. This may not be a significant issue for single-family homes, duplexes and townhomes, but it is quite significant for Type-R occupancies like multifamily that are far more likely to have parking lots and other exterior lighting like their counterparts subject to the commercial code. A 4-story multifamily building with exactly the same systems and layout would therefore be subject to exterior lighting requirements while a 3-story variation would not. This creates a loophole in the code for low-rise R-occupancies.

This proposal directs exterior lighting for these occupancies to the commercial code and its LPD requirements. Small R-occupancy buildings are little different than small commercial buildings which are already subject to those requirements. The proposal exempts solar-powered lighting and any lighting controlled by a motion sensor.

When applied to the low-rise multifamily prototype developed by Pacific Northwest National Laboratories for the code determination studies, this requirement saved up to 0.5% (based on climate zone) whole building energy over the 2015 IECC. Since both 2018 and 2015 lack exterior lighting requirements, this is a reasonable approximation of savings.

Cost Impact: The code change proposal will increase the cost of construction

This will increase the cost of construction. However, the proposal refers only R-occupancies to the existing commercial exterior lighting requirements, which already cover smaller commercial buildings.

For example, a base light fixture cost for a 70 W halogen fixture is \$118 .00 (<https://www.lightingsupply.com/stonco-sla71mal-6>) and the cost for an enhanced 80 W LED light fixture that will meet the proposed efficacy requirements is \$158.33 (<https://www.lightingsupply.com/best-lighting-products-ledmpal80-t-5k>)

Proposal # 5187

RE148-19

RE149-19

IECC: R404.2 (IRC N1104.2) (New)

Proponent: Marilyn Williams, representing National Electrical Manufacturers Association (mar_williams@nema.org)

2018 International Energy Conservation Code

Add new text as follows:

R404.2 (IRC N1104.2) Exterior lighting controls Where the total permanently installed Exterior lighting power is greater than 30 watts, the exterior lighting permanently mounted to a residential building, or to other buildings on the same lot, shall comply with the following:

1. Lighting shall be controlled by a manual on and off switch which permits automatic shut off actions.
2. Lighting shall automatically turn off when daylight is present during the daytime and satisfies the lighting needs.
3. Lighting shall automatically turn off by time-switch control or when activity has not been detected for 15 minutes or more.
4. Controls that override automatic shut off actions shall not be allowed unless the override automatically returns automatic control to its normal operation within six twenty-four hours.

Reason: The increase in construction cost is due to the addition of a simple photocell or use of exterior lighting fixtures with integral photocell. These are inexpensive and readily available in many options at retailers and electrical distributors. Photocell costs are often under \$10. Exterior light fixtures with integral photocell (and often including a motion detector), are available for a total packaged cost from the sub \$20 range, up to many times this cost based the fixture style, grade and aesthetics. The added cost of the controls is typically minimal, or an inseparable option included with the exterior lighting fixture altogether. The 2014 CEE report "Lighting Controls Market Characterization Report", identifies the use of a photosensor or timer can save, on the average, 15 up to 60KWh per year, based on the efficacy of the light source that is controlled.

Cost Impact: The code change proposal will increase the cost of construction

The increase in construction cost is due to the addition of a simple photocell or use of exterior lighting fixtures with integral photocell. These are inexpensive and readily available in many options at retailers and electrical distributors. Photocell costs are often under \$10. Exterior light fixtures with integral photocell (and often including a motion detector), are available for a total packaged cost from the sub \$20 range, up to many times this cost based the fixture style, grade and aesthetics. The added cost of the controls is typically minimal, or an inseparable option included with the exterior lighting fixture altogether. The 2014 CEE report "Lighting Controls Market Characterization Report", identifies the use of a photosensor or timer can save, on the average, 15 up to 60KWh per year, based on the efficacy of the light source that is controlled.

Proposal # 4434

RE149-19

RE150-19

IECC: R406.2 (IRC N1106.2)

Proponent: Joel Martell, representing National Association of Home Builders (jmartell@nahb.org)

2018 International Energy Conservation Code

Revise as follows:

R406.2 (IRC N1106.2) Mandatory requirements. Compliance with this section requires that the provisions identified in Sections R401 through R404 indicated as "Mandatory" and Section R403.5.3 be met. The proposed total building thermal envelope UA which is sum of U-factor times assembly area shall be ~~greater~~ less than or equal to the building thermal envelope UA using the prescriptive U-factors from Table R402.1.2 multiplied by 1.15 in accordance with Equation 4-1, levels of efficiency and Solar Heat Gain Coefficients in Table 402.1.1 or 402.1.3 of the 2009 International Energy Conservation Code.

Exception: Supply and return ducts not completely inside the *building thermal envelope* shall be insulated to ~~an~~ a R-value of not less than R-6.

$$UA_{\text{Proposed design}} = 1.15 \times UA_{\text{Prescriptive reference design}} \text{ Equation 4-1}$$

Reason: This proposal increases the flexibility of the thermal envelope minimums that are part of the ERI compliance path mandatory requirements. The minimum thermal envelope requirements are that of the 2009 IECC prescriptive table. While this could be considered a reasonable "backstop", the flexibility it offers is minimal; for example both the 2009 and 2018 IECC require R-20 walls in climate zone 5 and because the 2009 IECC is the minimum, there is no ability to trade off wall insulation in climate zone 5, but wall insulation can be traded off in zones 3,4, 7 & 8 since the wall insulation requirements increased from the 2009. This proposal preserves this "reasonable envelope" concept and applies it to the ERI, but, rather than pointing to the prescriptive tables in a previous version of the IECC, the thermal backstop becomes a percent UA trade-off. The UA calculation will be performed internally with the compliance software and will not require any additional information to be entered as all the necessary information is already entered (component area and Ufactors/ R-values). This should not be problematic as it is already done for windows. This 15% will prevent installing single pane windows and significant reductions in the building envelope components.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The increased flexibility offered by this proposal will provide an opportunity for builders and designers to cost optimize an efficient home and potentially reduce the cost of construction.

Proposal # 4294

RE150-19

RE151-19

IECC: R405.2 (IRC N1105.2) , ICC Chapter 6 (IRC Chapter 44)

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

R405.2 (IRC N1105.2) Mandatory requirements. Compliance with this section requires that the mandatory provisions identified in Section R401.2 be met. The building thermal envelope shall be greater than or equal to levels of efficiency and Solar Heat Gain Coefficients in Table R402.1.1 or R402.1.3 of the 2009 International Energy Conservation Code. Supply and return ducts not completely inside the *building thermal envelope* shall be insulated to an *R*-value of not less than R-6.

Add new text as follows:

ICC

International Code Council, Inc.
500 New Jersey Avenue NW 6th Floor
Washington DC 20001

IECC-2009: International Energy Conservation Code

Reason: The purpose of this code change is to help ensure long-term energy savings and occupant comfort by applying a reasonable, consistent minimum mandatory thermal envelope backstop across the IECC's two performance-based compliance paths. Since 2015, the newest IECC compliance path, the Energy Rating Index (R406), has already included a minimum mandatory thermal envelope backstop based on the 2009 IECC prescriptive requirements. While a minimum backstop is most important for the ERI, it would also be useful if applied to the simulated performance alternative in Section R405. This proposal will accomplish this objective.

An important part of the logic behind the minimum thermal envelope requirements for the ERI applies to the performance path in Section R405 as well -- a well-built thermal envelope provides long-term energy savings and improved comfort for occupants over the lifetime of the home, and upgrades to the thermal envelope are easiest to incorporate (and most cost-effective) at construction. This is consistent with the intent of the IECC set forth in Section R101.3. Specifically, the IECC is intended to "regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building." Regardless of the compliance option selected by the code user, the IECC should require a reasonable minimum level of performance by the home's permanent thermal envelope. As a result, this proposal would apply the same minimum mandatory requirements, including envelope requirements, to Section R405 compliance as currently apply to Section R406 compliance.

To our knowledge, the 2009 IECC backstop in Section R406.2 has been adopted by every state that has adopted the ERI as part of the 2015 or 2018 IECC. A trade-off backstop recognizes the crucial importance of a reasonably efficient thermal envelope, irrespective of the efficiency tradeoffs among various other building components. While we would prefer an even more robust backstop than the 2009 prescriptive requirements (such as the 2015 requirements, which were established in 2018 for ERI compliance that includes on-site generation), the 2009 requirements are at least a reasonable starting place and are consistent with the current backstop for ERI.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

Because this proposal only establishes a trade-off backstop to an alternative compliance path and not a prescriptive code requirement (the prescriptive requirements are already much more efficient than the proposed new backstop levels), and because most homebuilders are likely already meeting or exceeding these requirements, we conclude that there will not necessarily be any cost impact.

Proposal # 3988

RE151-19

RE152-19

IECC: R405.1 (IRC N1105.1), TABLE R405.5.2(1) [IRC N1105.5.2(1)]

Proponent: Craig Conner, representing self (craig.conner@mac.com); Maston Stafford, representing Self (maston.stafford@texenergy.org); Joseph Lstiburek, representing self (joe@buildingsscience.com); Aaron Gary, representing Self (aaron.gary@texenergy.org)

2018 International Energy Conservation Code

Revise as follows:

R405.1 (IRC N1105.1) Scope. This section establishes criteria for compliance using simulated energy performance analysis. ~~Such analysis shall include heating, cooling, mechanical ventilation and service water heating energy only. Devices or practices for which no credit is claimed and devices which are not installed shall not increase or decrease the proposed design energy use.~~

**TABLE R405.5.2(1) [IRC N1105.5.2(1)]
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Above-grade walls	Type: mass, where the proposed wall is a mass wall; otherwise, wood frame.	As proposed
	Gross area: same as proposed.	As proposed
	U-factor: as specified in Table R402.1.4.	As proposed
	Solar absorptance = 0.75.	As proposed
	Emittance = 0.90.	As proposed
Basement and crawl space walls	Type: same as proposed.	As proposed
	Gross area: same as proposed.	As proposed
	U-factor: as specified in Table R402.1.4, with the insulation layer on the interior side of the walls.	As proposed
Above-grade floors	Type: wood frame.	As proposed
	Gross area: same as proposed.	As proposed
	U-factor: as specified in Table R402.1.4.	As proposed
Ceilings	Type: wood frame.	As proposed
	Gross area: same as proposed.	As proposed
	U-factor: as specified in Table R402.1.4.	As proposed
Roofs	Type: composition shingle on wood sheathing.	As proposed
	Gross area: same as proposed.	As proposed
	Solar absorptance = 0.75.	As proposed
	Emittance = 0.90.	As proposed
Attics	Type: vented with an aperture of 1 ft ² per 300 ft ² of ceiling area.	As proposed
Foundations	Type: same as proposed.	As proposed
	Foundation wall area above and below grade and soil characteristics: same as proposed.	As proposed
Opaque doors	Area: 40 ft ² .	As proposed
	Orientation: North.	As proposed
	U-factor: same as fenestration as specified Table R402.1.4.	As proposed
Vertical	Total area ^h = (a) The proposed glazing area, where the proposed glazing area is less than 15 percent of the conditioned floor area (b) 15 percent of the conditioned floor area, where the proposed glazing area is 15 percent or more of the conditioned floor area.	As proposed

fenestration other than opaque doors	Orientation: equally distributed to four cardinal compass orientations (N, E, S & W).	As proposed
	U-factor: as specified in Table R402.1.4.	As proposed
	SHGC: as specified in Table R402.1.2 except for climate zones without an SHGC requirement, the SHGC shall be equal to 0.40.	As proposed
	Interior shade fraction: 0.92-(0.21 × SHGC for the standard reference design).	Interior shade fraction: 0.92-(0.21 × SHGC as proposed)
	External shading: none.	As proposed
Skylights	None.	As proposed
Thermally isolated sunrooms	None.	As proposed
Air exchange rate	<p>The air leakage rate at a pressure of 0.2 inch w.g. (50 Pa) shall be Climate Zones 1 and 2: 5 air changes per hour. Climate Zones 3 through 8: 3 air changes per hour.</p> <p>The mechanical ventilation rate shall be in addition to the air leakage rate and shall be the same as in the proposed design, but not greater than $0.01 \times CFA + 7.5 \times (N_{br} + 1)$</p> <p>where:</p> <p>CFA = conditioned floor area, ft².</p> <p>N_{br} = number of bedrooms.</p> <p>Energy recovery shall not be assumed for mechanical ventilation.</p>	<p>The measured air exchange rate.^a</p> <p>The mechanical ventilation rate^b shall be in addition to the air leakage rate and shall be as proposed.</p>
Mechanical ventilation	<p>Where mechanical ventilation is not specified in the proposed design: None</p> <p>Where mechanical ventilation is specified in the proposed design, the annual vent fan energy use, in units of kWh/yr, shall equal:</p> $(U_{ef}) \times [0.0876 \times CFA + 65.7 \times (N_{br} + 1)]$ <p>where:</p> <p>e_f = the minimum exhaust fan efficacy, as specified in Table R403.6.1, corresponding to a flow rate of $0.01 \times CFA + 7.5 \times (N_{br} + 1)$</p> <p>CFA = conditioned floor area, ft².</p> <p>N_{br} = number of bedrooms.</p>	As proposed
Internal gains	<p>IGain, in units of Btu/day per dwelling unit, shall equal: $17,900 + 23.8 \times CFA + 4,104 \times N_{br}$</p> <p>where:</p> <p>CFA = conditioned floor area, ft².</p> <p>N_{br} = number of bedrooms.</p>	Same as standard reference design.
Internal mass	Internal mass for furniture and contents: 8 pounds per square foot of floor area.	Same as standard reference design, plus any additional mass specifically designed as a thermal storage element ^c but not integral to the building envelope or structure.
Structural mass	For masonry floor slabs: 80 percent of floor area covered by R-2 carpet and pad, and 20 percent of floor directly exposed to room air.	As proposed
	For masonry basement walls: as proposed, but with insulation as specified in Table R402.1.4, located on the interior side of the walls.	As proposed
	For other walls, ceilings, floors, and interior walls: wood frame construction.	As proposed

Heating systems ^{d, e}	For other than electric heating without a heat pump: as proposed. Where the proposed design utilizes electric heating without a heat pump, the standard reference design shall be an air source heat pump meeting the requirements of Section C403 of the IECC—Commercial Provisions. Capacity: sized in accordance with Section R403.7.	As proposed
Cooling systems ^{d, f}	As proposed. Capacity: sized in accordance with Section R403.7.	As proposed
Service water heating ^{d, e, f, g}	As proposed. Use: same as proposed design.	As proposed Use, in units of gal/day = $30 + (10 \times N_{br})$ where: N_{br} = number of bedrooms.
Thermal distribution systems	Duct insulation: in accordance with Section R403.3.1. A thermal distribution system efficiency (DSE) of 0.88 shall be applied to both the heating and cooling system efficiencies for all systems other than tested duct systems. Exception: For nonducted heating and cooling systems that do not have a fan, the standard reference design thermal distribution system efficiency (DSE) shall be 1. For tested duct systems, the leakage rate shall be 4 cfm (113.3 L/min) per 100 ft ² (9.29 m ²) of conditioned floor area at a pressure of differential of 0.1 inch w.g. (25 Pa).	Duct insulation: as proposed. As tested or, where not tested, as specified in Table R405.5.2(2)
Thermostat	Type: Manual, cooling temperature setpoint = 75° F; heating temperature setpoint = 72° F.	Same as standard reference design.
Lighting ⁱ	$kWh/year = 0.61 \text{ w/ft}^2 \times CFA$ <u>Lighting power density (LPD) = 0.61 w/ft²</u> CFA = Conditioned floor area (ft ²)	<u>Same or</u> <u>kWh/year = 1 kWh per installed watt</u> <u>LPD w/ft² = as proposed</u>
Refrigerator ⁱ	<u>650 kWh / year</u>	Same, or As proposed <u>kWh/year</u>
Clothes Washer ^k	<u>500 kWh / year</u>	<u>Same or</u> <u>As proposed kWh/year</u>
Dishwasher ^l	<u>300 kWh / year</u>	<u>Same or</u> <u>As proposed kWh/year</u>
Drain Water Heat Recovery ^m	<u>No drain water heat recovery</u>	<u>Same or</u> <u>Service water heating reduced by 25% of drain water heater efficiency</u>
Ventilation ⁿ	<u>No balanced ventilation</u>	<u>Same or</u> <u>30% reduction in required rate with balanced ventilation per IRC Section 1505</u>
Heat Recovery ^o	<u>No heat recovery</u>	<u>Same or</u> <u>% heat recovery as reported by manufacturer</u>

Onsite Renewables ²	<u>No onsite renewables.</u>	<u>Same or Onsite renewables shall reduce the proposed design energy use.</u>
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For SI: 1 square foot = 0.93 m², 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m², 1 gallon (US) = 3.785 L,

°C = (°F-32)/1.8, 1 degree = 0.79 rad.

- a. Where required by the *code official*, testing shall be conducted by an *approved party*. Hourly calculations as specified in the ASHRAE *Handbook of Fundamentals*, or the equivalent, shall be used to determine the energy loads resulting from infiltration.
- b. The combined air exchange rate for infiltration and mechanical ventilation shall be determined in accordance with Equation 43 of 2001 ASHRAE *Handbook of Fundamentals*, page 26.24 and the "Whole-house Ventilation" provisions of 2001 ASHRAE *Handbook of Fundamentals*, page 26.19 for intermittent mechanical ventilation.
- c. Thermal storage element shall mean a component that is not part of the floors, walls or ceilings that is part of a passive solar system, and that provides thermal storage such as enclosed water columns, rock beds, or phase-change containers. A thermal storage element shall be in the same room as fenestration that faces within 15 degrees (0.26 rad) of true south, or shall be connected to such a room with pipes or ducts that allow the element to be actively charged.
- d. For a proposed design with multiple heating, cooling or water heating systems using different fuel types, the applicable standard reference design system capacities and fuel types shall be weighted in accordance with their respective loads as calculated by accepted engineering practice for each equipment and fuel type present.
- e. For a proposed design without a proposed heating system, a heating system having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and proposed design.
- f. For a proposed design home without a proposed cooling system, an electric air conditioner having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and the proposed design.
- g. For a proposed design with a nonstorage-type water heater, a 40-gallon storage-type water heater having the prevailing federal minimum energy factor for the same fuel as the predominant heating fuel type shall be assumed. For a proposed design without a proposed water heater, a 40-gallon storage-type water heater having the prevailing federal minimum efficiency for the same fuel as the predominant heating fuel type shall be assumed for both the proposed design and standard reference design.
- h. For residences with conditioned basements, R-2 and R-4 residences, and for townhouses, the following formula shall be used to determine glazing area:

$$AF = A_s \times FA \times F$$

where:

AF = Total glazing area.

A_s = Standard reference design total glazing area.

FA = (Above-grade thermal boundary gross wall area)/(above-grade boundary wall area + 0.5 × below-grade boundary wall area).

F = (above-grade thermal boundary wall area)/(above-grade thermal boundary wall area + common wall area) or 0.56, whichever is greater, and where:

Thermal boundary wall is any wall that separates conditioned space from unconditioned space or ambient conditions. Above-grade thermal boundary wall is any thermal boundary wall component not in contact with soil. Below-grade boundary wall is any thermal boundary wall in soil contact. Common wall area is the area of walls shared with an adjoining dwelling unit.

L and CFA are in the same units.

i. **Lighting verification** .For installed lighting a fixture/lamp schedule for the watts by room shall be provided for the interior lighting. Lighting schedule shall be summed to compute the total proposed watts.

j. **Refrigerator verification** . The annual kWhr of refrigerators shall be as specified by the EnergyGuide label" with Subpart C, U.S. 16 CFR 305

(Effective January 1, 2021).. Where there are multiple refrigerators, the annual kWhr shall be summed.

k. **Clothes washer verification.** The annual kWhr of clothes washers shall be as specified by the EnergyGuide label" with Subpart C. U.S. 16 CFR 305 (Effective January 1, 2021). Where there are multiple clothes washers, the highest kWhr shall be used.

l. **Dishwasher verification.** The annual kWhr of dishwashers shall be as specified by the EnergyGuide label" with Subpart C. U.S. 16 CFR 305 (Effective January 1, 2021). Where there are multiple dishwashers, the highest kWhr shall be used.

m. **Drain water heat recovery.** Drain water heat recovery unit efficiency shall be in accordance with Section R403.5.4 This credit shall require a drain water heat recovery unit be installed on all showers.

n. **Balanced ventilation verification .** Ventilation shall be in accordance with IRC 1505 which allows a 30% reduction in ventilation rate. To receive this credit exhaust-only bath fans shall be on a 20-minute timer or other device that shuts off the bath fan when not in use.

o. **Heat recovery verification .** Heat recovery ventilation or energy recovery ventilation shall be a reduction in energy use as specified by the manufacturer.

p. **On-site renewables verification.** Energy from on-site renewables shall be a reduction in the residence's energy use based on an approved calculation of on-site renewable energy production.

Reason: This code change proposal expands the performance calculation to include additional options for energy savings. In all cases these options are neutral if not taken, but offer credits if taken. This change specifies efficiency measures in a way that makes them enforceable. Multiple jurisdictions reduce specific IECC/IRC energy requirements because those requirements seem difficult for some situations. For example air tightness and specific insulation levels are reduced in many jurisdictions. This code change gives the code user new options to increase energy efficiency in one area to compensate for another area.

The options in this proposal were picked because they have significant impact, can be specified in simple terms, and can be specified based on existing tests or standards. The performance section user can use or not use any of these options. Options not used do not affect the performance calculation, because the standard reference design and the proposed design become the same.

The ERI already includes the items listed here. The performance calculation should also include those items.

Several measures of efficiency in this change are based on existing tests or labels. Clothes washer, refrigerator and dishwasher annual energy use is on the federally required label. These are the yellow Energy Guide labels.

Lighting:

Lighting power density (LPD) is a concept usually applied to commercial spaces. The LPD for the reference design was selected based on Table C405.3.2.1 in the commercial IECC. The reference design (base case) of 0.61 was the lowest LPD from several that were similar to residential space. The similar values were "Dormitory" at 0.61; "Multifamily" at 0.68; and "Hotel/Motel" is 0.75.

The proposed lighting annual energy use is calculated as hours of use times watts. An average use of 1000 hours per year (2.74 hours per day) is within the reported range for actual light use and is presumed. Based on this use per day the proposed lighting annual energy use is simply 1 kWh per watt of installed lighting.

Lighting wattage will need to be verifiable, as lighting savings are based on the watts of installed lighting. Code officials are unlikely to have the time to count watts in a house. A list of lighting by room would give enough detail to spot check one or more rooms in a house.

Refrigerator, Clothes Washer, and Dishwasher:

These appliances all required to have EnergyGuide labels by federal law. The EnergyGuide labels all have kWhr/year on the label.

Drain water heat recovery:

The drain water heat recover applies to showers. Showers average over 25% of the service hot water use in homes. The devices recover heat from water going down the drain water and use it to preheat the incoming water. The heat recovery of a unit is rated by tests in CSA B55.1, which is already required in the code. (Section R403.5.4).

Ventilation:

Balanced ventilation performs better, requires less ventilation and uses less energy. Approved group A code changes (M22 and RM22) specified

that balanced ventilation required 30% less ventilation, hence the 30% reduction in the performance calculation.

Overall, this proposed change allows residences to achieve the energy efficiency in the IECC/IRC in a variety of ways. It comes with the philosophy that the goal is to reduce energy use. However, there are many ways to achieve that energy efficiency and the code user should be given the flexibility to choose how to achieve energy efficiency.

The performance calculation should also account for heating, cooling, and water heating equipment efficiency. A separate change restores the performance calculation credit for higher efficiency heating, cooling and water heating equipment.

Reference standard.

Subpart C, U.S. 16 CFR 305 (Effective January 1, 2021).

The proposed lighting energy use is calculated as hours of use times watts. An average use of 1000 hours per year (2.75 hours per day) is within the reported range for actual light use and is presumed. The proposed lighting annual energy use is simply 1 kWh per watt of installed lighting.

Lighting wattage will need to be verifiable, as lighting savings are based on the watts of installed lighting. Code officials are unlikely to have the time to count watts in a house. A list of lighting by room would give enough detail to spot check one or more rooms in a house.

Refrigerator:

This will favor, but not require, refrigerators without through the door ice, with freezer on the top rather than side-to-side. These refrigerators use less energy.

Equipment verification:

One big issue with having options for more efficient equipment and devices is inspection and verification. The efficiency used must be easy to verify.

Overall, this proposed change allows residences to achieve the energy efficiency in the IECC/IRC in a variety of ways. It comes with the philosophy that the goal is to reduce energy use. However, there are many ways to achieve that energy efficiency and the code user should be given the flexibility to choose how to achieve energy efficiency.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This will offer options for achieving efficient homes. If anything options typically decrease costs.

Proposal # 5521

RE152-19

RE153-19

IECC: R405.3

Proponent: Ted Williams, representing American Gas Association (twilliams@aga.org)

2018 International Energy Conservation Code

Revise as follows:

R405.3 (IRC N1105.3) Performance-based compliance. Compliance based on simulated energy performance requires that a proposed residence (*proposed design*) be shown to have an annual energy cost that is less than or equal to the annual energy cost of the *standard reference design*. Energy prices shall be taken from a source *approved* by the *code official*, such as the Department of Energy, Energy Information Administration's State Energy Data System Prices and Expenditures reports. *Code officials* shall be permitted to require time-of-use pricing in energy cost calculations.

Exception: The energy use based on source energy expressed in Btu or Btu per square foot of *conditioned floor area* shall be ~~permitted to be substituted for the energy cost. The source energy multiplier for electricity shall be 3.16. The source energy multiplier 3.16 for electricity and 1.1 for fuels other than electricity shall be 1.1.~~ or other multipliers for national or regional annual average energy consumption from nationally-recognized and validated data sources.

Reason: The proposed change is consistent with the proposed change to C407.3 and is based upon the source energy metric usage in Federal energy programs including Energy Star for Commercial Buildings and Home Energy Score. This revised exception provides the only means of assessing energy performance on fuel cycle energy consumption and ultimately carbon footprints since site energy metrics alone cannot account for these upstream energy system losses. In addition, the allowance in the proposed exception language for use of "other multipliers" addresses a persistent criticism of national average multipliers, which do not reflect regional or local mixes of renewable energy in meeting building demands, and encourages authorities having jurisdiction to use locally-relevant multipliers that are available from utilities and other sources. Also, greater usefulness of the exception is critical since the basic requirements of R405.3 focusing on energy cost is not consistent with the intent of the IECC as stated in R101.3, which addresses energy use and conservation, not energy cost.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal would not increase the cost of construction since the proposal is for changes to an exception. If the use of source energy metrics allows more alternatives for achieving energy performance improvements, it may decrease construction costs ultimately.

Proposal # 5579

RE153-19

RE154-19

IECC: R405.3 (New), TABLE R405.3.1 [IRC N1105.3.1] (New)

Proponent: Steven Rosenstock, Edison Electric Institute, representing Edison Electric Institute (srosenstock@eei.org); Keith Dennis, representing NRECA (keith.dennis@nreca.coop)

2018 International Energy Conservation Code

Add new text as follows:

R405.3 (IRC N1105.3) Performance-based compliance. Compliance based on simulated energy performance requires that a proposed residence (*proposed design*) be shown to have an annual energy cost that is less than or equal to the annual energy cost of the *standard reference design*. Energy prices shall be taken from a source *approved by the code official*, such as the Department of Energy, Energy Information Administration's State Energy Data System Prices and Expenditures reports. *Code officials* shall be permitted to require time-of-use pricing in energy cost calculations.

Exception: The energy use based on site energy or source energy expressed in Btu or Btu per square foot of *conditioned floor area* shall be permitted to be substituted for the energy cost. The source energy estimate multipliers for energy sources shall be taken from Table R405.3.1.

**TABLE R405.3.1 (IRC N1105.3.1)
SOURCE ENERGY ESTIMATED MULTIPLIERS**

SOURCE ENERGY TYPE	ESTIMATED SOURCE MULTIPLIER^a
Electricity, Imported, General Grid	2.61
Electricity, Imported, Local or National RPS	Greater of [2.61 x (1 - RPS%)] or 1.00
Electricity, Off-Site Delivered Renewable	1.00
On-Site Renewable Electricity, used by building or exported	1.00
On-Site Stored Renewable Electricity (used by building or exported)	1.00
Natural Gas, domestic, no flaring/venting	1.09
Natural Gas, domestic, with 20% flaring/venting	1.37
Natural gas, imported as LNG	1.25
Fuel Oil (1, 2, 4, 5, 6, Diesel, Kerosene), domestic	1.19
Fuel Oil, imported from overseas	1.45
Propane, Liquid Propane, domestic	1.15
Propane, Liquid Propane, domestic, with 20% flaring/venting	1.49
Steam, Non-Renewable	1.45
Steam, Renewable	1.00
Hot Water, Non-Renewable	1.35
Hot Water, Renewable	1.00
Chilled Water, Non-Renewable	1.04
Chilled Water, Renewable	1.00
Coal or Other, domestic	1.05

a. Values represent averages for the United States.

Reason: The world of energy production and energy storage and choices of energy supply is changing rapidly. The current language is outdated and does not account for all of the changes going on and needs to be revised.

This proposal will make the provision more flexible for building designers, building owners, and code officials. By allowing the use of site energy, which was allowed in previous versions of the IECC, the performance path can be based on real measured data. By updating source energy estimates, there will be more information provided to code officials and building owners.

More buildings are producing and storing energy on-site, so it does not make technical or analytical sense to require the use of outdated "source energy" estimates.

Site Energy

Allowing the use of site energy is more appropriate for buildings that are producing or storing energy on-site. In the future, many buildings will be producing energy and storing energy, along with consuming energy. Building systems may be consuming energy that was produced from an off-site energy grid and/or produced from an on-site energy production system and/or delivered from an off-site energy storage system (e.g., a grid battery or EV battery) and/or delivered from an on-site energy storage system, (e.g., and battery or fuel storage tank or thermal energy storage system). At the same time, the building may be producing energy that is used by building equipment, sent to an on-site energy storage system, or exported to another building (or buildings) or to the energy grid.

In a letter to DOE, ASHRAE said:

"the Society believes that the multiple and varying weighting factors and algorithms required for estimating source energy conversions are often inconsistent and ultimately cloud and complicate understanding. Since source energy conversion factors vary widely from place to place and across time, the use of fixed national average conversion factors could lead to inconsistent estimates of consumption."

"Thus, in this case ***the best method for determining if a building is a NZEB is to look at the energy crossing the boundary at the site of the building; hence "site" energy is the best choice to use.***" (emphasis added)

Site energy was part of the exception for many years until it was removed. There are many reasons to allow site energy to be used as an alternative to source energy or energy costs:

- Site energy is an actual metric that can be measured and verified by code officials, while source energy is an estimate.
- Site energy information is credible, as it is shown on customers' energy bills on a monthly basis and used in other consensus-based code documents, such as ASHRAE 90.1, use site energy metrics for efficiency requirements.
- DOE uses site energy information in many of its energy efficiency and energy consumption publications, such as the Residential Energy Consumption Survey. DOE uses site energy for its appliance energy efficiency standards program and the FTC uses site energy on the yellow EnergyGuide labels found on consumer appliances. EPA uses site energy to determine if an appliance or home qualifies for the Energy Star program.
- Site energy is reliable, since it can be measured by utilities, consumers, and independent 3 parties. In terms of energy efficiency upgrades, consumers rely on site energy information (amount used by older appliance or equipment compared to new appliance or equipment) to help them make energy efficiency decisions.
- Site energy is replicable, as the units of measurement (kWh, therms, gallons, Btu's) can be used throughout the United States and are familiar to consumers on their monthly energy bills. Source energy is not replicable, as different estimates must be used for different energy sources, and different entities can make different assumptions about upstream production and delivery of different energy sources.
- Site energy is transparent and easy to understand. It can be based on meter readings or DOE test procedures or FTC EnergyGuide labels or Energy Star labels. It is the metric that allows people to easily compare energy efficiency options in the marketplace. It is the metric that allows people to make good economic choices when faced with competitive alternatives.

Source Energy Estimates

There are many ways to estimate upstream energy losses. The energy production industry is very dynamic and subject to significant changes. In the United States in 2018, there was a record amounts of natural gas produced from hydraulic fracturing production techniques. In 2018, there was a record amount of oil produced and imported from oil sands production. In 2018, there was a record amount of electricity produced from renewable forms of energy and a record amount of electricity produced by combined-cycle natural gas turbines.

The values that are currently shown should be deleted and not used. The values shown are not consistent with values shown in other published documents. Many documents and articles have been published over the past several years with source energy estimates as shown in the bibliography. The current values in the IECC do not match and cannot be substantiated with any of these published documents.

Different fossil fuels have different upstream source estimates. In the current IECC, all fossil fuels are assumed to have the same multiplier. In other documents, there is a large and statistically significant variation in the upstream estimates that will have a significant impact on energy performance results. As one example, for fuel oil and propane, EPA's Portfolio Manager uses a factor of 1.01 for both, while NREL used estimated values of 1.158 and 1.151, while IGCC 2015 uses 1.19 for fuel oil and 1.15 for propane. The use of 3.16 for electricity is overstated for many parts of the United States and does not account for significant regional differences or the increase in the use of renewable power generation and combined cycle gas

turbines.

In other publications and web sites, the estimates for electricity are shown on a national basis, a regional basis, or a state by state basis. This is due to the variety of electric generation techniques which have upstream energy losses that can vary by orders of magnitude based on local conditions, regional conditions, physical location, season, month, week, or day, as well as hourly fluctuations in the amount of sunlight or wind speed.

The revisions to the values are based on reports published by the US Energy Information Administration, the US Department of Energy, the US Environmental Protection Agency, national labs, and other public sources of information. It is a technical fact that there are significant differences in terms of upstream estimates for electricity as well as fossil fuels. The new estimates provide more defensible and accurate estimates.

Bibliography: National Renewable Energy Laboratory NREL/TP-550-38617 "Source Energy and Emission Factors for Energy Use in Buildings" (June 2007)

American Gas Association EA 2009-3 "A Comparison of Energy Use, Operating Costs, and Carbon Dioxide Emissions of Home Appliances" (October 2009)

Environmental Protection Agency "Energy Star Performance Ratings Methodology for Incorporating Source Energy Use" (August 2009 and 2017 update)

National Renewable Energy Laboratory NREL/TP-550-47246 "Building America Research Benchmark Definition" (January 2010)

International Code Council "International Green Construction Code" (May 2015)

American Gas Association "Dispatching Direct Use", Table 1, (November 2015)

US Department of Energy "Accounting Methodology for Source Energy of Non-Combustible Renewable Electricity Generation" (October 2016)

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal only provides another option for the simulation used for the performance path.

Proposal # 4672

RE154-19

RE155-19

IECC: R404.1 (IRC N1104.1)

Proponent: Marilyn Williams, representing National Electrical Manufacturers Association (mar_williams@nema.org)

2018 International Energy Conservation Code

Revise as follows:

R404.1 (IRC N1104.1) Lighting equipment (Mandatory). ~~Not less than 90 percent of the permanently installed lighting fixtures shall contain only high-efficacy lamps. Luminaires shall utilize lamps with an efficacy of at least 65 lumens-per-watt, or have a luminaire efficacy of at least 45 lumens-per-watt.~~

Proposal # 4453

RE155-19

RE155-19

IECC: R405.3 (IRC N1105.3)

Proponent: Charles Foster, representing self (cfoster20187@yahoo.com)

2018 International Energy Conservation Code

Revise as follows:

R405.3 (IRC N1105.3) Performance-based compliance. Compliance based on simulated energy performance requires that a proposed residence (*proposed design*) be shown to have an annual energy cost that is less than or equal to the annual energy cost of the *standard reference design*. Energy prices shall be taken from a source *approved* by the *code official*, such as the Department of Energy, Energy Information Administration's State Energy Data System Prices and Expenditures reports. *Code officials* shall be permitted to require time-of-use pricing in energy cost calculations.

~~**Exception:** The energy use based on source energy expressed in Btu or Btu per square foot of conditioned floor area shall be permitted to be substituted for the energy cost. The source energy multiplier for electricity shall be 3.16. The source energy multiplier for fuels other than electricity shall be 1.1.~~

Reason: There is only one metric that consumers are concerned with. That metric is cost. The IECC and its predecessor the model energy code traditionally relied on energy costs to demonstrate compliance. During the 2015 code cycle, this section added the current exception for the use of source energy as an alternative to cost.

Source energy is a relatively complex exercise used to estimate the approximate amount of raw energy consumed in the delivery of energy to ultimate customers. It is not a measurement nor a repeatable calculation across either geography or time.

Among its many limitations, source energy is particularly challenged when dealing with electricity as it treats electricity derived from renewables like solar and wind the same as electricity from an old coal fired generator.

The U.S. Department of Energy recognizes this absurdity – of treating wind the same as coal – and several years ago published a report on the topic. (SEE bibliography).

The overwhelming majority of jurisdictions using the IECC rely on cost.

There is no meaningful reason to keep the exception in the code and it should be removed.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal imposes no additional compliance requirements and, therefore, neither increases nor decreases the cost of construction.

Proposal # 4977

RE155-19

RE156-19

IECC: R405.4 (IRC N1105.4) (New)

Proponent: Joseph Cain, representing Solar Energy Industries Association (SEIA) (JoeCainPE@gmail.com)

2018 International Energy Conservation Code

Add new text as follows:

R405.4 (IRC N1105.4) On-site renewable energy. *On-site renewable energy shall be considered as a reduction in energy use of the building.*

Reason: The IECC should integrate energy efficiency measures and renewable energy systems. Builders should get credit for what they do. As presented by the Building Technologies Office of the Department of Energy's 2018 National Energy Codes Conference, according to the U.S. Energy Information Administration's AEO 2018 report, typical Residential End Uses include Space heating at 24% and Space cooling at 11%, for a combined space heating/cooling at 35% of all Residential Energy End Uses. Water heating accounts for 13.5% of Residential Energy End Uses. These figures illustrate that we have done a very good job of reducing regulated loads, such that unregulated loads now represent greater than 50% of all Residential Energy End Uses. Renewable energy systems can offset not only the unregulated loads, but can also offset the reduced regulated loads.

Compliance measures and compliance paths that focus only on building envelope measures and discourage or penalize renewable energy systems -- or fail to make renewable energy systems attractive to builders as a compliance option - are focused on solving 35% of the problem. The IECC should encourage the use of energy efficiency plus renewable energy, to solve 100% of the problem.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Installation of an on-site photovoltaic system could increase or decrease the overall first cost of construction.

Proposal # 5687

RE156-19

RE157-19

IECC: R405.4.2 (IRC N1105.4.2)

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

R405.4.2 (IRC N1105.4.2) Compliance report. Compliance software tools shall generate a report that documents that the *proposed design* complies with Section R405.3. A compliance report on the *proposed design* shall be submitted with the application for the building permit. Upon completion of the building, a compliance report based on the as-built condition of the building shall be submitted to the *code official* before a certificate of occupancy is issued. ~~Batch sampling of buildings to determine energy code compliance shall only be allowed for stacked multiple-family units.~~ Compliance reports shall include information in accordance with Sections R405.4.2.1 and R405.4.2.2. Where the *proposed design* of a building could be built on different sites where the cardinal orientation of the building on each site is different, compliance of the *proposed design* for the purposes of the application for the building permit shall be based on the worst-case orientation, worst-case configuration, worst-case *building* air leakage and worst-case duct leakage. Such worst-case parameters shall be used as inputs to the compliance software for energy analysis.

Reason: The purpose of this code change proposal is to remove confusing and incomplete language from the performance path regarding “batch sampling” of buildings. Section R405.4.2 contains orphan language that implies that batch sampling might be acceptable for stacked multiple family units, but there is no process or criteria for “batch sampling” defined anywhere in the IECC. Before any sort of sampling is allowed, a number of very important questions must be addressed, such as which parts of the building may be batch sampled, what sample size must be collected, what happens in the event of a failure, etc. Although some common voluntary programs permit sampling for certain specified measures, the IECC does not currently allow this practice and should not until these important questions are addressed. Moreover, we are concerned that batch sampling would fail to ensure that every home meets the code, since presumably only some homes would be included in the sampling.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal cleans up excess language that refers to sampling practices that do not currently exist in the IECC.

Proposal # 4110

RE157-19

RE158-19

IECC: R405.4.2 (IRC N1105.4.2), R405.4.2.1 (IRC N1105.4.2.1), R405.4.2.2 (IRC N1105.4.2.2) , R405.4.3 (IRC N1105.4.3)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

R405.4.2 (IRC N1105.4.2) Compliance report. Compliance software tools shall generate a report that documents that the *proposed design* complies with Section R405.3. A compliance report on the *proposed design* shall be submitted with the application for the building permit. Upon completion of the building, a confirmed compliance report based on the ~~as-built~~ confirmed condition of the building shall be submitted to the *code official* before a certificate of occupancy is issued. Batch sampling of *buildings* to determine energy code compliance shall only be allowed for stacked multiple-family units. Compliance reports shall include information in accordance with Sections R405.4.2.1 and R405.4.2.2.

~~Where the *proposed design* of a building could be built on different sites where the cardinal orientation of the building on each site is different, compliance of the *proposed design* for the purposes of the application for the building permit shall be based on the worst case orientation, worst case configuration, worst case *building* air leakage and worst case duct leakage. Such worst case parameters shall be used as inputs to the compliance software for energy analysis.~~

R405.4.2.1 (IRC N1105.4.2.1) Compliance report for permit application. ~~A compliance report~~ Compliance reports submitted with the application for building permit shall include the following:

1. Building street address, or other building site identification.
2. ~~A statement indicating that the *proposed design* complies with Section R405.3.~~ The name of the individual performing the analysis and generating the compliance report.
3. ~~An inspection checklist documenting the building component characteristics of the *proposed design* as indicated in Table R405.5.2(1). The inspection checklist shall show results for both the *standard reference design* and the *proposed design* with user inputs to the compliance software to generate the results.~~ The name and version of the compliance software tool.
4. ~~A site-specific energy analysis report that is in compliance with Section R405.3.~~ If requested by the authority having jurisdiction, documentation of all inputs entered into the software used to produce the results for the reference design and/or the rated home.
5. ~~The name of the individual performing the analysis and generating the report.~~ A certificate indicating that the *proposed design* complies with Section R405.3. The certificate shall document the building components energy specifications that are included in the calculation including, component level insulation *R*-values or *U*-factors, assumed duct system and building envelope air leakage testing assumptions, as well as, the type and rated efficiencies of proposed heating, cooling, mechanical ventilation, and service water heating equipment to be installed. If onsite renewable energy systems will be installed the certificate shall report the type and production size of the proposed system.
6. ~~The name and version of the compliance software tool.~~ When a site-specific report is not generated, the proposed design shall be based on the worst-case orientation and configuration of the rated home.

R405.4.2.2 (IRC N1105.4.2.2) Compliance Confirmed compliance report for certificate of occupancy. A confirmed compliance report submitted for obtaining the certificate of occupancy shall ~~be made site and address specific and~~ include the following:

1. Building street address, or other building site identification.
2. A statement indicating that the as-built building complies with Section R405.3. The name of the individual performing the analysis and generating the report.
3. ~~A certificate indicating that the building passes the performance matrix for code compliance and indicating the energy saving features of the buildings.~~ The name and version of the compliance software tool.
4. ~~A site-specific energy analysis report that is in compliance with Section R405.3.~~ If requested by the authority having jurisdiction, documentation of all inputs entered into the software used to produce the results for the reference design and/or the rated home.
5. ~~The name of the individual performing the analysis and generating the report.~~ A final confirmed certificate indicating compliance based on inspection and statement indicating that the confirmed rated design of the built home complies with Section R405.3. The certificate shall report the energy features that were confirmed to be in the home including component level insulation *R*- values or *U*-factors, results from any required duct system and building envelope air leakage testing, as wells as the type and rated efficiencies of the heating, cooling, mechanical ventilation, and service water heating equipment installed.
6. ~~The name and version of the compliance software tool.~~ When onsite renewable energy systems have been installed, the certificate shall report the type and production size of the installed system.

R405.4.3 (IRC N1105.4.3) Additional documentation. The *code official* shall be permitted to require the following documents:

- 1: Documentation of the building component characteristics of the *standard reference design*;
- 2: A certification signed by the builder providing the building component characteristics of the *proposed design* as given in Table R405.5.2(1);
- 3: Documentation of the actual values used in the software calculations for the *proposed design*;

Reason: EnergyLogic began to use the Section R405 Simulated Performance alternative and the cost compliance report with our Builder clients to demonstrate energy code compliance when the 2009 IECC was adopted by jurisdictions in the Denver Metro area. We fundamentally defined the process by which the path was used at the time as most jurisdictions did not have experience using it. Use of the pathway took off as we demonstrated that the systems thinking, building science trade-off approach offered tremendous flexibility for how to build a cost-effective code compliant house within a defined structure that ensured both jurisdictional and third-party stringent verification. Therefore, in the 2015 code development cycle we decided to define the process by which the Simulated Performance path was successfully being implemented in Colorado in the body of the IECC to help jurisdictions and builders better understand how to implement the pathway to gain flexibility of choice and trade-off, as well as, to ensure verification that backs it up for compliance.

In the 2021 code adoption cycle, we propose to update the compliance requirements based on what we have learned over the years using the path to help thousands of homes a year demonstrate compliance with the IECC. The changes we propose offer clarification and simplification rather than actually changing what is required. For example, the use of the terms proposed and confirmed to refer to documents that must be part of the document set needed to obtain the building permit and certificate of occupancy is more clearly laid out. In addition, section R405.4.2.1 Compliance report for permit application and section R405.4.2.2 Confirmed compliance report for certificate of occupancy, have been consolidated and reordered to more clearly identify for the jurisdiction having authority the documentation needed to be reviewed to demonstrate compliance.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

There is no cost implication with these changes to the code. The proposal does not add new requirements but rather cleans up the section for better understanding and use by the jurisdictions and builders that choose it.

Proposal # 5254

RE158-19

RE159-19

IECC: R405.4.2.1

Proponent: Kirk Nagle, City of Aurora, representing Myself (knagle@auroragov.org)

2018 International Energy Conservation Code

Revise as follows:

R405.4.2.1 (IRC N1105.4.2.1) Compliance report for permit application. A compliance report submitted with the application for building permit shall include the following:

1. Building street address, or other building site identification.
2. Declare simulated performance path
3. A statement indicating that the *proposed design* complies with Section R405.3.
4. An inspection checklist documenting the building component characteristics of the *proposed design* as indicated in Table R405.5.2(1). The inspection checklist shall show results for both the *standard reference design* and the *proposed design* with user inputs to the compliance software to generate the results.
5. A site-specific energy analysis report that is in compliance with Section R405.3.
6. The name of the individual performing the analysis and generating the report.
7. The name and version of the compliance software tool.

Reason: This code change is being proposed to clarify the energy path to the code official and the documentation for permit. Many reports do not specify the path that is being proposed and the code official has to contact the applicant to verify the energy path they are intending to use, to comply with the energy code. By providing the method of compliance the code official can focus on the details of the report and this information will expedite the permit process time.

Cost Impact: The code change proposal will increase the cost of construction
This will increase the cost of construction by a very minor amount, adding a data entry to report.

Proposal # 5660

RE159-19

RE160-19

IECC: R402.5 (IRC N1102.5), R405.5.2.1 (IRC N1105.5.2.1) (New)

Proponent: Darren Meyers, P.E., International Energy Conservation Consultants LLC, representing Self (dmeyers@ieccode.com)

2018 International Energy Conservation Code

Revise as follows:

R402.1.5 (IRC N1102.1.5) Total UA alternative. Where the total *building thermal envelope* UA, the sum of *U*-factor times assembly area, is less than or equal to the total UA resulting from multiplying the *U*-factors in Table R402.1.4 by the same assembly area as in the proposed *building*, the *building* shall be considered to be in compliance with Table R402.1.2. The UA calculation shall be performed using a method consistent with the ASHRAE *Handbook of Fundamentals* and shall include the thermal bridging effects of framing materials. In addition to UA compliance, the SHGC requirements shall be met.

~~**R402.5 (IRC N1102.5) R402.1.5.1 (IRC N1102.5.1) Maximum fenestration U-factor and SHGC (Mandatory).** The area-weighted average maximum fenestration *U*-factor permitted using tradeoffs from Section R402.1.5 or R405 shall be 0.48 in *Climate Zones* 4 and 5 and 0.40 in *Climate Zones* 6 through 8 for vertical fenestration, and 0.75 in *Climate Zones* 4 through 8 for skylights. The area-weighted average maximum fenestration SHGC permitted using tradeoffs from Section R405 in *Climate Zones* 1 through 3 shall be 0.50.~~

Add new text as follows:

R405.5.2.1 (IRC N1105.5.2.1) Maximum fenestration U-factor and SHGC (Mandatory) The area-weighted average maximum fenestration *U*-factor permitted using Section R405 shall be 0.48 in *Climate Zones* 4 and 5 and 0.40 in *Climate Zones* 6 through 8 for vertical fenestration, and 0.75 in *Climate Zones* 4 through 8 for skylights. The area-weighted average maximum fenestration SHGC permitted using Section R405 in *Climate Zones* 1 through 3 shall be 0.50.

Reason: This proposal relocates and apportions the provisions of Section R402.5 to their appropriate locations as they apply specifically to the methodologies therein. No change in stringency or applicability is proposed.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

There is no cost implication aligned with this proposal. Rather, it is an exercise steeped in clarification such that a provision "hanging" at the end of Section R402, is appropriately assigned to the "Total UA Alternative" and the "Simulated Performance Alternative," accordingly. No change to stringency is proposed.

Proposal # 5459

RE160-19

RE161-19

IECC: TABLE R405.5.2(1) [IRC N1105.5.2(1)]

Proponent: Jennifer Hatfield, representing American Architectural Manufacturers Association (jen@jhatfieldandassociates.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R405.5.2(1) [IRC N1105.5.2(1)]
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

Portions of table not shown remain unchanged.

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Vertical fenestration other than opaque doors	Vertical Fenestration Total area ^h = (a) The proposed vertical fenestration glazing area (AVF), where the proposed total fenestration glazing area (AE) is less than 15 percent of the conditioned floor area (CFA) (b) 15 percent of the conditioned floor area. The adjusted vertical fenestration area (AVF _{adj}), where the AE proposed glazing area is 15 percent or more of the conditioned floor area (CFA) $AVF_{adj} = AVF \times (0.15 \times CFA/AE)$	As proposed
	Orientation: equally distributed to four cardinal compass orientations (N, E, S & W).	As proposed
	U-factor: as specified for Fenestration in Table R402.1.4.	As proposed
	SHGC: as specified for Glazed Fenestration in Table R402.1.2 except for climate zones without an SHGC requirement, the SHGC shall be equal to 0.40.	As proposed
	Interior shade fraction: 0.92-(0.21 x SHGC for the standard reference design).	Interior shade fraction: 0.92-(0.21 x SHGC as proposed)
	External shading: none.	As proposed
	Skylights	None. Skylight area ^h = (a) The proposed skylight area (ASKY), where the proposed total fenestration area (AF) is less than 15 percent of the conditioned floor area (CFA) (b) The adjusted skylight area (ASKY _{adj}), where the AF is 15 percent or more of the CFA $ASKY_{adj} = ASKY \times (0.15 \times CFA/AF)$
Orientation: as proposed		As proposed
U-factor: as specified for Skylights in Table R402.1.2		As proposed
SHGC: as specified for Glazed Fenestration and footnote (b) in Table R402.1.2, except for climate zones without an SHGC requirement, the SHGC shall be equal to 0.40.		As proposed
For the area of proposed skylights equipped and rated with factory-installed interior shades, the interior shade fraction is 0.92 - (0.21 x SHGC) [SHGC as above for the standard reference design]		As proposed, with shades assumed closed 50% of the daylight hours
External shading: none		As proposed

For SI: 1 square foot = 0.93 m², 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m², 1 gallon (US) = 3.785 L, °C = (°F-32)/1.8, 1 degree = 0.79 rad.

- a. Where required by the *code official*, testing shall be conducted by an *approved* party. Hourly calculations as specified in the ASHRAE *Handbook of Fundamentals*, or the equivalent, shall be used to determine the energy loads resulting from infiltration.
- b. The combined air exchange rate for infiltration and mechanical ventilation shall be determined in accordance with Equation 43 of 2001 ASHRAE *Handbook of Fundamentals*, page 26.24 and the "Whole-house Ventilation" provisions of 2001 ASHRAE *Handbook of Fundamentals*, page 26.19 for intermittent mechanical ventilation.
- c. Thermal storage element shall mean a component that is not part of the floors, walls or ceilings that is part of a passive solar system, and that provides thermal storage such as enclosed water columns, rock beds, or phase-change containers. A thermal storage element shall be in the same room as fenestration that faces within 15 degrees (0.26 rad) of true south, or shall be connected to such a room with pipes or ducts that allow the element to be actively charged.
- d. For a proposed design with multiple heating, cooling or water heating systems using different fuel types, the applicable standard reference design system capacities and fuel types shall be weighted in accordance with their respective loads as calculated by accepted engineering practice for each equipment and fuel type present.
- e. For a proposed design without a proposed heating system, a heating system having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and proposed design.
- f. For a proposed design home without a proposed cooling system, an electric air conditioner having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and the proposed design.
- g. For a proposed design with a nonstorage-type water heater, a 40-gallon storage-type water heater having the prevailing federal minimum energy factor for the same fuel as the predominant heating fuel type shall be assumed. For a proposed design without a proposed water heater, a 40-gallon storage-type water heater having the prevailing federal minimum efficiency for the same fuel as the predominant heating fuel type shall be assumed for both the proposed design and standard reference design.
- h. Light-transmitting fenestration area includes the area of sash, curbing or other framing elements that are part of the conditioned space enclosure, including light-transmitting assemblies in the walls bounding conditioned basements. For doors where the light-transmitting opening is less than 50 percent of the door area, only the light-transmitting area is included. For residences with conditioned basements, R-2 and R-4 residences, and for townhouses, the following formula shall be used to determine glazing fenestration area:

$$AF = A_s \times FA \times F$$

where:

AF = Total glazing Proposed total fenestration area.

A_s = Standard reference design total glazing fenestration area.

FA = (Above-grade thermal boundary gross wall area)/(above-grade boundary wall area + 0.5 × below-grade boundary wall area).

F = (above-grade thermal boundary wall area)/(above-grade thermal boundary wall area + common wall area) or 0.56, whichever is greater;

and where: Thermal boundary wall is any wall that separates conditioned space from unconditioned space or ambient conditions. Above-grade thermal boundary wall is any thermal boundary wall component not in contact with soil. Below-grade boundary wall is any thermal boundary wall in soil contact. Common wall area is the area of walls shared with an adjoining dwelling unit.

L A_F, A_s and *CFA* are in the same units.

Reason: The IECC residential simulated energy performance analysis standard reference design specification table has historically included skylight area in the "Glazing" row, as reflected in the 2012 IECC:

**TABLE R405.5.2(1)
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Glazing ^a	Total area ^b – (a) The proposed glazing area; where proposed glazing area is less than 15% of the conditioned floor area. (b) 15% of the conditioned floor area; where the proposed glazing area is 15% or more of the conditioned floor area.	As proposed
	Orientation: equally distributed to four cardinal compass orientations (N, E, S & W).	As proposed
	U-factor: from Table R402.1.3	As proposed
	SHGC: From Table R402.1.1 except that for climates with no requirement (NR) SHGC – 0.40 shall be used.	As proposed
	Interior shade fraction: 0.92-(0.21 × SHGC for the standard reference design) External shading: none	As proposed

...

- a. Glazing shall be defined as sunlight-transmitting fenestration, including the area of sash, curbing or other framing elements, that enclose conditioned basements. For doors where the sunlight opening is less than 50 percent of the door area, the glazing area is the sunlight transmitting opening area. For all other doors, the glazing area is the frame opening area for the door including the door and the frame.
- b. For residences with conditioned basements, R-2 and R-4 residences and townhouses, the following formula shall be used to determine glazing area

$$AF = A_s \times FA \times F$$

where:

AF = Total glazing area.

A_s = Standard reference design total glazing area.

FA = (Above-grade thermal boundary gross wall area)/(above-grade boundary wall area + 0.5 × below-grade boundary wall area).

...

Footnote (a) clearly refers to “the area of ... curbing ...” in the definition of “Glazing”, which is only germane to skylights on a roof. The commentary versions of the 2012 and prior editions reinforce this intent to cover skylight area in the glazing row for the reference design.

The approval of RE173-13 upset the applecart for skylights in the 2015 IECC. The proponent later acknowledged at 2018 IECC code hearings that it was not intentional, but the two major elements of that change took away the only place for skylights to be included in the reference design:

- “Glazing” was changed to “Vertical fenestration other than opaque doors”
- Footnote (a) was inexplicably deleted, rather than redefine fenestration area calculation rules.

Our proposed changes to Table R405.5.2(1) reinstate the allowance to include skylight area in the Standard Reference Design as part of the Total Fenestration Area when they are part of the proposed design, by adding the following:

1. Provisions for skylight area, U-factor and shading that mirror the Vertical Fenestration provisions, wherever practical.
2. Provisions for skylight SHGC that mirror those for Vertical Fenestration, with the addition of a reference to Footnote (b) of Table R402.1.2 specific to skylight SHGC.
3. Provisions for skylight orientation based upon “As Proposed”. Typically, skylight installation in residential construction is not able to be equally distributed to all four cardinal compass orientations, as assumed for vertical fenestration under the Simulated Performance Alternative provisions.
4. Suitable interior shading provisions that are used when any of the proposed skylights are rated products that include integral interior shading.

This proposal also includes the following coordinating changes:

1. In footnote (h), reference to “glazing area” is replaced by “fenestration area”, while restoring needed clarifying language from old footnote (a) defining what is included in calculating the area of various fenestration products regardless of slope or position on the envelope.
2. Provisions are added to reduce the vertical fenestration area and skylight area proportionally for the Standard Reference Design, whenever any skylight area is proposed and total fenestration area equals or exceeds 15% of conditioned floor area.

Bibliography: 2012 IECC, Table R405.5.2(1)

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The code change proposal will not increase the cost of construction but rather reinstates language that was unintentionally removed.

Proposal # 5105

RE161-19

RE162-19

IECC: TABLE R405.5.2(1) [IRC N1105.5.2(1)]

Proponent: Gary Klein, representing self (gsmklein@comcast.net)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R405.5.2(1) [IRC N1105.5.2(1)]
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

Portions of table not shown remain unchanged.

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN																		
Service water heating ^{d, e, f, g}	As proposed.	As proposed																		
	Use: same as proposed design.	Use, in units of gal/day = $(30 + (10 \times N_{br})) \times (1 - HWDS)$																		
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		<table border="1"> <thead> <tr> <th colspan="2">Compactness Ratioⁱ</th> <th>HWDS Factor</th> </tr> <tr> <th>1 story</th> <th>2 or More Stories</th> <th></th> </tr> </thead> <tbody> <tr> <td>> 60%</td> <td>> 30%</td> <td>0</td> </tr> <tr> <td>> 30% to ≤ 60%</td> <td>> 15% to ≤ 30%</td> <td>0.05</td> </tr> <tr> <td>> 15% to ≤ 30%</td> <td>> 7.5% to ≤ 15%</td> <td>0.10</td> </tr> <tr> <td>< 15%</td> <td>< 7.5%</td> <td>0.15</td> </tr> </tbody> </table>	Compactness Ratio ⁱ		HWDS Factor	1 story	2 or More Stories		> 60%	> 30%	0	> 30% to ≤ 60%	> 15% to ≤ 30%	0.05	> 15% to ≤ 30%	> 7.5% to ≤ 15%	0.10	< 15%	< 7.5%	0.15
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For SI: 1 square foot = 0.93 m², 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m², 1 gallon (US) = 3.785 L,

°C = (°F - 32)/1.8, 1 degree = 0.79 rad.

- Where required by the *code official*, testing shall be conducted by an *approved party*. Hourly calculations as specified in the *ASHRAE Handbook of Fundamentals*, or the equivalent, shall be used to determine the energy loads resulting from infiltration.
- The combined air exchange rate for infiltration and mechanical ventilation shall be determined in accordance with Equation 43 of 2001 *ASHRAE Handbook of Fundamentals*, page 26.24 and the "Whole-house Ventilation" provisions of 2001 *ASHRAE Handbook of Fundamentals*, page 26.19 for intermittent mechanical ventilation.
- Thermal storage element shall mean a component that is not part of the floors, walls or ceilings that is part of a passive solar system, and that provides thermal storage such as enclosed water columns, rock beds, or phase-change containers. A thermal storage element shall be in the same room as fenestration that faces within 15 degrees (0.26 rad) of true south, or shall be connected to such a room with pipes or ducts that allow the element to be actively charged.
- For a proposed design with multiple heating, cooling or water heating systems using different fuel types, the applicable standard reference design system capacities and fuel types shall be weighted in accordance with their respective loads as calculated by accepted engineering practice for each equipment and fuel type present.
- For a proposed design without a proposed heating system, a heating system having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and proposed design.
- For a proposed design home without a proposed cooling system, an electric air conditioner having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and the proposed design.
- For a proposed design with a nonstorage-type water heater, a 40-gallon storage-type water heater having the prevailing federal minimum energy factor for the same fuel as the predominant heating fuel type shall be assumed. For a proposed design without a proposed water heater, a 40-gallon storage-type water heater having the prevailing federal minimum efficiency for the same fuel as the predominant heating fuel type shall be assumed for both the proposed design and standard reference design.
- For residences with conditioned basements, R-2 and R-4 residences, and for townhouses, the following formula shall be used to determine glazing area:

$$AF = A_s \times FA \times F$$

where:

AF = Total glazing area.

A_s = Standard reference design total glazing area.

FA = (Above-grade thermal boundary gross wall area)/(above-grade boundary wall area + 0.5 × below-grade boundary wall area).

F = (above-grade thermal boundary wall area)/(above-grade thermal boundary wall area + common wall area) or 0.56, whichever is greater.

and where:

Thermal boundary wall is any wall that separates conditioned space from unconditioned space or ambient conditions.

Above-grade thermal boundary wall is any thermal boundary wall component not in contact with soil.

Below-grade boundary wall is any thermal boundary wall in soil contact.

Common wall area is the area of walls shared with an adjoining dwelling unit.

L and CFA are in the same units.

- i. The factor for the compactness of the hot water distribution system is the ratio of the area of the rectangle that bounds the source of hot water and the fixtures that it serves (the "hot water rectangle") divided by the floor area of the dwelling.
 1. Sources of hot water include water heaters, or in multi-family buildings with central water heating systems, circulation loops or electric heat traced pipes.
 2. The hot water rectangle shall include the source of hot water and the points of termination of all hot water fixture supply piping.
 3. The hot water rectangle shall be shown on the floor plans and the area shall be computed to the nearest square foot.
 4. Where there is more than one water heater and each water heater serves different plumbing fixtures and appliances, it is permissible to establish a separate hot water rectangle for each hot water distribution system and add the area of these rectangles together to determine the Compactness Ratio.
 5. The basement or attic shall be counted as a story when it contains the water heater.
 6. Compliance shall be demonstrated by providing a drawing on the plans that shows the hot water distribution system rectangle(s), comparing the area of the rectangle(s) to the area of the dwelling and identifying the appropriate compactness ratio and HWDS factor.

Reason: The purpose of this proposal is to encourage the architectural compactness of the location of the wet rooms and the water heaters that serve them.

Wet rooms contain plumbing fixtures and appliances. They are often located far apart from each other and from the water heater that serves them. The long distances between them results in long and often larger diameter piping runs. These piping runs need to be cleared of the ambient temperature water in them before hot water can arrive. This addition time is often annoying to consumers and the waste of water and energy while waiting can be costly.

If the architect locates the wet rooms closer together and to the water heater that serves them, it makes it possible for the pipe runs to be shorter and often of a smaller diameter. The reduced volume of ambient temperature water clears out more quickly, increasing customer satisfaction. In addition, the associated water and energy waste is less, reducing operating costs.

Benefits:

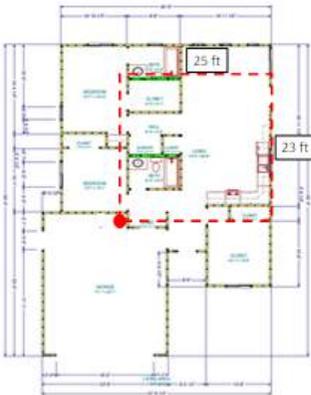
1. This proposal provides a credit when the wet rooms are located close to each other. There is no penalty for not taking advantage of the credit.
2. The builder still has flexibility over where to put the wet rooms and the water heater(s). It is possible to take advantage of the credit in larger dwellings by having a water heater associated with each group of wet rooms.
3. The credit can be applied to single and multi-family dwellings. Where the dwelling has its own water heater, the calculation is done with the water heater as the source of hot water. In multi-family buildings with central water heating systems, the calculation is done from where the branch off the circulation loop or heat traced trunk line to the apartment begins.
4. Compliance can be demonstrated on the drawings and verified during plan check.

How to Implement the Proposed Credit for Architectural Compactness

- Locate the water heater and the hot water fixtures and appliances.
- 2. Draw a rectangle through the center line of the water heater and the plumbing walls next to the hot water fixtures and appliances.
- 3. Calculate the area of this rectangle.
- 4. Divide this area by the conditioned floor area of the home to get the Compactness Ratio.
- 5. Determine if a credit can be taken and how large it can be.



- 1-Story, 3 Bedroom, 2 Bath**
1. Conditioned floor space: 1,147 SF
 2. Hot water system rectangle: $36 \times 23 = 828$ SF
 3. Compactness Ratio: $828 / 1,147 = 72\%$
 4. HWDS Factor for 1-Story: 0.0



- 1-Story, 3 Bedroom, 2 Bath**
1. Move the water heater into the corner near the center of the garage.
 2. Conditioned floor space: 1,147 SF
 3. Hot water system rectangle: $25 \times 23 = 575$ SF
 4. Compactness Ratio: $575 / 1,147 = 50\%$
 5. HWDS Factor for 1-Story: 0.05

Habitat for Humanity, Stockton CA

Plumbing wall goes around the middle bathroom

Bounded area is roughly 50 sq ft

Plumbing wall is roughly 22 feet long



1-Story, 3 Bedroom, 2 Bath

1. Same builder, similar size dwelling.
2. Different floor plan with wet rooms located close to each other
3. Move the water heater very close to the wet rooms
4. Conditioned floor space: 1,223 SF
5. Hot water system rectangle: 8x9 = 72 SF
6. Compactness Ratio: $72/1,223 = 5.9\%$
7. HWDS Factor for 1-Story: 0.15

2 story, 4 bedrooms, 3 bath 2625 sq ft Meritage Homes Bakersfield

2-Story, 4 Br/3 Ba, 2,625 sq ft

Compactness Ratio = $962/2,625 = 37\%$
 HWDS Factor = 0.0

Show the rectangle on all floors with hot water uses.

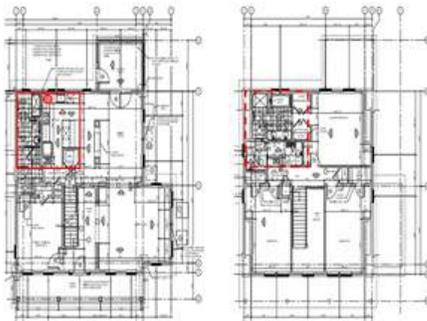


https://www.nist.gov/sites/default/files/net-zero_energy_high-performance_buildings_program.pdf

2-Story above basement, 4Br / 3Ba, 2,709 sq ft

Compactness Ratio = $325/2,709 = 12\%$
 HWDS Factor = 0.10

Show the rectangle on all floors with hot water uses.



Camden, Chula Vista - Camden Sierra at Otay Ranch, 1A



- 1-Story Apartment**
1. 1Br/1Ba, 720 sq ft
 2. Compactness Ratio = $209/720 = 29\%$
 3. HWDS Factor = 0.05
 4. The water heater location could be where a central hot water system enters the apartment.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

Locating the wet rooms closer together and to the water heater that serves them reduces the cost of installing the hot water distribution system. Typical dwellings have very large compactness ratios, often much larger than the 60% cut off point for obtaining this credit. Reducing the ratio from 75% to 20% in a 1-story single family detached dwelling can reduce the first costs by \$1,000-2,000.

The reason we are not claiming a cost reduction is that there will be some cost for the architect to (re)design a given nominal floor plan to take advantage of the credit. For production builders this cost can be amortized over many homes, so at some point, it will cost less to build all future houses with this floor plan.

Another reason we are not claiming it will reduce construction costs is that if the buider chooses to take advantage of the credit by installing more than one water heater so that each water heater is close to the wet rooms it serves, there will be a cost for te second water heater. Some, perhaps all of the extra cost due to the additional water heater(s) will be offset by the reduced costs of the hot water distribution system. However, multiple water heaters are often installed in larger dwellings and where this is already the case, the marginal cost of locating closer to groups of wet rooms is likely to be small compared to the savings in the hot water distribution system. And in dwellings where a circulation loop was planned in order to get hot water to fixtures quickly, installing a second water heater close each group of wet rooms can eliminate the need for and costs of the circulation loop.

Proposal # 5450

RE162-19

RE163-19

IECC: TABLE R405.5.2(1) [IRC N1105.5.2(1)]

Proponent: Ed Osann, Natural Resources Defense Council, representing Natural Resources Defense Council (eosann@nrdc.org)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R405.5.2(1) [IRC N1105.5.2(1)]
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

Portions of table not shown remain unchanged.

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Service water heating ^{d, e, f, g}	As proposed. Use: same as proposed design.	As proposed Use, in units of gal/day = 30 <u>25.5</u> + (4 0 <u>8.5</u> × N _{br}) where: N _{br} = number of bedrooms.

For SI: 1 square foot = 0.93 m², 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m², 1 gallon (US) = 3.785 L,

°C = (°F-32)/1.8, 1 degree = 0.79 rad.

- d. For a proposed design with multiple heating, cooling or water heating systems using different fuel types, the applicable standard reference design system capacities and fuel types shall be weighted in accordance with their respective loads as calculated by accepted engineering practice for each equipment and fuel type present.
- e. For a proposed design without a proposed heating system, a heating system having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and proposed design.
- f. For a proposed design home without a proposed cooling system, an electric air conditioner having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and the proposed design.
- g. For a proposed design with a nonstorage-type water heater, a 40-gallon storage-type water heater having the prevailing federal minimum energy factor for the same fuel as the predominant heating fuel type shall be assumed. For a proposed design without a proposed water heater, a 40-gallon storage-type water heater having the prevailing federal minimum efficiency for the same fuel as the predominant heating fuel type shall be assumed for both the proposed design and standard reference design.

Reason: This proposal will revise the formula in Table R405.5.2(1) that specifies the volume of domestic hot water usage in the residential performance path. This formula has remained unchanged in the code since the very first edition of the IECC in 1998, even as residential hot water usage declined over this period. The proposal will reduce the stipulated daily volume of service hot water use by 15%. For example, under the current formula, the daily hot water use of a 3-bedroom home is 60 gallons, while under the proposal a 3-bedroom home would be assumed to draw 51 gallons of hot water. The formula currently applies to both the standard reference design and the builder's proposed design, and the proposal does not change this parity. Nor does the proposal change any other aspect of DHW system design or water heater selection. By overestimating hot water usage, the current formula overstates the relative share of hot water energy use compared with all other energy uses included in the performance path analysis. Revising this formula will make the characterization of hot water energy use more realistic, and acknowledge the progress made in improving the efficiency of hot water use over the last 20 years.

Background

The current formula for domestic hot water use has remained unchanged since the first edition of the IECC in 1998. It appears to have had its origin in the last CABO energy code development process of 1995-96, which produced a draft text that became the ICC's template for the the first edition of the IECC. (ICC Staff) In the 20+ years since the adoption of this formula, the drivers of domestic hot water usage have changed, in large part due to federal efficiency standards that save energy by reducing hot water use.

The US Department of Energy recognized that previous assumptions about residential hot water use were too high during the development of the current water heater efficiency standard adopted in 2010. (DOE STD) In the course of developing this standard, DOE reviewed the hot water model developed during the previous rulemaking that concluded in 2001 and was based on 1990s-era appliance performance. For its new analysis, DOE developed a new set of draw patterns based on field data assembled in a Lawrence Berkeley National Laboratory report. (Lutz et al) The LBNL report incorporated data collected by 10 independent studies involving 142 houses averaging 3.04 occupants, and 1.5 million hot water draws. The LBNL report found an average daily median volume of hot water use among its sample of 50.6 gallons.

In its 2009 Technical Support Document (DOE TSD) for the 2010 water heater standard, DOE noted that --

"The Hot Water Draw Model incorporates the parameters for clothes washer and dishwasher hot water use. These parameters reflect assumptions about clothes washer and dishwasher water use as they existed in the 1990s. Since that time, there has been a considerable change to clothes washer and dishwasher technology that has resulted in lower hot water use. In particular, updated Federal energy conservation standards for clothes washers that became effective in 2007 and for dishwashers that will become effective in 2010 have a significant impact on clothes washer and dishwasher hot water use.

The baseline water use for clothes washers in the 1990s was 39.2 gallons/cycle and the water use calculated based on the 2007 standard is 21.0 gallons/cycle. The baseline water use for dishwashers in the 1990s was 8.2 gallons/cycle and the water use calculated based on the 2010 standard is 6.5 gallons/cycle. Therefore, DOE updated the draw model to account for the reduced hot water use by adjusting the dishwasher and clothes washer water use variables to account for the new standards. The results are shown in Table 7-B.3.1. For example, the impact on gas-fired storage water heaters was a reduction of the average daily water use by 10.7 percent."

In the TSD's accompanying table, the results of these revisions to the draw model are shown for four types of water heater (gas-fired storage, electric, oil-fired, and gas instantaneous), with water use reductions for all of them clustering close to the average reduction of 10.1 percent for the group.

DOE took further note in the reduction in residential hot water use during the development of a revised test procedure for hot water heaters adopted in 2014. In its 2013 NOPR on the revised test procedure (DOE TP NOPR), DOE referred once again to the LBNL report, stating --

"LBNL found that typical usage in North America is characterized by . . . a smaller volume of water per day than is currently prescribed in the residential test method . . . "

More recently, the Water Research Foundation's "Residential End Use of Water, Version 2" (REUWS 2) report published in 2016 documented substantial reductions in residential indoor water use compared with a similar assesment in 1999. Additionally, REUWS 2 specifically collected data on hot water use in a subset of its sampled homes (94 homes in 10 cities), and found an average use of 45.5 gallons per household per day. The median number of bedrooms in this sample was 3.0, which squares with the US national median bedroom count of 3.0 recorded by the US Census in 2015. (CENSUS)

Thus, LBNL's assessment published in 2010 found a median draw of 50.6 gallons per day and encouraged DOE to reduce the draw volumes in the hot water model for the 2010 efficiency standard as well as the draw volumes in the water heater test procedure revised in 2014. REUWS 2 corroborated the downward trend found by LBNL with a median daily draw of 45.5 gallons. In light of the foundational role of the LBNL report in the daily draw volumes used in both the current water heater standard and the water heater test procedure, this proposal achieves alignment between the data relied upon by DOE and the water usage stipulated for the performance path analysis in Table R405.5.2(1) by reducing the constants in the formula by 15%.

Effects of Proposal

The effect of the revision of the formula on the assumed daily hot water use in homes of varying numbers of bedrooms can be seen in the following table.

Service Hot Water Daily Usage for Reference Design and Proposed Design in Energy Performance Analysis

Home Bedroom Count	Current Formula	Revised Formula
2 Bedroom Home	50 gal/day	42.5 gal/day
3 Bedroom Home	60 gal/day	51.0 gal/day
4 Bedroom Home	70 gal/day	59.5 gal/day
5 Bedroom Home	80 gal/day	68.0 gal/day

It should be remembered that the daily hot water usage established by the formula in Table R405.5.2(1) does NOT serve as a performance requirement for appliances or fixtures in the home. Rather, it simply provides the deemed value of daily water use upon which the energy consumption of various equipment choices made by the builder can be quantified and brought into the calculation of the annual energy cost (or source energy consumption) of the whole building. The revision to the formula in this proposal would make the values used for hot water energy consumption in the performance analysis more reflective of recent residential water use patterns, and thus more realistic.

Bibliography: CENSUS, US Census Bureau, 2011-2015 American Community Survey 5-Year Estimates.

DOE STD, US Department of Energy, Final Rule, Energy Conservation Program: Energy Conservation Standards for Residential Water Heaters, Direct Heating Equipment, and Pool Heaters, Docket Number EE-2006-BT-STD-0129, *Federal Register*, April 10, 2010. p. 20112. Available at <<https://www.regulations.gov/document?D=EERE-2006-STD-0129-0005>>.

DOE TP NOPR, US Department of Energy, Notice of Proposed Rulemaking, Energy Conservation Program for Consumer Products and Certain

Commercial and Industrial Equipment: Test Procedures for Residential and Commercial Water Heaters, *Federal Register*, November 4, 2013, p. 66202. Available at <<https://www.regulations.gov/document?D=EERE-2011-BT-TP-0042-0051>>.

DOE TSD, US Department of Energy, Notice of Proposed Rulemaking, *Technical Support Document*, Energy Conservation Program for Consumer Products: Energy Conservation Standards for Residential Water Heaters, Direct Heating Equipment, and Pool Heaters, November 23, 2009. Available at <<https://www.regulations.gov/document?D=EERE-2006-STD-0129-0170>>.

ICC Staff, Personal communication in response to a code history question, Fred Grable e-mail, Dec. 17, 2018.

Lutz et al, *Hot Water Draw Patterns in Single-Family Houses: Findings from Field Studies*, Lawrence Berkeley National Laboratory, LBNL-4830E, May 2011. Available at <<https://escholarship.org/us/item/2k24v1kj>>.

REUWS 2, DeOreo et al, *Residential End Uses of Water, Version 2*, Water Research Council, Report 4309b, c. 2016. Available at <www.waterrf.org/Pages/Projects.aspx?PID=4309>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposal has no impact on the cost of construction. It revises the voluntary residential performance path by adjusting the volume of daily hot water usage assumed for *both* the reference design and the builder's proposed design. It contains no requirement that would raise the cost of water heating equipment.

Proposal # 5133

RE163-19

RE164-19

IECC: TABLE R405.5.2(1) [IRC N1105.5.2(1)]

Proponent: Gary Klein, representing self (gsmklein@comcast.net)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R405.5.2(1) [IRC N1105.5.2(1)]
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

Portions of table not shown remain unchanged.

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Service water heating ^{d, e, f, g}	As proposed. Use: same as proposed design.	As proposed Use, in units of gal/day = $30 + (10 \times N_{br})$ where: N_{br} = number of bedrooms.

For SI: 1 square foot = 0.93 m², 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m², 1 gallon (US) = 3.785 L,

°C = (°F-32)/1.8, 1 degree = 0.79 rad.

- g. For a proposed design with a nonstorage-type water heater, a 40-gallon storage-type water heater having an efficiency in accordance with the minimum federal efficiency standard using the same draw pattern from Appendix E, Subpart B of 10 CFR Part 430 (2019) for the same fuel as the predominant heating fuel type shall be assumed. For a proposed design without a proposed water heater, a 40-gallon storage-type water heater having an efficiency in accordance with the minimum federal efficiency standard using the same draw pattern from Appendix E, Subpart B of 10 CFR Part 430 (2019) for the same fuel as the predominant heating fuel type shall be assumed for both the proposed design and standard reference design.

Reason: Due to changes in 10 CFR § 430.32 (2018) the phrasing in this footnote needs to be revised. Due to the government shutdown it has not been possible to get comments from key staff on the proper way to revise this footnote.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The revision to the footnote will only change the requirements for comparing the proposed design to the standard reference design. It will not directly affect the actual cost of compliance.

Proposal # 5573

RE164-19

RE165-19

IECC: TABLE R405.5.2(2) [IRC N1105.5.2(2)]

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

TABLE R405.5.2(2) [IRC N1105.5.2(2)]
DEFAULT DISTRIBUTION SYSTEM EFFICIENCIES FOR PROPOSED DESIGNS^a

Portions of table not shown remain unchanged.

DISTRIBUTION SYSTEM CONFIGURATION AND CONDITION	FORCED AIR SYSTEMS	HYDRONIC SYSTEMS ^b
Distribution system components located in unconditioned space	—	0.95
Untested distribution systems entirely located in conditioned space ^c	0.88	1
<u>Proposed "reduced leakage" when the installed air distribution system is located entirely within the continuous air barrier assembly and building thermal envelope's defined conditioned space as verified through inspection before drywall has been installed^e</u>	0.96	—
"Ductless" systems ^d	1	—

For SI: 1 cubic foot per minute = 0.47 L/s, 1 square foot = 0.093 m², 1 pound per square inch = 6895 Pa, 1 inch water gauge = 1250 Pa.

- Default values in this table are for untested distribution systems, which must still meet minimum requirements for duct system insulation.
- Hydronic systems shall mean those systems that distribute heating and cooling energy directly to individual spaces using liquids pumped through closed-loop piping and that do not depend on ducted, forced airflow to maintain space temperatures.
- Entire system in conditioned space shall mean that no component of the distribution system, including the air-handler unit, is located outside of the conditioned space.
- Ductless systems shall be allowed to have forced airflow across a coil but shall not have any ducted airflow external to the manufacturer's air-handler enclosure.
- For homes with thermal distribution systems documented through visual verification at a rough stage of construction before drywall has been installed to be entirely within the continuous air barrier assembly and building thermal envelope of conditioned space, including all ducts and the manufacturer's air handler enclosure, a DSE of 0.96 shall be applied to the Proposed Design without the requirement to conduct duct leakage testing. Alternatively, Total leakage of not greater than 4 cfm per 100 ft² of conditioned floor area at a pressure difference of 0.1 inches w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure, shall be deemed to meet this requirement without measurement of leakage to outdoors.

Reason: The energy penalty or loss of duct leakage is different for duct systems that are located inside or outside of the buildings continuous air barrier assembly. The 2006 IECC recognized this in the IECC table titled, "DEFAULT DISTRIBUTION SYSTEM EFFICIENCIES FOR PROPOSED DESIGNS" that accompanies the proposed and reference home table for the Simulated Performance Alternative path. At some point this was removed, but since the energy code only requires testing for Total duct leakage it makes sense to add it back in. If the entirety of the duct system including the air handler cabinet is confirmed to be located inside conditioned space as defined by the continuous air barrier and thermal envelope assemblies, then the likelihood of the system leaking to the outdoors is little. Therefore, the energy loss of duct leakage to outside would also be little. If testing is not performed for duct leakage to outside a small penalty should be assessed which this proposal provided. If, alternatively, a total duct leakage test is performed then the total duct leakage test results can be used in the modeling for leakage to outside which this proposal also allows as long as the total duct leakage number is not greater than 4 CFM per 100 ft² of conditioned floor area.

This proposal, although allowing verified HVAC duct systems not to be tested for duct leakage to outdoors, does assess a DSE of 0.96 which equates to a 4% energy loss for the system. Thus, if needed for compliance or to allow designed tradeoffs to be calculated in the software, duct leakage could be tested to demonstrate a reduced leakage level below this rate.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

In most cases this proposal would lower the cost of 3rd party compliance with the IECC as a single total duct leakage test could be used to document location and leakage of the duct system allowing for no testing to occur to quantify duct leakage to the outdoors

Proposal # 5280

RE165-19

RE166-19

IECC: TABLE R405.5.2(1), [IRC N1105.5.2(1)]

Proponent: Gary Klein, representing self (gsmklein@comcast.net)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R405.5.2(1), [IRC N1105.5.2(1)]
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

Portions of table not shown remain unchanged.

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Service water heating ^{d, e, f, g}	<p>The efficiency shall be selected based on a water heater with the same first hour rating and draw pattern as the As proposed water heater.</p> <p>Use: same as proposed design.</p>	<p>As proposed</p> <p>Use, in units of gal/day = 30 + (10 × N_{br})</p> <p>where:</p> <p>N_{br} = number of bedrooms.</p>

For SI: 1 square foot = 0.93 m², 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m², 1 gallon (US) = 3.785 L,

°C = (°F-32)/1.8, 1 degree = 0.79 rad.

- a. Where required by the *code official*, testing shall be conducted by an *approved party*. Hourly calculations as specified in the *ASHRAE Handbook of Fundamentals*, or the equivalent, shall be used to determine the energy loads resulting from infiltration.
- b. The combined air exchange rate for infiltration and mechanical ventilation shall be determined in accordance with Equation 43 of 2001 *ASHRAE Handbook of Fundamentals*, page 26.24 and the “Whole-house Ventilation” provisions of 2001 *ASHRAE Handbook of Fundamentals*, page 26.19 for intermittent mechanical ventilation.
- c. Thermal storage element shall mean a component that is not part of the floors, walls or ceilings that is part of a passive solar system, and that provides thermal storage such as enclosed water columns, rock beds, or phase-change containers. A thermal storage element shall be in the same room as fenestration that faces within 15 degrees (0.26 rad) of true south, or shall be connected to such a room with pipes or ducts that allow the element to be actively charged.
- d. For a proposed design with multiple heating, cooling or water heating systems using different fuel types, the applicable standard reference design system capacities and fuel types shall be weighted in accordance with their respective loads as calculated by accepted engineering practice for each equipment and fuel type present.
- e. For a proposed design without a proposed heating system, a heating system having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and proposed design.
- f. For a proposed design home without a proposed cooling system, an electric air conditioner having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and the proposed design.
- g. For a proposed design with a nonstorage-type water heater, a 40-gallon storage-type water heater having the prevailing federal minimum energy factor for the same fuel as the predominant heating fuel type shall be assumed. For a proposed design without a proposed water heater, a 40-gallon storage-type water heater having the prevailing federal minimum efficiency for the same fuel as the predominant heating fuel type shall be assumed for both the proposed design and standard reference design.
- h. For residences with conditioned basements, R-2 and R-4 residences, and for townhouses, the following formula shall be used to determine glazing area:

$$AF = A_s \times FA \times F$$

where:

AF = Total glazing area.

A_s = Standard reference design total glazing area.

FA = (Above-grade thermal boundary gross wall area)/(above-grade boundary wall area + 0.5 × below-grade boundary wall area).

F = (above-grade thermal boundary wall area)/(above-grade thermal boundary wall area + common wall area) or 0.56, whichever is greater.

and where:

Thermal boundary wall is any wall that separates conditioned space from unconditioned space or ambient conditions.

Above-grade thermal boundary wall is any thermal boundary wall component not in contact with soil.

Below-grade boundary wall is any thermal boundary wall in soil contact.

Common wall area is the area of walls shared with an adjoining dwelling unit.

L and *CFA* are in the same units.

Reason: The method of test for water heater efficiency was updated in 10 CFR §430.32 (2018). The proposed changes to the service water heating row in the performance table reflect these changes.

The two deleted footnotes referred to in this row do not appear to be related to water heating.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The updates to the table are the same in both the standard reference and the proposed columns. No new requirements are imposed on construction practices, hence no changes to the cost of construction are expected.

Proposal # 5287

RE166-19

RE167-19

IECC: TABLE R405.5.2(1) [IRC N1105.5.2(1)]

Proponent: Marilyn Williams, representing NEMA (mar_williams@nema.org)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R405.5.2(1) [IRC N1105.5.2(1)]
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

Portions of table not shown remain unchanged.

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Air exchange rate	<p>The air leakage rate at a pressure of 0.2 inch w.g. (50 Pa) shall be Climate Zones 1 and 2: 5 air changes per hour <u>for spaces with ducted heating and cooling systems;</u> <u>4 air changes per hour for non-ducted heating and cooling systems. Climate Zones 3 through 8: 3 air</u> <u>changes per hour for spaces with ducted heating and cooling systems; 2 air changes per hour for</u> <u>non-ducted heating and cooling systems.</u></p> <p>The mechanical ventilation rate shall be in addition to the air leakage rate and shall be the same as in the proposed design, but not greater than $0.01 \times CFA + 7.5 \times (N_{br} + 1)$</p> <p>where:</p> <p>CFA = conditioned floor area, ft².</p> <p>N_{br} = number of bedrooms.</p> <p>Energy recovery shall not be assumed for mechanical ventilation.</p>	<p>The measured air exchange rate.^a</p> <p>The mechanical ventilation rate^b shall be in addition to the air leakage rate and shall be as proposed.</p>

For SI: 1 square foot = 0.93 m², 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m², 1 gallon (US) = 3.785 L,

°C = (°F-32)/1.8, 1 degree = 0.79 rad.

- a. Where required by the *code official*, testing shall be conducted by an *approved party*. Hourly calculations as specified in the *ASHRAE Handbook of Fundamentals*, or the equivalent, shall be used to determine the energy loads resulting from infiltration.

Reason: Energy losses through ductwork are recognized as significant and come from two distinct sources; air lost through ductwork to the outside and , separately, induced infiltration/exfiltration caused by duct pressurization. Air lost to the outside is self-explanatory and is, in fact, already recognized by the 2015 IECC (and earlier versions) in Table R405.5.2(2) where distribution system efficiency is discounted under certain common conditions,. In addition, there is growing recognition that ductwork design can have a significant impact on infiltration/exfiltration. On this basis, a reasonable person could conclude that, all other things being held constant, a non-ducted ERH systems would consume less energy than a ducted electric furnace. This proposal recognized the reduced infiltration impact of using non-ducted space heating.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal imposes no additional requirement and, thus, does not add costs.

Proposal # 4079

RE167-19

RE168-19

IECC: R202 (IRC N1101.6), TABLE R405.5.2(1) [IRC N1105.5.2(1)]

Proponent: Marilyn Williams, representing NEMA

2018 International Energy Conservation Code

Revise as follows:

**TABLE R405.5.2(1) [IRC N1105.5.2(1)]
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

Portions of table not shown remain unchanged.

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Heating systems ^{d, e}	<p>For other than electric heating without a heat pump: as proposed.</p> <p>Where the proposed design utilizes electric heating without a heat pump, the standard reference design shall be an air source heat pump meeting the requirements of Section C403 of the IECC—Commercial Provisions.</p> <p>Capacity: sized in accordance with Section R403.7.</p> <p><u>Exception: Where the proposed design is for grid-interactive electric thermal storage, the standard reference shall be as proposed.</u></p>	As proposed

d. For a proposed design with multiple heating, cooling or water heating systems using different fuel types, the applicable standard reference design system capacities and fuel types shall be weighted in accordance with their respective loads as calculated by accepted engineering practice for each equipment and fuel type present.

e. For a proposed design without a proposed heating system, a heating system having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and proposed design.

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Add new definition as follows:

GRID-INTERACTIVE ELECTRICAL THERMAL STORAGE (GETS). An energy storage system that provides electric system grid operators (utilities, ISO's, RTO's, etc) with variable control of a building's space and water heating end uses to assist in the real-time balancing of energy supply and demand on the electric grid and integration of renewable energy from solar and wind while providing low cost space and water heat for consumers.

Reason: GRID-Interactive Electric Thermal Storage (GETS) is an energy storage system that provides electric system grid operators (utilities, ISO's, RTO's, etc) with variable control of a building's space and water heating end uses to assist in the real-time balancing of energy supply and demand on the electric grid and integration of renewable energy from solar and wind while providing low cost space and water heat for consumers.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal imposes no additional requirement and, thus, does not add costs.

Proposal # 4080

RE168-19

RE169-19

IECC: TABLE R405.5.2(1) [IRC N1105.5.2(1)]

Proponent: Mike Moore, representing Broan-NuTone (mmoore@newportventures.net)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R405.5.2(1) [IRC N1105.5.2(1)]
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

Portions of table not shown remain unchanged.

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Air exchange rate	<p>The air leakage rate at a pressure of 0.2 inch w.g. (50 Pa) shall be Climate Zones 1 and 2: 5 air changes per hour. Climate Zones 3 through 8: 3 air changes per hour.</p> <p>The mechanical ventilation rate shall be in addition to the air leakage rate and shall be the same as in the proposed design, but not greater than $0.03 \times CFA + 7.5 \times (N_{br} + 1)$</p> <p>where:</p> <p>CFA = conditioned floor area, ft².</p> <p>N_{br} = number of bedrooms.</p> <p>Energy recovery shall not be assumed for mechanical ventilation.</p>	<p>The measured air exchange rate.^a</p> <p>The mechanical ventilation rate^b shall be in addition to the air leakage rate and shall be as proposed.</p>
Mechanical ventilation	<p>Where mechanical ventilation is not specified in the proposed design: None</p> <p>Where mechanical ventilation is specified in the proposed design, the annual vent fan energy use, in units of kWh/yr, shall equal:</p> $(1/e_f) \times [0.0876 \times CFA + 65.7 \times (N_{br} + 1)]$ <p>where:</p> <p>e_f = the minimum exhaust fan efficacy, as specified in Table R403.6.1, corresponding to <u>the flow rate of the proposed design</u> a flow rate of $0.01 \times CFA + 7.5 \times (N_{br} + 1)$</p> <p>CFA = conditioned floor area, ft².</p> <p>N_{br} = number of bedrooms.</p>	<p>As proposed</p>

For SI: 1 square foot = 0.93 m², 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m², 1 gallon (US) = 3.785 L,

°C = (°F-32)/1.8, 1 degree = 0.79 rad.

- a. Where required by the *code official*, testing shall be conducted by an *approved party*. Hourly calculations as specified in the *ASHRAE Handbook of Fundamentals*, or the equivalent, shall be used to determine the energy loads resulting from infiltration.

Reason: ASHRAE 62.2 is the ANSI consensus standard for determining the ventilation flow rates needed to provide minimum acceptable indoor air quality. It is well known that ASHRAE 62.2 ventilation rates can be higher than IRC ventilation rates, especially for tight dwelling units. As homes get tighter, ASHRAE's rates go up. On the other hand, the IRC's rates are constant regardless of how tight a dwelling unit is; a home with an air tightness of 0.5 ACH50 would require the same amount of ventilation as a home with an air tightness of 5 ACH50, resulting in drastically fewer air changes for the tight home and putting the tight home at risk for poor indoor air quality. When using the performance path to comply with the IECC (i.e., Table R405.5.2(1)), a high performance home with a tight dwelling unit is penalized for following adjusting its ventilation rate upward to

compensate for the decrease in infiltration air changes. This table should not penalize homes for maintaining minimum IAQ in accordance with ANSI consensus standards. As such, the flow rate for the reference home should still be equal to the proposed design homes flow rate, but should also be capped at the ASHRAE 62.2 rate. Under this scenario, flow rates for the proposed design exceeding the minimum ASHRAE flow rate (based on the simplified compliance path equation of $0.3 \cdot CFA + 7.5 \cdot (Nbr+1)$) will still be penalized for additional energy used.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal has no bearing on the cost of construction as it does not require builders to size ventilation systems differently. It simply permits builders to not be penalized if electing to set ventilation air flow rates equal to that established within the ANSI consensus standard for minimum acceptable indoor air quality.

Proposal # 5416

RE169-19

RE170-19

IECC: TABLE R405.5.2(1) [IRC N1105.5.2(1)]

Proponent: Marilyn Williams, representing National Electrical Manufacturers Association

2018 International Energy Conservation Code

Revise as follows:

**TABLE R405.5.2(1) [IRC N1105.5.2(1)]
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

Portions of table not shown remain unchanged.

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Heating systems ^{d, e}	For other than <u>forced-air</u> electric heating without a heat pump: as proposed. Where the proposed design utilizes forced-air electric heating without a heat pump, the standard reference design shall be an air source heat pump meeting the requirements of Section C403 of the IECC—Commercial Provisions. Capacity: sized in accordance with Section R403.7. <u>Where the proposed design utilizes non-forced-air electric heating: as proposed.</u>	As proposed

For SI: 1 square foot = 0.93 m², 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m², 1 gallon (US) = 3.785 L,

°C = (°F-32)/1.8, 1 degree = 0.79 rad.

- d. For a proposed design with multiple heating, cooling or water heating systems using different fuel types, the applicable standard reference design system capacities and fuel types shall be weighted in accordance with their respective loads as calculated by accepted engineering practice for each equipment and fuel type present.
- e. For a proposed design without a proposed heating system, a heating system having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and proposed design.

Reason: As it is written, Table R405.5.2(1) requires a modeler to assume a heat pump system whenever a designer proposes to use "... other than electric heating without a heat pump," *i.e.*, electric resistance or electric radiant heating (collectively "ERH") in a new residence. While perhaps serving a valuable function in some fashion (elimination of gaming where a modeler assumes an electric furnace for the reference house and then proposes a heat pump allowing a less stringent envelope), the limitation on use of ERH in the modeling is overly restrictive. ERH is available in many different applications and the performance characteristics of non-ducted ERH are very different from the performance characteristics of ducted heating systems, whether fueled by electricity, gas, or any other fuel. In addition to no duct energy losses, non-ducted ERH also enjoys significant energy savings from zoning. This proposal attempts to preserve the benefit of eliminating gaming while still recognizing the energy savings potential of non-ducted ERH. In addition, this proposal cites the heat pump specific provisions of the IECC commercial provisions rather than simply citing the commercial chapter.

Substantiation: ERH is available in a number of different configurations, including electric furnace, baseboard, radiant, energy storage and PTAC. For purposes of this proposal, however, only non-ducted ERH is being considered. The operational and energy consumption characteristics of ducted vs. non-ducted ERH are significant and are at the core of the rationale behind this code change proposal. Unfortunately, ducted and non-ducted ERH systems are often grouped together (as they are in the existing code language).

Language like that found currently in Table R405.5.2(1) that requires a modeler to assume a heat pump in the reference house, even if the designer intends to use electric baseboard heating in the proposed house, has been in the IECC for many years. The justification cited historically for that modeling limitation is:

- That modelers will game the system by assuming ERH in the reference house but a heat pump in the proposed house, thereby allowing a less stringent envelope, and/or
- That a heat pump will consume on the order of half the energy of an electric furnace installed in the same house so the code should discourage designers from specifying ERH and instead should specify a heat pump.

With respect to the former of these justifications, the current language requiring the same equipment to be modeled in both the reference and the proposed designs denies any opportunity to game the system as described above.

That leaves the latter as the sole justification for the modeling restriction against using electric resistance heating as the equipment assumption in the

reference house. To some extent, this seems appropriate. If, for instance, in a heating dominated climate, a designer is proposing to install a ducted electric furnace with central air-conditioning, then inciting that designer to use a heat pump instead would probably be expected to save significant amounts of energy at a relatively modest cost.

But there are significant operational and energy consumption characteristics that distinguish **ducted from non-ducted** ERH as described in more detail below.

Ducted vs. non-ducted heating systems. Non-ducted ERH has significantly different operational and energy consumption characteristics from ducted heating systems.

Fan Power. Numerous studies over the last decade have identified furnace fan energy usage as more significant than before believed. As a result, the U.S. Department of Energy has initiated a rulemaking to establish a test procedure for determining furnace fan energy. Likewise, the Environmental Protection Agency now has an Energy Star rating for efficient furnace fans. Of course, non-ducted ERH like baseboard or radiant doesn't use a fan. On this basis, a reasonable person could conclude that, all other things being held constant, a non-ducted heating system (without a fan) would consume less energy than a ducted system with a fan using the same technology (gas, oil, electric resistance, etc.) .

Duct loss and fan induced infiltration. Energy losses through ductwork are recognized as significant and come from two distinct sources; air lost through ductwork to the outside and induced infiltration/exfiltration caused by duct pressurization. Air lost to the outside is self-explanatory and is, in fact, already recognized by the 2012 IECC (and earlier versions) in Table R405.5.2(2) where distribution system efficiency is discounted under certain common conditions. In addition, there is growing recognition that ductwork design can have a significant impact on infiltration/exfiltration. On this basis, a reasonable person could conclude that, all other things being held constant, a non-ducted ERH system would consume less energy than a ducted electric furnace.

Zoning. Ducted, central heating, whether it be a ducted heat pump, electric furnace, gas furnace or other, is designed to serve large areas, most often an entire house. Non-ducted ERH, on the other hand, generally divides a house up into numerous independently controlled zones. The energy efficiency benefits of zoning are well documented as it allows users to heat only those areas that are occupied resulting in significant savings. On this basis, a reasonable person could conclude that, all other things being held constant, a zoned, non-ducted heating system would consume less energy than a ducted heating system using the same technology (gas, oil, electric resistance, etc.).

Additional considerations. Few people would argue that, at the margin, a zoned, non-ducted ERH would be expected to consume fewer btu's over the course of a winter than a ducted electric furnace. In addition to these operational differences, however, (no fan energy, no duct losses, benefits of zoning), there are other reasons why ERH should be treated differently from ducted heating systems as noted below.

Cooling. There are still a non-trivial amount of new homes built in the United States every year without central cooling. According to the EIA, over 800,000 new homes were built between 2000 and 2009 without air-conditioning. A recent study in the Pacific Northwest revealed a relationship between increased use of cooling energy in homes that use heat pumps vis-à-vis electric furnaces. While there are a number of potential explanations, at least one explanation is that people using non-ducted ERH consciously decline to install air conditioning. Thus, inciting the use of heat pumps over ERH may have the unintended result of increasing summer cooling energy.

Cooling dominated climate. In cooling dominated climates, with relatively few heating degree days (DOE Climate Zones 1 & 2), driving a builder to use a heat pump which would save relatively little – if any – heating energy due to the warm climate would result in fewer dollars for that builder to spend on other things like more attic insulation or higher SEER air-conditioning – something that would actually result in energy savings.

Non-ducted ERH has significantly different operating characteristics than ducted heating systems.

With respect to the assumption that a heat pump system will consume less than half the btus's of an electric resistance heating system because the heat pump has a COP of 2 or better, this assumption may be valid for a comparison between a ducted heat pump and a ducted electric resistance furnace, but it not accurate for non-ducted, zoned ERH (See Note 1 below)

In a study conducted by the National Association of Home Builders Research Center for the U.S. Department of Energy, an occupied house in the Washington, D.C. area was monitored for performance over a winter. The house contained three distinct heating systems; central electric heat pump, electric radiant heat, and electric baseboard heat. After the data was weather normalized, it revealed that, under actual homeowner controlled conditions, the electric radiant system used 33% percent less energy than the heat pump system and 52% less than the electric baseboard system. Thus, the heat pump only saved about 28% the energy consumed by the electric baseboard system.

Heat pumps are a great option when a person wants a central, ducted heating and cooling system but they having different operating characteristics from a non-ducted heating system.

Note 1. Recent field data from a large survey of homes suggests that the actual (vs. theoretical) relationship may not be as well understood as previously believed. See study at http://www.nwcouncil.org/energy/rtf/meetings/2009/04/Draft%202008%20NEEM%20Study_040608.pdf (p. 21) where observed heat pump energy savings were far short of expectations and the report said

“For the heat pump cases, however, the apparent similarity between electric resistance and heat pump systems suggest minimal savings for the more efficient heat pump option. Some form of behavioral —takeback||, poor heat pump installations or increased summer cooling load for heat pumps vis-à-vis resistance houses seem the likeliest explanations. Given that a number of the zone 1 sites (e.g.: Medford, Oregon; Yakima, Washington; and The Dalles, Oregon), have cooling climates, the latter seems plausible. A possible alternate contributing explanation is that these heat pump units do not in fact achieve an average COP of as much as 2 under actual operating conditions. Field notes from heat pump cases in the Oregon sample (a high percentage of heat pumps) mentioned occupants who complained about a lack of comfort to their heating contractor and were told by their heating contractors to switch the heat pumps to run in electric resistance heating mode.”

Bibliography: Study of manufactured housing in the Pacific Northwest,
http://www.nwcouncil.org/energy/rtf/meetings/2009/04/Draft%202008%20NEEM%20Study_040608.pdf

NAHB Radiant Heat Study, http://www.toolbase.org/PDF/CaseStudies/enerjoy_case_study.pdf

For an Alliance to Save Energy video on the benefits of zoning see <http://www.energynow.com/video/2011/11/16/home-efficiency-tips-heating-and-cooling-zones> where the moderator quotes the Department of Energy as saying that zoning can save up to 30% on home heating and cooling bills.

For information on duct leakage see <http://www.greenbuildingadvisor.com/blogs/dept/musings/duct-leakage-testing>. Also see EPA Energy Star guidance at http://www.energystar.gov/index.cfm?c=home_improvement.hm_improvement_ducts.

For information on fan induced infiltration into buildings see http://www.buildingscience.com/documents/digests/bsd-014-air-flow-control-in-buildings/files/bsd-014_air-flow-control_ed.pdf.

For an article on the significance of furnace fan energy see <http://aceee.org/proceedings-paper/ss08/panel02/paper09>. Also see U.S. Department of Energy Appliance Efficiency furnace fan docket at http://www1.eere.energy.gov/buildings/appliance_standards/residential/furnace_fans.html.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal imposes no additional requirement and, thus, does not add costs.

Proposal # 4081

RE170-19

RE171-19

IECC: TABLE R405.5.2(1) [IRC N1105.5.2(1)]

Proponent: Joel Martell, representing National Association of Home Builders (jmartell@nahb.org)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R405.5.2(1) [IRC N1105.5.2(1)]
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

Portions of table not shown remain unchanged.

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Thermal distribution systems	<p>Duct insulation: in accordance with Section R403.3.1.</p> <p>A thermal distribution system efficiency (DSE) of 0.88 shall be applied to both the heating and cooling system efficiencies. for all systems other than tested duct systems.</p> <p>Exception: For nonducted heating and cooling systems that do not have a fan, the standard reference design thermal distribution system efficiency. (DSE) shall be 1.</p> <p>For tested duct systems, the leakage rate shall be 4 cfm (113.3 L/min) per 100 ft² (9.29 m²) of conditioned floor area at a pressure of differential of 0.1 inch w.g. (25 Pa).</p>	<p>Duct insulation: as proposed.</p> <p>As tested or, where not tested, as specified in Table R405.5.2(2)</p>

For SI: 1 square foot = 0.93 m², 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m², 1 gallon (US) = 3.785 L,

°C = (°F-32)/1.8, 1 degree = 0.79 rad.

Proposal # 4814

RE171-19

RE172-19

IECC: R405.5.2.(1) [IRC N1105.5.2(1)]

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com); Chris McTaggart, representing Building Efficiency Resources (cmctaggart@theber.com); Shauna Mozingo (sdmozingo@shaunnamozingo.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R405.5.2(1) [IRC N1105.5.2(1)]
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

Portions of table not shown remain unchanged.

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Thermal distribution systems	Duct insulation: in accordance with Section R403.3.1. A thermal distribution system efficiency (DSE) of 0.88 shall be applied to both the heating and cooling system efficiencies for all systems other than tested duct systems. <u>Duct location: same as proposed design.</u> Exception: For nonducted heating and cooling systems that do not have a fan, the standard reference design thermal distribution system efficiency (DSE) shall be 1. For tested duct systems, the leakage rate shall be 4 cfm (113.3 L/min) per 100 ft ² (9.29 m ²) of conditioned floor area at a pressure of differential of 0.1 inch w.g. (25 Pa).	Duct insulation: as proposed. <u>Duct location: as proposed</u> As tested or, where not tested, as specified in Table R405.5.2(2)

For SI: 1 square foot = 0.93 m², 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m², 1 gallon (US) = 3.785 L,

°C = (°F-32)/1.8, 1 degree = 0.79 rad.

Reason: Duct location plays a significant role in the energy performance of the HVAC distribution system yet the location has not been specifically called out in the specification for the standard reference and proposed design. Most software that I am aware of that model for compliance using the Simulated Performance path interpret the model to include duct location so this addition to the language of the specification justifies that modeling interpretation.

In addition, the modeling software models the energy penalty associated with duct leakage to outside not total duct leakage. The additional language of this proposal makes it clear which duct leakage test is being used in the modeling.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
There is no cost impact to the language clarification that is offered through the adoption of this proposal.

Proposal # 5279

RE172-19

RE173-19

IECC: TABLE R405.5.2(1) [IRC N1105.5.2(1)]

Proponent: Mike Moore, representing Broan-NuTone (mmoore@newportventures.net)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R405.5.2(1) [IRC N1105.5.2(1)]
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

Portions of table not shown remain unchanged.

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Dehumidistat	<p><u>Where a mechanical ventilation system with latent heat recovery is not specified in the proposed design: None.</u></p> <p><u>Where the proposed design utilizes a mechanical ventilation system with latent heat recovery:</u></p> <p><u>Dehumidistat type: Manual, setpoint = 60% relative humidity.</u></p> <p><u>Dehumidifier: whole-home with integrated energy factor = 1.77 liters/kWh.</u></p>	<p><u>Same as standard reference design.</u></p>

For SI: 1 square foot = 0.93 m², 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m², 1 gallon (US) = 3.785 L,

°C = (°F-32)/1.8, 1 degree = 0.79 rad.

- a. Where required by the *code official*, testing shall be conducted by an *approved party*. Hourly calculations as specified in the *ASHRAE Handbook of Fundamentals*, or the equivalent, shall be used to determine the energy loads resulting from infiltration.
- b. The combined air exchange rate for infiltration and mechanical ventilation shall be determined in accordance with Equation 43 of 2001 *ASHRAE Handbook of Fundamentals*, page 26.24 and the “Whole-house Ventilation” provisions of 2001 *ASHRAE Handbook of Fundamentals*, page 26.19 for intermittent mechanical ventilation.
- c. Thermal storage element shall mean a component that is not part of the floors, walls or ceilings that is part of a passive solar system, and that provides thermal storage such as enclosed water columns, rock beds, or phase-change containers. A thermal storage element shall be in the same room as fenestration that faces within 15 degrees (0.26 rad) of true south, or shall be connected to such a room with pipes or ducts that allow the element to be actively charged.
- d. For a proposed design with multiple heating, cooling or water heating systems using different fuel types, the applicable standard reference design system capacities and fuel types shall be weighted in accordance with their respective loads as calculated by accepted engineering practice for each equipment and fuel type present.
- e. For a proposed design without a proposed heating system, a heating system having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and proposed design.
- f. For a proposed design home without a proposed cooling system, an electric air conditioner having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and the proposed design.
- g. For a proposed design with a nonstorage-type water heater, a 40-gallon storage-type water heater having the prevailing federal minimum energy factor for the same fuel as the predominant heating fuel type shall be assumed. For a proposed design without a proposed water heater, a 40-gallon storage-type water heater having the prevailing federal minimum efficiency for the same fuel as the predominant heating fuel type shall be assumed for both the proposed design and standard reference design.
- h. For residences with conditioned basements, R-2 and R-4 residences, and for townhouses, the following formula shall be used to determine glazing area:

$$AF = A_s \times FA \times F$$

where:

AF = Total glazing area.

A_s = Standard reference design total glazing area.

FA = (Above-grade thermal boundary gross wall area)/(above-grade boundary wall area + 0.5 × below-grade boundary wall area).

F = (above-grade thermal boundary wall area)/(above-grade thermal boundary wall area + common wall area) or 0.56, whichever is

greater.

and where:

Thermal boundary wall is any wall that separates conditioned space from unconditioned space or ambient conditions.

Above-grade thermal boundary wall is any thermal boundary wall component not in contact with soil.

Below-grade boundary wall is any thermal boundary wall in soil contact.

Common wall area is the area of walls shared with an adjoining dwelling unit.

L and *CFA* are in the same units.

Reason: Addressing latent loads associated with ventilation air can require a large amount of energy, especially in humid climates. Specification of energy recovery ventilators (ERVs) for mechanical ventilation can reduce the latent loads associated with ventilation air; however, there is no way to account for the ability of ERVs to reduce latent loads of ventilation air within Table N1105.5.2(1). This proposal establishes a method for accounting for the latent energy savings of ERVs where specified in the proposed design. A target of 60% relative humidity is typical for the upper bound in residential applications; above this level, there can be problems associated with moisture and condensation, negatively affecting building durability and indoor air quality; using a setpoint below this level can significantly increase energy use of the dehumidifier (and perhaps over-emphasize the benefit of ERVs in typical residential applications). The energy factor used for the dehumidifier (1.77 liters/kWh) is identical to the minimum value listed in the code of federal regulations (10 CFR 430.32) for typical whole-home dehumidifiers (i.e., those with a case volume < 8 ft³).

Cost Impact: The code change proposal will decrease the cost of construction. Where ERVs are specified, this measure can reduce the cost of construction by reducing the annual energy costs associated with the proposed design and permitting more flexibility in design.

Proposal # 5336

RE173-19

RE174-19

IECC: TABLE R405.5.2(1) [IRC N1105.5.2(1)]

Proponent: Maston Stafford, TexEnergy Solutions, representing Self (maston.stafford@texenergy.org)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R405.5.2(1) [IRC N1105.5.2(1)]
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

Portions of table not shown remain unchanged.

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Mechanical ventilation	<p>Where mechanical ventilation is not specified in the proposed design: None Where mechanical ventilation is specified in the proposed design, the annual vent fan energy use, in units of kWh/yr, shall equal:</p> $(1/e_f) \times [0.0876 \times CFA + 65.7 \times (N_{br} + 1)]$ <p>where: e_f = the minimum exhaust fan efficacy, as specified in Table R403.6.1, corresponding to a flow rate of $0.01 \times CFA + 7.5 \times (N_{br} + 1)$</p> <p>CFA = conditioned floor area, ft².</p> <p>N_{br} = number of bedrooms.</p>	<p>As proposed</p> <p><u>Use, in units of kWh/yr = 0.365 x W x H x (CFM required / CFM proposed)</u></p> <p><u>Where:</u></p> <p><u>W = fan watts of proposed mechanical ventilation fan</u></p> <p><u>H = hours per day that the mechanical ventilation fan is proposed to run.</u></p> <p><u>CFM required = (0.01 x CFA + 7.5 x (N_{br} + 1).</u></p> <p><u>CFA = conditioned floor area, ft²</u></p> <p><u>N_{br} = number of bedrooms</u></p>

For SI: 1 square foot = 0.93 m², 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m², 1 gallon (US) = 3.785 L,

°C = (°F-32)/1.8, 1 degree = 0.79 rad.

Reason: The design of the mechanical ventilation system can have a large impact on the energy performance of a dwelling. This impact is not included in the Performance Path however and as a result there is no difference in the between using a 20 watt exhaust fan or 600 watt AHU to deliver 50 CFM of air. As the minimum efficiencies of mechanical ventilation systems are not governed by NAECA and efficiency floors are already included in the IECC in R403.6 it seems reasonable to include potential efficiency gains based on design selection in the Performance Path similar to the Air exchange rate and Thermal distribution systems.

Cost Impact: The code change proposal will decrease the cost of construction

By allowing mechanical ventilation systems to be modeled appropriately, correct (and smaller) equipment sizes will lower construction costs

Proposal # 5560

RE174-19

RE175-19

IECC: R405.2 (IRC N1105.2), TABLE R405.5.2(1) [IRC N1105.2(1)]

Proponent: Joel Martell, representing National Association of Home Builders (jmartell@nahb.org)

2018 International Energy Conservation Code

Revise as follows:

R405.2 (IRC N1105.2) Mandatory requirements. Compliance with this section requires that the mandatory provisions identified in Section R401.2 be met. ~~met.~~ The proposed total building thermal envelope UA, which is the sum of U-factor times the assembly area shall be less than or equal to the UA of the building thermal envelope using the prescriptive U-factors from Table R402.1.4 multiplied by 1.15 in accordance with Equation 4-1. All Supply and return ducts not completely inside the *building thermal envelope* shall be insulated to an *R*-value of not less than R-6.

Equation 4-1: $UA_{\text{proposed design}} \leq 1.15 \times UA_{\text{prescriptive reference design}}$

**TABLE R405.5.2(1) [IRC N1105.2(1)]
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

Portions of table not shown remain unchanged.

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Heating systems ^{d, e, i}	For other than electric heating without a heat pump, as proposed: Where the proposed design utilizes electric heating without a heat pump, the standard reference design shall be an air source heat pump meeting the requirements of Section C403 of the IECC—Commercial Provisions.	As proposed
	Capacity: sized in accordance with Section R403.7.	
	<u>Fuel Type/ Capacity: Same as proposed design</u>	As Proposed
	<u>Product class: Same as proposed design</u>	As Proposed
	<u>Efficiencies:</u>	
	<u>Heat pump: Complying with 10 CFR §430.32 (2018)</u>	As Proposed
	<u>Furnaces: Complying with 10 CFR §430.32 (2018)</u>	As Proposed
Cooling systems ^{d, f}	As proposed. Capacity: sized in accordance with Section R403.7.	As proposed
	<u>Fuel Type/ Capacity: Same as proposed design</u>	As Proposed
	<u>Efficiencies: Complying with 10 CFR §430.32 (2018)</u>	As Proposed
Service water heating ^{d, e, f, g}	As proposed. Use: same as proposed design.	As proposed Use, in units of gal/day = $30 + (10 \times N_{br})$ where: N_{br} = number of bedrooms.
	<u>Fuel Type: Same as proposed design</u>	As proposed
	<u>Rated Storage Volume: Same as proposed design</u>	As proposed
	<u>Draw Pattern: Same as proposed design</u>	As proposed
	<u>Efficiencies: Uniform Energy Factor complying with 10 CFR §430.32 (2018)</u>	As proposed
	<u>Use: gal/day = $30 + 10 \times N_{br}$</u>	Same as standard reference
	<u>Tank temperature: 120 °F</u>	Same as standard reference

For SI: 1 square foot = 0.93 m², 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m², 1 gallon (US) = 3.785 L,

°C = (°F-32)/1.8, 1 degree = 0.79 rad.

- a. Where required by the *code official*, testing shall be conducted by an *approved* party. Hourly calculations as specified in the ASHRAE *Handbook of Fundamentals*, or the equivalent, shall be used to determine the energy loads resulting from infiltration.
- b. The combined air exchange rate for infiltration and mechanical ventilation shall be determined in accordance with Equation 43 of 2001 ASHRAE *Handbook of Fundamentals*, page 26.24 and the "Whole-house Ventilation" provisions of 2001 ASHRAE *Handbook of Fundamentals*, page 26.19 for intermittent mechanical ventilation.
- c. Thermal storage element shall mean a component that is not part of the floors, walls or ceilings that is part of a passive solar system, and that provides thermal storage such as enclosed water columns, rock beds, or phase-change containers. A thermal storage element shall be in the same room as fenestration that faces within 15 degrees (0.26 rad) of true south, or shall be connected to such a room with pipes or ducts that allow the element to be actively charged.
- d. For a proposed design with multiple heating, cooling or water heating systems using different fuel types, the applicable standard reference design system capacities and fuel types shall be weighted in accordance with their respective loads as calculated by accepted engineering practice for each equipment and fuel type present.
- e. For a proposed design without a proposed heating system, a heating system having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and proposed design.
- f. For a proposed design home without a proposed cooling system, an electric air conditioner having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and the proposed design.
- g. For a proposed design with a nonstorage-type water heater, a 40-gallon storage-type water heater having the prevailing federal minimum energy factor for the same fuel as the predominant heating fuel type shall be assumed. For a proposed design without a proposed water heater, a 40-gallon storage-type water heater having the prevailing federal minimum efficiency for the same fuel as the predominant heating fuel type shall be assumed. the following assumptions shall be made for both the proposed design and standard reference design.

Fuel Type: Same as the predominant heating fuel type

Rated Storage Volume: 40 Gallons Draw Pattern: Medium Efficiency: Uniform Energy Factor complying with 10 CFR §430.32 (2018)

- h. For residences with conditioned basements, R-2 and R-4 residences, and for townhouses, the following formula shall be used to determine glazing area:

$$AF = A_s \times FA \times F$$

where:

AF = Total glazing area.

A_s = Standard reference design total glazing area.

FA = (Above-grade thermal boundary gross wall area)/(above-grade boundary wall area + 0.5 × below-grade boundary wall area).

F = (above-grade thermal boundary wall area)/(above-grade thermal boundary wall area + common wall area) or 0.56, whichever is greater.

and where:

Thermal boundary wall is any wall that separates conditioned space from unconditioned space or ambient conditions.

Above-grade thermal boundary wall is any thermal boundary wall component not in contact with soil.

Below-grade boundary wall is any thermal boundary wall in soil contact.

Common wall area is the area of walls shared with an adjoining dwelling unit.

L and CFA are in the same units.

- i. Electric resistance heating must use Split Systems-Heat Pumps HSPF found in 10 CFR §430.32 (2018) as the standard reference design.

Reason: This proposal includes energy neutral trade-offs for equipment efficiency, but also includes a reasonable thermal envelope through the addition of a UA backstop. The ERI compliance path reintroduced equipment efficiencies as part of energy neutral trade-offs and also included a new concept of requiring a reasonable minimum thermal envelope in a performance-type analysis. This proposal takes this "reasonable envelope" concept and applies it to the Simulated Performance Alternative (Section 405). However, rather than pointing to the prescriptive tables in a previous version of the IECC as is done in the ERI, the thermal backstop becomes a percent UA trade-off. The UA calculation will be performed internally with the compliance software. It is an easy calculation as all the necessary information is already entered (component area and U-factors/R-values). This should not be problematic as it is already done for windows. Energy neutral equipment trade-offs had been in the IECC residential section for years. Equipment trade-offs are included in every other energy code/standard and above code program in the United States:
IECC Commercial

ASHRAE 90.1

IgCC

National Green Building Standard

LEED Commercial

LEED for Homes

Energy Star

RESNET

The fear that has been spread with bringing back equipment trade-offs is that the envelope will be substandard. The proposed UA trade-off of 15% considered a reasonable envelope backstop. Quite often, the use of this high-efficiency equipment provides a more cost-effective solution to achieve code compliance. Eliminating this ability discourages the concept of the "house as a system" approach, which is a cornerstone of building science.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This will help achieve higher performing dwellings while adding flexibility.

Proposal # 4322

RE175-19

RE176-19

IECC: TABLE R405.5.2(1) [IRC N1105.5.2(1)], DOE Chapter 6

Proponent: Craig Conner, representing self (craig.conner@mac.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R405.5.2(1) [IRC N1105.5.2(1)]
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

Portions of table not shown remain unchanged.

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Heating systems ^{d, e}	<p>For other than electric heating without a heat pump: as proposed. Where the proposed design utilizes electric heating without a heat pump, the standard reference design shall be an air source heat pump meeting the requirements of Section C403 of the IECC—Commercial Provisions.</p> <p>Capacity: sized in accordance with Section R403.7.</p> <p><u>Fuel Type/ Capacity: Same as proposed design</u></p> <p><u>Product class: As proposed</u></p> <p><u>Efficiencies:</u></p> <p><u>Heat pump: Complying with Subpart C of 10 CFR 430.32 (2021).</u></p> <p><u>Furnaces: Complying with Subpart C of 10 CFR 430.32 (2021).</u></p> <p><u>Boilers: Complying with Subpart C of 10 CFR 430.32 (2021).</u></p>	<p><u>As proposed</u></p> <p><u>As Proposed</u></p> <p><u>As Proposed</u></p> <p><u>As Proposed</u></p> <p><u>As Proposed</u></p> <p><u>As Proposed</u></p>
Cooling systems ^{d, f}	<p>As proposed. Capacity: sized in accordance with Section R403.7.</p> <p><u>Fuel Type/ Capacity: Same as proposed design.</u></p> <p><u>Efficiencies: Complying with Subpart C of 10 CFR 430.32 (2021).</u></p>	<p><u>As proposed</u></p> <p><u>As Proposed</u></p> <p><u>As Proposed</u></p>
Service water heating ^{d, e, f, g}	<p>As proposed. Use: same as proposed design.</p> <p><u>Fuel Type: Same as proposed design Subpart C of 10 CFR 430.32 (2021)</u></p> <p><u>Efficiencies: Uniform Energy Factor</u></p> <p><u>Use: gal/day = 30 + 10 x Nbr</u></p> <p><u>Tank temperature: 120 °F</u></p>	<p><u>As proposed</u></p> <p><u>Use, in units of gal/day = 30 + (10 x N_{br})</u></p> <p><u>where:</u></p> <p><u>N_{br} = number of bedrooms.</u></p> <p><u>As Proposed</u></p> <p><u>As Proposed</u></p> <p><u>Same as standard reference</u></p> <p><u>Same of standard reference</u></p>

For SI: 1 square foot = 0.93 m², 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m², 1 gallon (US) = 3.785 L,

°C = (°F-32)/1.8, 1 degree = 0.79 rad.

- d. For a proposed design with multiple heating, cooling or water heating systems using different fuel types, the applicable standard reference design system capacities and fuel types shall be weighted in accordance with their respective loads as calculated by accepted engineering practice for each equipment and fuel type present.
- e. For a proposed design without a proposed heating system, a heating system having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and proposed design.
- f. For a proposed design home without a proposed cooling system, an electric air conditioner having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and the proposed design.
- g. ~~For a proposed design with a nonstorage-type water heater, a 40-gallon storage-type water heater having the prevailing federal minimum energy factor for the~~ with the same fuel as the predominant heating fuel type shall be assumed. For a proposed design without a proposed water heater, a 40-gallon storage-type water heater having the prevailing federal minimum efficiency for the same fuel as the predominant heating fuel type shall be assumed for both the proposed design and standard reference design. ~~assumed for the standard reference design.~~ The minimum uniform energy factor shall be selected based on the Medium draw pattern found in Subpart C of 10 CFR 430.32 (2021). This water heater shall be used for the proposed water heater in the case of a proposed design without a proposed water heater.

Add new standard(s) as follows:

DOE U.S. Department of Energy 10 CFR, Part 430: Energy Conservation Program for Consumer Products: Test Procedures and Certification and Enforcement Requirement for Plumbing Products: and Certification and Enforcement Requirements for Residential Appliances. 10 CFR, Part 431: Energy Efficiency Program for Certain Commercial and Industrial Equipment: Test Procedures and Efficiency Standards: Final Rules

Reason: Equipment efficiency is a key part of home energy efficiency. This proposal restores equipment efficiency to the performance calculation. This proposal also corrects a long-standing error in the code, that of citing “prevailing federal minimum efficiency”.

The code's use of "prevailing federal minimum efficiency" is inappropriate and may hamper adoption. Yes, this language has been used for some time and is currently in three existing table footnotes, footnotes “e”, “f” and “g”. However, “prevailing” creates a problem. When states, counties and cities adopt laws, they are obligated to make the exact content of the law available to the public. When the ‘prevailing’ federal minimum efficiency changes; the jurisdiction’s code also changes automatically. Changing the “prevailing” standard without any jurisdictional process means another body, which is not the legislative body of the jurisdiction, changes the laws within the jurisdiction without any public hearing or vote by the local legislative body. This is called an illegal delegation of legislative authority. This is why I-code referenced standards always come with a date/edition (see the referenced standard chapter). The I-codes don’t reference any old edition of a standard, they reference a specific edition of that standard.

The other problem with simply saying ‘prevailing federal minimum efficiency’ is that it doesn’t tell the designer or the code official where to find those values. The solution is to cite the specific Federal law and date, just as is done with any standard referenced in the I-codes. Yes – this does lock in the efficiency standard used for 3 years. But that is what we do for every other standard.

Equipment efficiency is a key part of home energy efficiency. More efficient equipment saves more energy. Significant energy savings is available for every type of equipment efficiency. A high-efficiency 95 AFUE furnace saves energy. A high-efficiency 19 SEER air conditioner saves energy. Ground source heat pumps save considerable energy. Solar water heating saves energy. Homes that use more efficient equipment should get credit for choosing more efficient equipment. Equipment efficiency was a part of the residential IECC performance calculation in 2006 and prior. Equipment efficiency is part of the commercial IECC performance calculation, ASHRAE 90.1 and 90.2, to name a few.

Some argue that longer-life measures should not be traded for shorter-life measures. For example, don’t trade lower wall insulation for higher equipment efficiency. However the ERI allows one to trade higher-efficiency refrigerators, higher-efficiency clothes washers and higher-efficiency dishwashers for lower wall insulation. Clothes washers in particular are often moved with the owner when a house is sold. The lifetime of windows is less than insulation, should we allow better windows to be traded for lower wall insulation? I’d argue to keep all tradeoffs. However, if one argues to keep equipment efficiency tradeoffs out of Section R405 performance trades, then to be consistent one should also argue to keep equipment efficiency, refrigerators, clothes washers and dishwashers out of the tradeoffs for insulation in the ERI.

Why was equipment efficiency taken out of after the 2006 residential IECC? In the proponent’s opinion one reason was to protect the market for some types of products that thought equipment efficiency might compete and reduce their market share. For instance, some might use high

efficiency equipment instead of higher levels of insulation. The goal of the code should be to deliver energy efficiency, not to protect products.

Moving to even higher levels of energy efficiency in the code will require restoring flexibility, part of which is equipment efficiency. If builders get credit for what they do, be it equipment efficiency, solar, or whatever, then this proponent is comfortable asking them to achieve higher levels of efficiency, even increasing requirements through code. However, without flexibility, then builders need more exceptions and lesser requirements to make up for the flexibility they are denied by code. Without restoring flexibility, additional energy efficiency in code is much more difficult to achieve.

Cost Impact: The code change proposal will decrease the cost of construction

Allowing credit for high efficiency equipment will encourage energy efficiency and promote lower cost ways to get to energy efficient homes.

Staff Analysis: A review of the standard proposed for inclusion in the code, 10 CFR 430.32 (2021), with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 5411

RE176-19

RE177-19

IECC: TABLE R405.5.2(1) [IRC N1105.5.2(1)]

Proponent: Joseph Hill, NYSDOS, representing NYSDOS (Joseph.Hill@dos.ny.gov); John Addario, New York State Department of State, representing New York State Department of State (john.addario@dos.ny.gov)

2018 International Energy Conservation Code

Revise as follows:

TABLE R405.5.2(1) [IRC N1105.5.2(1)]
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

Portions of table not shown remain unchanged.

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Air exchange rate	<p>The air leakage rate at a pressure of 0.2 inch w.g. (50 Pa) shall be Climate Zones 1 and 2: 5 air changes per hour. Climate Zones 3 through 8: 3 air changes per hour.</p> <p>The mechanical ventilation rate shall be in addition to the air leakage rate and shall be the same as in the proposed design, but not greater than $0.03 \times CFA + 7.5 \times (N_{br} + 1)$</p> <p>where:</p> <p>CFA = conditioned floor area, ft².</p> <p>N_{br} = number of bedrooms.</p> <p>Energy recovery shall not be assumed for mechanical ventilation.</p>	<p>The measured air exchange rate.^a</p> <p>The mechanical ventilation rate^b shall be in addition to the air leakage rate and shall be as proposed.</p>
Mechanical ventilation	<p>Where mechanical ventilation is not specified in the proposed design: None</p> <p>Where mechanical ventilation is specified in the proposed design, the annual vent fan energy use, in units of kWh/yr, shall equal:</p> $(1/e_f) \times [0.0876 \times CFA + 65.7 \times (N_{br} + 1)]$ <p>where:</p> <p>e_f = the minimum exhaust fan efficacy, as specified in Table R403.6.1, corresponding to a flow rate of $0.03 \times CFA + 7.5 \times (N_{br} + 1)$</p> <p>CFA = conditioned floor area, ft².</p> <p>N_{br} = number of bedrooms.</p>	<p style="text-align: center;">As proposed</p>

For SI: 1 square foot = 0.93 m², 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m², 1 gallon (US) = 3.785 L,

°C = (°F-32)/1.8, 1 degree = 0.79 rad.

- a. Where required by the *code official*, testing shall be conducted by an *approved party*. Hourly calculations as specified in the *ASHRAE Handbook of Fundamentals*, or the equivalent, shall be used to determine the energy loads resulting from infiltration.
- b. The combined air exchange rate for infiltration and mechanical ventilation shall be determined in accordance with Equation 43 of 2001 *ASHRAE Handbook of Fundamentals*, page 26.24 and the “Whole-house Ventilation” provisions of 2001 *ASHRAE Handbook of Fundamentals*, page 26.19 for intermittent mechanical ventilation.
- c. Thermal storage element shall mean a component that is not part of the floors, walls or ceilings that is part of a passive solar system, and that provides thermal storage such as enclosed water columns, rock beds, or phase-change containers. A thermal storage element shall be in the same room as fenestration that faces within 15 degrees (0.26 rad) of true south, or shall be connected to such a room with pipes or ducts that allow the element to be actively charged.
- d. For a proposed design with multiple heating, cooling or water heating systems using different fuel types, the applicable standard reference design system capacities and fuel types shall be weighted in accordance with their respective loads as calculated by accepted engineering practice for each equipment and fuel type present.
- e. For a proposed design without a proposed heating system, a heating system having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and proposed design.

- f. For a proposed design home without a proposed cooling system, an electric air conditioner having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and the proposed design.
- g. For a proposed design with a nonstorage-type water heater, a 40-gallon storage-type water heater having the prevailing federal minimum energy factor for the same fuel as the predominant heating fuel type shall be assumed. For a proposed design without a proposed water heater, a 40-gallon storage-type water heater having the prevailing federal minimum efficiency for the same fuel as the predominant heating fuel type shall be assumed for both the proposed design and standard reference design.
- h. For residences with conditioned basements, R-2 and R-4 residences, and for townhouses, the following formula shall be used to determine glazing area:

$$AF = A_s \times FA \times F$$

where:

AF = Total glazing area.

A_s = Standard reference design total glazing area.

FA = (Above-grade thermal boundary gross wall area)/(above-grade boundary wall area + 0.5 × below-grade boundary wall area).

F = (above-grade thermal boundary wall area)/(above-grade thermal boundary wall area + common wall area) or 0.56, whichever is greater.

and where:

Thermal boundary wall is any wall that separates conditioned space from unconditioned space or ambient conditions.

Above-grade thermal boundary wall is any thermal boundary wall component not in contact with soil.

Below-grade boundary wall is any thermal boundary wall in soil contact.

Common wall area is the area of walls shared with an adjoining dwelling unit.

L and CFA are in the same units.

Reason: In 2012, the IRC and IECC were modified introducing "Whole House Mechanical Ventilation" which was required in one and two family dwelling units and townhouse construction, when tested to less than 5 ACH 50. This is essentially all such buildings as described. ASHRAE 62.2004 was used as a basis for the rate of ventilation, which designated the ventilation rate of whole house ventilation at $Q_{fan} = 0.01A \text{ floor} + 7.5 (BR + 1)$. This version, is as according to the the 2012 IRC Code and Commentary. The more recent versions of ASHRAE 62.2-(2013 / 2016.) have recognized the need to improve indoor air quality, have revised the rate of ventilation to Mechanical Ventilation $Q_{fan} = .003A \text{ floor} + 7.5 (BR + 1)$. This was done because the prior rate assumed a significant amount of outdoor air from infiltration, which due to improvements in the IECC, has steadily dropped, necessitating an increase in the mechanical ventilation rate. It is therefore not appropriate in 2019 to still be referencing ventilation rates from those outdated standards This revised rate = $0.03A \text{ floor} + 7.5 (BR + 1)$ is also contained in ANSI/RESNET ICC-2014 which sets R406.3 Energy rating index at odds with itself, since there was a modification to the IECC code text of this section setting the ventilation rate back to $Q_{fan} = 0.01A \text{ floor} + 7.5 (BR + 1)$. This issue will likely be the focus of a code change proposal by the authors of the RESNET standard.

Bibliography: 2018 IECC

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposal modifies the rate of mechanical ventilation to be consistent with ANSI/RESNET/ICC-2014 which utilizes ASHRAE 62.2-2013 for its ventilation standard. This modification does not impose a cost to the code.

Proposal # 4933

RE177-19

RE178-19

IECC: TABLE R405.5.2(1) [IRC N1105.5.2(1)], TABLE R403.6.1 (IRC N1103.6.1)

Proponent: Mike Moore, Newport Ventures, representing Broan-NuTone (mmoore@newportventures.net)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R405.5.2(1) [IRC N1105.5.2(1)]
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

Portions of table not shown remain unchanged.

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Air exchange rate	<p>The air leakage rate at a pressure of 0.2 inch w.g. (50 Pa) shall be Climate Zones 1 and 2: 5 air changes per hour. Climate Zones 3 through 8: 3 air changes per hour.</p> <p>The mechanical ventilation rate shall be in addition to the air leakage rate and shall be the same as in the proposed design, but not greater than $0.01 \times CFA + 7.5 \times (N_{br} + 1)$</p> <p>where:</p> <p>CFA = conditioned floor area, ft².</p> <p>N_{br} = number of bedrooms.</p> <p><u>The mechanical ventilation system type shall be the same as in the proposed design.</u> Energy recovery shall not be assumed for mechanical ventilation.</p>	<p>The measured air exchange rate.^a</p> <p>The mechanical ventilation rate^b shall be in addition to the air leakage rate and shall be as proposed.</p>
Mechanical ventilation	<p>Where mechanical ventilation is not specified in the proposed design: None Where mechanical ventilation is specified in the proposed design, the annual vent fan energy use, in units of kWh/yr, shall equal:</p> $(1/e_f) \times [0.0876 \times CFA + 65.7 \times (N_{br} + 1)]$ <p>where:</p> <p>e_f = the minimum exhaust fan efficacy, as specified in Table R403.6.1, corresponding to <u>the system type</u> at a flow rate of $0.01 \times CFA + 7.5 \times (N_{br} + 1)$</p> <p>CFA = conditioned floor area, ft².</p> <p>N_{br} = number of bedrooms.</p>	As proposed

For SI: 1 square foot = 0.93 m², 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m², 1 gallon (US) = 3.785 L,

°C = (°F-32)/1.8, 1 degree = 0.79 rad.

- a. Where required by the *code official*, testing shall be conducted by an *approved party*. Hourly calculations as specified in the *ASHRAE Handbook of Fundamentals*, or the equivalent, shall be used to determine the energy loads resulting from infiltration.
- b. The combined air exchange rate for infiltration and mechanical ventilation shall be determined in accordance with Equation 43 of 2001 *ASHRAE Handbook of Fundamentals*, page 26.24 and the “Whole-house Ventilation” provisions of 2001 *ASHRAE Handbook of Fundamentals*, page 26.19 for intermittent mechanical ventilation.
- c. Thermal storage element shall mean a component that is not part of the floors, walls or ceilings that is part of a passive solar system, and that provides thermal storage such as enclosed water columns, rock beds, or phase-change containers. A thermal storage element shall be in the same room as fenestration that faces within 15 degrees (0.26 rad) of true south, or shall be connected to such a room with pipes or ducts that allow the element to be actively charged.
- d. For a proposed design with multiple heating, cooling or water heating systems using different fuel types, the applicable standard reference design system capacities and fuel types shall be weighted in accordance with their respective loads as calculated by accepted engineering practice for each equipment and fuel type present.
- e. For a proposed design without a proposed heating system, a heating system having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and proposed design.
- f. For a proposed design home without a proposed cooling system, an electric air conditioner having the prevailing federal minimum

efficiency shall be assumed for both the standard reference design and the proposed design.

- g. For a proposed design with a nonstorage-type water heater, a 40-gallon storage-type water heater having the prevailing federal minimum energy factor for the same fuel as the predominant heating fuel type shall be assumed. For a proposed design without a proposed water heater, a 40-gallon storage-type water heater having the prevailing federal minimum efficiency for the same fuel as the predominant heating fuel type shall be assumed for both the proposed design and standard reference design.
- h. For residences with conditioned basements, R-2 and R-4 residences, and for townhouses, the following formula shall be used to determine glazing area:

$$AF = A_s \times FA \times F$$

where:

AF = Total glazing area.

A_s = Standard reference design total glazing area.

FA = (Above-grade thermal boundary gross wall area)/(above-grade boundary wall area + 0.5 × below-grade boundary wall area).

F = (above-grade thermal boundary wall area)/(above-grade thermal boundary wall area + common wall area) or 0.56, whichever is greater.

and where:

Thermal boundary wall is any wall that separates conditioned space from unconditioned space or ambient conditions.

Above-grade thermal boundary wall is any thermal boundary wall component not in contact with soil.

Below-grade boundary wall is any thermal boundary wall in soil contact.

Common wall area is the area of walls shared with an adjoining dwelling unit.

L and CFA are in the same units.

**TABLE R403.6.1 (IRC N1103.6.1)
WHOLE-HOUSE MECHANICAL VENTILATION SYSTEM FAN EFFICACY^a**

FAN LOCATION SYSTEM TYPE	AIR FLOW RATE MINIMUM(CFM)	MINIMUM EFFICACY(CFM/WATT)	AIR FLOW RATE MAXIMUM(CFM)
HRV, or ERV, or balanced	Any	1.2 cfm/watt	Any
Range hoods	Any	2.8 cfm/watt	Any
In-line supply or exhaust fan	Any	2.8 cfm/watt	Any
Other exhaust fan Bathroom, utility room	≥ 90	1.4 cfm/watt	< 90
Bathroom, utility room	≥ 90	2.8 cfm/watt	Any

For SI: 1 cfm = 28.3 L/min.

- a. When tested in accordance with HVI Standard 916.

Reason: Changes to Table R405.5.2(1):

Ventilation system type is often selected as a function of climate, with supply systems seeing greater specification in the warm climates and exhaust systems seeing greater specification in cold climates. In keeping with ANSI/RESNET 301, this proposed change would compare the performance of the proposed design's ventilation system type with a comparable code-minimum ventilation system type for the reference home. The advantage of this change is that it permits builders and designers to select climate appropriate ventilation systems without receiving an automatic energy penalty that could be associated with the system type. As currently written, a builder selecting a heating or energy recovery ventilator (H/ERV) that meets the code minimum fan efficacy of 1.2 cfm/W would be penalized for not meeting the code minimum exhaust fan efficacy of 2.8-3.5 cfm/W, as determined by Table R403.6.1.

If approved, following are examples of how the reference home would be modeled based on the selection of the proposed design:

1. If the proposed design specifies an H/ERV, the reference home would be modeled with a balanced system without heat or energy recovery and having a fan efficacy of 1.2 cfm/W.

2. If the proposed design specifies a central fan integrated (CFI) system, the reference home would be modeled with an in-line supply fan with an efficacy of 3.8 cfm/W.

3. If the proposed design specifies a bathroom exhaust fan with a flow rate ≥ 90 cfm, the reference home would be modeled with an exhaust fan with an efficacy of 2.8 cfm/W.

Changes to Table R403.6.1:

Changes proposed to this table are for clarification and simplification. First, the table should not be based on the location of the fan but on the type of fan being installed. For example, an HRV or ERV is not a location, but a system type. Balanced fans without heat recovery are currently omitted from the table, and should be listed along side HRVs and ERVs, which are also balanced systems. Because balanced fans are grouped with HRVs and ERVs, the use of the term "in-line fan" should be clarified to include supply and exhaust in-line systems (also not a location, but a system type). Finally, if a "bathroom" fan is installed in a hallway to provide ventilation (a typical installation location for whole-house mechanical ventilation systems), the current table is silent on the minimum efficacy required, because it does not address "hallway" fans. So, this proposal combines typical bathroom, utility room, and hallway exhaust fans into the category of "other exhaust fans"; no changes are made to the fan efficacies for these products. The last column can be deleted by changing the "Air Flow Rate Minimum" column heading to "Air Flow Rate".

Cost Impact: The code change proposal will not increase or decrease the cost of construction

Ultimately, ventilation system selection is up to the builder, so there is no increase or decrease in the cost of construction associated with this code change proposal.

Proposal # 5121

RE178-19

RE179-19

IECC: TABLE R405.5.2(1) [IRC N11005.5.2(1)]

Proponent: Neil Leslie, representing self

2018 International Energy Conservation Code

Revise as follows:

**TABLE R405.5.2(1) [IRC N1105.5.2(1)]
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

Portions of table not shown remain unchanged.

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Heating systems ^{d, f, g}	<p>For other than electric heating without a heat pump: as proposed. Where the proposed design utilizes electric heating without a heat pump, the standard reference design shall be an air Air source heat pump meeting the requirements of Section C403 of the IECC—Commercial Provisions.</p> <p>Capacity: sized in accordance with Section R403.7.</p>	As proposed
Cooling systems ^{d, f, g}	<p>As proposed. Air cooled electric air conditioner meeting the requirements of Section C403 of the IECC—Commercial Provisions. Capacity: sized in accordance with Section R403.7.</p>	As proposed
Service water heating ^{d, e, f, g}	<p>As proposed. Electric resistance storage water heater meeting the requirements of Section C403 of the IECC—Commercial Provisions. Use: same as proposed design.</p>	<p>As proposed Use, in units of gal/day = 30 + (10 × N_{br})</p> <p>where:</p> <p>N_{br} = number of bedrooms.</p>

For SI: 1 square foot = 0.93 m², 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m², 1 gallon (US) = 3.785 L,

°C = (°F-32)/1.8, 1 degree = 0.79 rad.

- d. ~~For a proposed design with multiple heating, cooling or water heating systems using different fuel types, the applicable standard reference design system capacities and fuel types shall be weighted in accordance with their respective loads as calculated by accepted engineering practice for each equipment and fuel type present.~~

For a proposed design without a proposed heating system, ~~a~~ an air source heat pump heating system having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and proposed design.

- e. For a proposed design home without a proposed cooling system, an electric air conditioner having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and the proposed design.
- f. For a proposed design with a nonstorage-type water heater, a 40-gallon storage-type electric resistance water heater having the prevailing federal minimum energy factor ~~for the same fuel as the predominant heating fuel type~~ shall be assumed. For a proposed design without a proposed water heater, a 40-gallon storage-type water heater having the prevailing federal minimum efficiency for the same fuel as the predominant heating fuel type shall be assumed for both the proposed design and standard reference design.

Reason: A single technology-blind baseline performance requirement is critical for a uniform and consistent implementation of the IECC performance path primary intent. Shifting to a single baseline design provides an equitable credit to all technologies that have lower annual costs compared to the single baseline level irrespective of energy form or technology design. It establishes fixed reference home performance requirements BEFORE making the technology and energy choices for the rated home. A single reference design methodology creates a level playing field for all technology and energy forms and provides equitable treatment of advanced renewable, waste heat recovery, hybrid, and multi-fuel technology options. It is especially important for equitable and consistent evaluation of on-site power generation and combined heat and power

systems.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Options are already available in the current code. This change merely provides a more equitable baseline for performance comparisons.

Staff Analysis: Current table note d is deleted and the remaining table notes were relettered.

Proposal # 4883

RE179-19

RE180-19

IECC: R405.3 (IRC N1105.3)

Proponent: Chris McTaggart, Building Efficiency Resources, representing Building Efficiency Resources (cmctaggart@theber.com)

2018 International Energy Conservation Code

Revise as follows:

R405.3 (IRC N1105.3) Performance-based compliance. Compliance based on simulated energy performance requires that a proposed residence (*proposed design*) be shown to have an annual energy cost that is less than or equal to the annual energy cost of the ~~standard reference design~~. Energy prices shall be taken from a source ~~approved by the code official~~, such as the Department of Energy, Energy Information Administration's State Energy Data System Prices and Expenditures reports. ~~Code officials shall be permitted to require time-of-use pricing in energy cost calculations.~~

Exception: ~~The energy use based on source energy expressed in Btu or Btu per square foot of conditioned floor area shall be permitted to be substituted for the energy cost that is less than or equal to the annual source energy use of the standard reference design.~~ The source energy multiplier for electricity shall be 3.16. The source energy multiplier for fuels other than electricity shall be 1.1.

Reason: The current R405 option to demonstrate compliance using comparative annual energy cost between the *proposed design* and *standard reference design* introduces an inappropriate additional variable of utility costs that can radically confuse compliance.

The ratios between fuel and electricity costs are constantly changing, which can result in a *proposed design* based on a builder's typical set of architectural plans that achieves compliance on the day that the costs were aggregated, but which does not comply days or months after when costs change. Therefore you can have two homes built from the same planset, with the same specs, built to the same code by the same builder in the same geographic area with one being compliant and the other non-compliant, simply because of variations in the ratios of electric vs fuel costs over time. Similarly, you could have two homes built from the same planset, with the same specs, built to the same code by the same builder at the exact same time in the same geographic area - but in different energy utility territories - with one being compliant and the other non-compliant, simply because they use different utility providers with differing costs.

Furthermore, it is an excessive burden for a code official to have to create and implement their own process for validating the energy utility cost data used in the software file. For one, there is little guidance in the code for code officials for how to define what cost data or process of creating/maintaining cost data is acceptable. The current code suggests that EIA state-average data could be used, which is ok, but should this data be updated monthly? Annually? The EIA state-average data fluctuates month-by-month, and is often seasonal in nature; some software programs allow seasonal inputs, but again - is that what's expected or is it simply an annual average? How often should this cost data be updated? What if a barely-passing planset in a residential development no longer passes with updated energy cost data after the first year of a multi-year build out? If not using EIA data, finding actual data from the specific utilities in question is a huge undertaking, as the fee, rate and tariff sheets from utilities are typically massive and complex.

There are simply too many questions, variables and outliers associated with cost-based compliance due to the variability and ever changing nature of energy costs. This introduces confusion and a "wildcard" that the code official may not truly understand or understand how to reasonably assess what's fair and reasonable. The "x-factor" of energy costs and the relative difference between fuels and electricity introduce an independent variable that really has to be used when assessing building energy efficiency from a compliance standpoint. It is not reasonable to have a variable such as cost be able to change the same planset's compliance within the same code cycle depending on what and when cost data is pulled, and potentially utility vs utility.

This proposal seeks to simplify the Performance compliance process by focusing on known, fixed energy use calculations, resulting in a compliance path that is based exclusively on building energy characteristics and climate data. The proposal maintains the previous "exceptions" of using source energy use or use per sqft of *conditioned floor area* (otherwise known as a source EUI). While there is no doubt there has been fair debate over time regarding site vs source energy, electricity vs fuel source energy factors, total energy vs EUI, etc, this proposal does not seek to resolve those conflicts but instead elects to adopt the previous "exception" compliance options already adopted into previous energy codes.

To document the need for this change, I have uploaded two PDF compliance documents produced from REM/Rate software for a planset seeking to comply with the current 2012 IECC with state amendments in Iowa. The *proposed design* complies with the code by achieving exact cost compliance in dollars as the *standard reference design* when using 2015 EIA state average cost data, which were the current costs at the time this planset was originally run in the software for compliance. When updating the model to only change costs to the most up-to-date EIA state data (2017), the home now does not comply with the code as the *proposed design* is estimated to cost more to operate than the *standard reference design*.

Currently, all software programs that are popularly used to demonstrate compliance (REM/Rate, REM/Design, Ekotrope, EnergyGauge) are set up to create R405 compliance reports exclusively compute cost compliance; they are not set up to express compliance using annual source energy. However, all of these software programs have the ability to configure the Performance compliance reports for either annual source energy or EUI.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal will have no impact on construction costs. There will be a minor cost to software providers to alter the Performance compliance calculations to annual source energy or source EUI vs cost, but they will unlikely pass these costs down to their users. This proposal will save time and money for code officials and AHJs by reducing the need for the code official to have to police energy cost data in Performance code software.

Proposal # 5478

RE180-19

RE181-19

IECC: R406.2 (IRC N1106.2), TABLE R406.2 (IRC N1106.2) (New)

Proponent: Terry Kozlowski, representing Southern Nevada Chapter; Amanda Moss, representing SN-ICC Member; Cassidy Wilson, representing SN-ICC Member; Valarie Evans, representing Southern Nevada Chapter

2018 International Energy Conservation Code

Revise as follows:

R406.2 (IRC N1106.2) Mandatory requirements. Compliance with this section requires that the provisions identified in Sections R401 through R404 indicated as “Mandatory” and Section R403.5.3 be met. The *building thermal envelope* shall be greater than or equal to levels of efficiency and *Solar Heat Gain Coefficients* in Table 402.1.1 or 402.1.3 of the 2009 International Energy Conservation Code - 406.2. The mandatory thermal envelope requirements referenced in this section and Section R406.4 may be met by utilizing the Total UA Alternative referenced in Section R402.1.5.

Exception: Supply and return ducts not completely inside the *building thermal envelope* shall be insulated to an *R*-value of not less than R-6.

Add new text as follows:

**TABLE R406.2 (IRC N1106.2)
ALTERNATIVE COMPLIANCE INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a**

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION ^{b, e} SHGC	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ⁱ	FLOOR R-VALUE	BASEMENT ^c WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWL SPACE ^c WALL R-VALUE
1	1.20	0.75	0.30	30	13	3 / 4	13	0	0	0
2	0.65 ^j	0.75	0.30	30	13	4 / 6	13	0	0	0
3	0.50 ^j	0.65	0.30	30	13	5 / 8	19	5 / 13 ^f	0	5 / 13
4 except Marine	0.35	0.60	NR	38	13	5 / 10	19	10 / 13	10_2ft	10 / 13
5 and Marine 4	0.35	0.60	NR	38	20 or 13+5 ^h	13 / 17	30 ^g	10 / 13	10_2 ft	10 / 13
6	0.35	0.60	NR	49	20 or 13+5 ^h	15 / 19	30 ^g	15 / 19	10_4 ft	10 / 13
7 and 8	0.35	0.60	NR	49	21	19 / 21	38 ^g	15 / 19	10_4 ft	10 / 13
-	-	-	-	-	-	-	-	-	-	-

R-values are minimums. *U*-factors and SHGC are maximums. R-19 batts compressed into a nominal 2 x 6 framing cavity such that the *R*-value is reduced by R-1 or more shall be marked with the compressed batt *R*-value in addition to the full thickness *R*-value.
b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.
c. “15/19” means R-15 continuous insulated sheathing on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. “15/19” shall be permitted to be met with R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulated sheathing on the interior or exterior of the home. “10/13” means R-10 continuous insulated sheathing on the interior or exterior of the home or R-13 cavity insulation at the interior of the basement wall.
d. R-5 shall be added to the required slab edge *R*-values for heated slabs. Insulation depth shall be the depth of the footing or 2 feet, whichever is less in Zones 1 through 3 for heated slabs.
e. There are no SHGC requirements in the Marine Zone.
f. Basement wall insulation is not required in warm-humid locations as defined by Figure R301.1 and Table R301.1.
g. Or insulation sufficient to fill the framing cavity. R-19 minimum.
i. Or insulation sufficient to fill the framing cavity. R-19 minimum.

h. "13+5" means R-13 cavity insulation plus R-5 insulated sheathing. If structural sheathing covers 25 percent or less of the exterior, insulating sheathing is not required where structural sheathing is used. If structural sheathing covers more than 25 percent of exterior, structural sheathing shall be supplemented with insulated sheathing of at least R-2.
i. The second R-value applies when more than half the insulation is on the interior of the mass wall.
j. For impact rated fenestration complying with Section R301.2.1.2 of the IRC or Section 1609.2 of the IBC, maximum U-factor shall be 0.75 in Zone 2 and 0.65 in Zone 3.

Reason: The UA Alternative in Section R402.1.5 meets the intent and energy performance of code, using UA value tradeoffs within the envelope to deliver maximum efficiency in delivering envelope performance.

The UA Alternative should be available to residential builders regardless of whether the builder is using prescriptive, performance or ERI approach because it encourages innovation and response to individual market/climate factors without minimizing envelope performance. Furthermore, adoption of this approach in the base IECC will encourage adoption of base code, instead of individual jurisdictions lessening prescriptive requirements of R406.4 to achieve the flexibility needed.

Using an approved energy simulation tool, a builder can trade-off elements of the building thermal envelope to achieve superior energy performance, while having the same overall UA value.

A requirement to refer to a previous code cycle for information requires multiple code books with multiple cycles which causes confusion. By adding the information from the table in the 2009 IECC to the 2021 IECC, this allows the use of a single document.

Bibliography: R101.5.1 Compliance materials. The *code official* shall be permitted to approve specific computer software, worksheets, compliance manuals and other similar materials that meet the intent of this code.

ENERGY SIMULATION TOOL. An *approved* software program or calculation-based methodology that projects the annual energy use of a *building*.

Cost Impact: The code change proposal will decrease the cost of construction

This allows builders to adjust envelope features based on climate zone and orientation of a structure. The optimal delivery of envelope efficiencies in that location and orientation could result in savings.

RE182-19

IECC: R406.2 (IRC N1106.2) , TABLE R406.4 (IRC N1106.4)

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

R406.2 (IRC N1106.2) Mandatory requirements. Compliance with this section requires that the provisions identified in Sections R401 through R404 indicated as “Mandatory” and Section R403.5.3 be met. The *building thermal envelope* shall be greater than or equal to levels of efficiency and *Solar Heat Gain Coefficients* in Table 402.1.1 or 402.1.3 of the 2009 International Energy Conservation Code. Where on-site renewable energy is included for compliance using the ERI analysis of Section R406.4, the building thermal envelope shall be greater than or equal to the levels of efficiency and SHGC in Table R402.1.2 or Table R402.1.4 of the 2018 *International Energy Conservation Code*.

Exception: Supply and return ducts not completely inside the *building thermal envelope* shall be insulated to an *R*-value of not less than R-6.

**TABLE R406.4 (IRC N1106.4)
MAXIMUM ENERGY RATING INDEX**

CLIMATE ZONE	ENERGY RATING INDEX *
1	57
2	57
3	57
4	62
5	61
6	61
7	58
8	58

~~a. Where on-site renewable energy is included for compliance using the ERI analysis of Section R406.4, the building shall meet the mandatory requirements of Section R406.2, and the building thermal envelope shall be greater than or equal to the levels of efficiency and SHGC in Table R402.1.2 or Table R402.1.4 of the 2015 International Energy Conservation Code.~~

Reason: The purpose of this code change proposal is to make two important updates to the Energy Rating Index. First, this proposal makes an editorial improvement by moving footnote “a” of Table R406.4 into Section R406.2, which contains the other mandatory requirements for the ERI. Given that two different thermal envelope backstops apply to the ERI depending on whether on-site renewable energy is included in the calculation, it makes sense to put these two backstops side-by-side in the same section of the code to reduce or eliminate any confusion.

Second, this proposal will update the enhanced thermal envelope backstop for homes with on-site renewable energy from the 2015 to the 2018 IECC, maintaining the same approach as set in the 2018 IECC – specifically, using the prescriptive path from the previous code as a backstop in this situation. This backstop is crucial to use of the ERI with on-site renewable energy. We continue to be concerned about the potential magnitude of trade-off credit that may apply if on-site generation is included in the ERI calculation. Analyses have shown that homes can achieve a 20-40 HERS points reduction with average-sized solar PV systems, which would allow enormous trade-offs of the home’s permanent envelope efficiency. See, e.g., RESNET, *The Impact of Photovoltaic Arrays on the HERS Index* (2015); and https://www.energycodes.gov/sites/default/files/documents/ECodes2016_06_Haack.pdf. Without reasonable limits on these solar trade-offs, homes with on-site generation could be built with far less efficiency, including substandard thermal envelopes, creating long-term problems for homeowners and reversing many of the benefits created by the IECC over the past 10 years.

Bibliography: RESNET, *The Impact of Photovoltaic Arrays on the HERS Index* (2015); and https://www.energycodes.gov/sites/default/files/documents/ECodes2016_06_Haack.pdf.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The editorial change to move the footnote into Section R406.2 will have no cost impact, and because the 2018 IECC incorporated only very moderate increases in efficiency over the 2015 IECC (primarily window improvements with no real upgrade cost), we expect no real cost impact. Moreover, this enhanced backstop only applies to homes built to the ERI that incorporate on-site power production into the ERI calculation, which is currently a very small percentage of all code-compliant homes. Code users can also avoid any cost increase by using other compliance

alternatives.

Proposal # 4009

RE182-19

RE183-19

IECC: R406.3 (IRC N1106.3)

Proponent: Ryan Meres, RESNET, representing RESNET (ryan.meres@gmail.com)

2018 International Energy Conservation Code

Revise as follows:

R406.3 (IRC N1106.3) Energy Rating Index. The Energy Rating Index (ERI) shall be determined in accordance with RESNET/ICC 301, ~~except for buildings covered by the International Residential Code, the ERI Reference Design Ventilation rate shall be in accordance with Equation 4-1.~~

~~Ventilation rate, CFM = (0.01 × total square foot area of house) + [7.5 × (number of bedrooms + 1)]~~

~~(Equation 4-1)~~

Energy used to recharge or refuel a vehicle used for transportation on roads that are not on the building site shall not be included in the *ERI reference design* or the *rated design*.

Reason: The language being proposed for deletion was approved during the 2018 IECC development cycle. Here is the proponent's reason statement from the proposal:

"As written the ERI ventilation rate specification is in conflict with the ventilation rate specified by the IRC. The current language references ANSI/RESNET/ICC Standard 301 which references the ASHRAE 62.2-2013. The ventilation rate in the ASHRAE Standard 62.2 is significantly higher than the ventilation rate in the IRC. The IRC rate was reaffirmed in Group A changes this code cycle. Without this ventilation rate correction, the higher ventilation rate would use more energy unnecessarily and thereby increase ERI scores for no good reason. Interestingly the ASHRAE 62.2-2010 used the same rate as is in the current IRC.

Third party organizations should not set ventilation rates for the IRC and the IECC. Ventilation rates in the IRC and IECC should be set by the ICC code development process. This proposal brings the IECC/IRC ERI calculation into compliance with the IRC ventilation rate by using the same ventilation equation as will be in Section 1507.3.3 of the 2018 IRC. The published committee reason expected this update, stating: "The difference in ventilation rate might need to be resolved but the experts can solve that through public comments." This is the public comment they were referring to."

The proponent makes this statement: "Without this ventilation rate correction, the higher ventilation rate would use more energy unnecessarily and thereby increase ERI scores for no good reason." In a study conducted by the Florida Solar Energy Center (FSEC), it was found that this change, as included in the 2018 IECC, actually increases ERI scores from 2-10 points, depending on climate zone. The reason for this is that the rated home under Standard 301 is not allowed to use a ventilation rate less than ASHRAE 62.2-2013. Since the 2018 IECC changed the reference home to require less ventilation than the rated home, the home will be shown to use more energy and increase the ERI score.

In a second statement the proponent says: "Third party organizations should not set ventilation rates for the IRC and IECC." This statement is also false. ANSI/RESNET/ICC Standard 301 does not require any specific ventilation rate, nor does RESNET take a position as to proper ventilation rates. RESNET's Standard Development Committee 300 chose to reference the most recent ANSI-approved standard for ventilation rates which is ASHRAE 62.2-2013. The standard does not require homes to meet those ventilation rates, instead, the standard simply doesn't give any "credit" (in the form of lower index scores) for ventilation rates that are less than required by ASHRAE 62.2.

When the proponent of this change in the 2018 cycle, submitted a proposal to change Standard 301, SDC 300 rejected the change with the following reason statement:

"ASHRAE Standard 62.2 is the sole American National Standard on ventilation for indoor air quality in low-rise residential buildings. RESNET has chosen to not conflict with this indoor air quality standard. ANSI/RESNET/ICC Standard 301 does not require any specific level of outdoor air ventilation. However, in order to not encourage outdoor air ventilation levels that do not meet the indoor air quality requirements of ASHRAE Standard 62.2, RESNET has chosen to provide no Energy Rating Index credit for ventilation air flow rates that are less than those required by ASHRAE Standard 62.2. There is no other American National Standard on ventilation for indoor air quality and RESNET has chosen to not provide credits for outdoor air ventilation rates that do not achieve this level of indoor air quality. ANSI/RESNET/ICC Standard 301 does not "require" any level of outdoor air ventilation. Rather it simply stops giving outdoor air exchange energy reduction credit at the 62.2 ventilation specification. The commenter would better seek resolution of the issue raised by this comment by working with the ASHRAE to amend ASHRAE Standard 62.2."

This change did not achieve the proponent's stated objectives during the 2018 code development cycle. By NOT approving this change to delete the ventilation requirement for the reference home, the committee would be allowing Section R406 to be out of alignment with Standard 301.

RESNET acknowledges that the scientific and political discussions regarding the "correct" ventilation rate for residential homes is contentious. Neither RESNET nor Standard 301 seek to determine the correct ventilation rate for homes.

At the time ANSI/RESNET/ICC 301-2014 was published, the published American National Standard for *Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings* was ASHRAE 62.2-2013. To align with published American National Standards for indoor air quality, RESNET chose to adopt the ventilation rates prescribed by ASHRAE 62.2-2013. RESNET considers this decision to be procedural. RESNET as an organization acknowledges ventilation is important for homes that are built to modern building energy code standards, which require fairly tight envelopes. However, RESNET is neutral regarding the "correct" ventilation rate. To facilitate this neutrality, RESNET Standards do not penalize homes with ventilation rates that are less than ASHRAE 62.2-2013 Standard minimum ventilation rates but RESNET also does not provide energy credit for such homes.

Regardless of which rate may be best, the ERI calculation procedure does not establish requirements for home ventilation rates. Rather such requirements are established by building code authorities and model codes such as set forth in Section R403.6 of the 2018 IECC. The ventilation rates used in the ANSI/RESNET/ICC 301 procedure do not change or modify any requirements of building codes or standards.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This code change proposal does not impact construction practices in any way and, therefore, does not increase the cost of construction. The proposal only impacts how the home is modeled within the energy modeling software, but does not require a home to meet any specific ventilation rate.

Proposal # 4857

RE183-19

RE184-19

IECC: R406.3 (IRC N1106.3)

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

R406.3 (IRC N1106.3) Energy Rating Index. The Energy Rating Index (ERI) shall be determined in accordance with RESNET/ICC 301 except for buildings covered by the International Residential Code, the ERI Reference Design Ventilation rate shall be in accordance with Equation ~~4-1~~ 4-1.

Ventilation rate, CFM = $(0.01 \times \text{total square foot area of house}) + [7.5 \times (\text{number of bedrooms} + 1)]$
(Equation 4-1)

Energy used to recharge or refuel a vehicle used for transportation on roads that are not on the building site shall not be included in the *ERI reference design* or the *rated design*.

For compliance purposes, any reduction in energy use of the rated design associated with on-site renewable energy shall not exceed 5 percent of the total energy use.

Reason: The purpose of this code change proposal is to help ensure that homes are built to an appropriate level of efficiency, irrespective of the amount of on-site generation that may be installed. The proposal adopts a 5 percent cap on the trade-off credit allowed for on-site power in the Energy Rating Index, similar to the 5 percent cap that applies in the simulated performance analysis of the 2018 IECC commercial chapter, Section C407.3, and ASHRAE Standard 90.1-2016 Energy Cost Budget Method.

- **2018 IECC C407.3:** "...The reduction in energy cost of the proposed design associated with on-site renewable energy shall be not more than 5 percent of the total energy cost."
- **ASHRAE Standard 90.1-2016, Section 11.4.3.1:** "...The reduction in *design energy cost* associated with *on-site renewable energy* shall be no more than 5% of the calculated *energy cost budget*."

It is important to note that this proposal does not limit the amount of on-site power production that can be installed on the home, nor does it apply any sort of "penalty" to homes with on-site power. The proposal simply recognizes that a reduction in energy use is not the same thing as on-site energy production, for purposes of code compliance. This proposal also supports the long-term goal of achieving net zero energy use by helping avoid steps backward in efficiency as on-site generation increases. If unlimited efficiency trade-off credit is allowed for increases in on-site generation, progress toward net-zero energy will stall. We do not see any good reason to allow steps backward in efficiency when it can be improved simultaneously with increases in on-site power production.

Cost Impact: The code change proposal will increase the cost of construction

The code change proposal will increase the cost of construction only if user selects the ERI compliance path and the cost of increased on-site power production is less than a commensurate amount of energy efficiency. However, given the long expected useful life of a home's permanent features (such as thermal envelope efficiency), we believe homeowners will experience lower costs and reduced risk over the long-term if trade-off credit for on-site power production is reasonably limited.

Proposal # 4013

RE184-19

RE185-19

IECC: R406.4 (IRC N1106.4) (New)

Proponent: Craig Conner, representing self (craig.conner@mac.com)

2018 International Energy Conservation Code

Add new text as follows:

R406.4 (IRC N1106.4) Energy cost The ERI as specified by Section 4.1 of RESNET 301 shall be computed with the energy cost as specified by Section R405.3.

Reason: The ERI path energy cost calculation should be consistent with the energy cost calculation in the performance path (Section R405). RESNET created their own method, the "normalized Modified End Use Load". The "normalized Modified End Use Load" is a complicated calculation that is inconsistent with the IECC's performance calculation in R405. The RESNET calculation is shown below in the bibliography. The ERI cost calculation should be consistent with the cost calculation in the IECC's performance calculation (Section R405).

Bibliography: Here is the normalized Modified End Use Load from RESNET 301
ANSI/RESNET/ICC 301-2019 page 17-18

http://www.resnet.us/blog/wp-content/uploads/2019/01/ANSIRESNETICC301-2019_vf1.23.19.pdf

4.1.1. Calculating End Use Loads. The normalized Modified End Use Loads (nMEUL) for space heating and cooling and service hot water use shall each be determined in accordance with Equation 4.1-1:

$$\mathbf{nMEUL = REUL * (nEC_x / EC_r)} \quad \mathbf{(Eq. 4.1-1)}$$

where:

nMEUL = normalized Modified End Use Loads (for heating, cooling, or hot water) as computed using an Approved Software Rating Tool.

REUL = Reference Home End Use Loads (for heating, cooling or hot water) as computed using an Approved Software Rating Tool.

nEC_x = normalized Energy Consumption for the Rated Home's end uses (for heating, including Auxiliary Electric Consumption, cooling or hot water) as computed using an Approved Software Rating Tool.

EC_r = estimated Energy Consumption for the Reference Home's end uses (for heating, including Auxiliary Electric Consumption, cooling or hot water) as computed using an Approved Software Rating Tool.

and where:

$$\mathbf{nEC_x = (a * EEC_x - b) * (EC_x * EC_r * DSE_r) / (EEC_x * REUL)} \quad \mathbf{(Eq. 4.1-1a)}$$

where:

EC_x = estimated Energy Consumption for the Rated Home's end uses (for heating, including Auxiliary Electric Consumption, cooling or hot water) as computed using an Approved Software Rating Tool.

EEC_x = Equipment Efficiency Coefficient for the Rated Home's equipment, such that EEC_x equals the energy consumption per unit load in like units as the load, and as derived from the Manufacturer's Equipment Performance Rating (MEPR) such that EEC_x equals 1.0 / MEPR for AFUE, COP or EF ratings, or such that EEC_x equals 3.413 / MEPR for HSPF, EER or SEER ratings.

$$\mathbf{DSE_r = REUL / EC_r * EEC_r}$$

For simplified system performance methods, DSE_r equals 0.80 for heating and cooling systems and 1.00 for hot water systems [see Table 4.2.2(1)]. However, for detailed modeling of heating and cooling systems, DSE_r less than 0.80 occurs as a result of part load performance degradation, coil air flow degradation, improper system charge and auxiliary resistance heating for Heat Pumps. Except as otherwise provided by these Standards, where detailed systems modeling is employed, it must be applied equally to both the Reference and the Rated Homes.

EEC_r = Equipment Efficiency Coefficient for the Reference Home's equipment, such that EEC_r equals the energy consumption per unit load in like units as the load, and as derived from the Manufacturer's Equipment Performance Rating (MEPR)

such that EEC_r equals $1.0 / MEPR$ for AFUE, COP or EF ratings, or such that EEC_r equals $3.413 / MEPR$ for HSPF, EER or SEER ratings and where the coefficients 'a' and 'b' are as defined by Table 4.1.1(1) below:

Table 4.1.1(1) Coefficients 'a' and 'b'

Fuel Type and End Use	a	b
Electric space heating	2.2561	0
Fossil fuel* space heating	1.0943	0.4030
Biomass space heating	0.8850	0.4047
Electric air conditioning	3.8090	0
Electric water heating	0.9200	0
Fossil fuel* water heating	1.1877	1.0130

*Such as natural gas, liquid propane gas, fuel oil

4.1.2. Calculating the Energy Rating Index. The Energy Rating Index shall be determined in accordance with Equation 4.1-2:

$$\text{Energy Rating Index} = PE_{\text{frac}} * (T_{\text{nML}} / (T_{\text{RL}} * IAF_{\text{RH}})) * 100 \quad (\text{Eq. 4.1-2})$$

where:

$$T_{\text{nML}} = nMEUL_{\text{HEAT}} + nMEUL_{\text{COOL}} + nMEUL_{\text{HW}} + EUL_{\text{LA}} \text{ (MBtu/y).}$$

$$T_{\text{RL}} = REUL_{\text{HEAT}} + REUL_{\text{COOL}} + REUL_{\text{HW}} + REUL_{\text{LA}} \text{ (MBtu/y).}$$

$$IAF_{\text{RH}} = \text{Index Adjustment Factor of Rated Home, per Eq. 4.3-2}$$

and where:

EUL_{LA} = The Rated Home end use loads for lighting, appliances and MELs as defined by Section 4.2.2.5.2, converted to MBtu/y, where MBtu/y = (kWh/y)/293 or (Therms/y)/10, as appropriate.

$REUL_{\text{LA}}$ = The Reference Home end use loads for lighting, appliances and MELs as defined by Section 4.2.2.5.1, converted to MBtu/y, where MBtu/y = (kWh/y)/293 or (Therms/y)/10, as appropriate.

and where:

$$PE_{\text{frac}} = (TEU - OPP) / TEU$$

TEU = Total energy use of the Rated Home including all rated and non-rated energy features where all fossil fuel site energy uses (Btu_{fossil}) are converted to equivalent electric energy use (kWh_{eq}) in accordance with Equation 4.1-3.

OPP = On-Site Power Production as defined by Section 4.2.2.6 of this Standard.

$$kWh_{\text{eq}} = (Btu_{\text{fossil}} * 0.40) / 3412 \quad (\text{Eq. 4.1-3})$$

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The choice of calculation does not inherently increase or decrease costs. However calculations based on energy cost will better align with the energy costs the consumer sees.

RE186-19

IECC: R406.3 (IRC N1106.3)

Proponent: Craig Conner, representing self (craig.conner@mac.com); Joseph Lstiburek, representing self (joe@buildingscience.com)

2018 International Energy Conservation Code

Revise as follows:

R406.3 (IRC N1106.3) Energy Rating Index. The Energy Rating Index (ERI) shall be determined in accordance with RESNET/ICC 301 ~~except for buildings covered by the International Residential Code, the ERI Reference Design Ventilation rate shall be in accordance with Equation 4-1.~~

~~Ventilation rate, CFM = (0.01 × total square foot area of house) + [7.5 × (number of bedrooms + 1)]~~

~~(Equation 4-1)~~

Exceptions:

1. For Table 4.2.2(1) of RESNET/ICC 301, the Reference Home and Rated Home air exchange rates shall be as specified for the air exchange rates in Table R405.5.2(1) of this code.
2. For Table 4.3.1(1) of RESNET/ICC 301, the air exchange rate shall be as specified for the air exchange rate for the standard reference design in Table R405.5.2(1) of this code.
3. The proposed ventilation rate shall comply with the mechanical ventilation requirements of Section M1505 of the International Residential Code or Section 403.3.3.2.1 of the International Mechanical Code. Energy used to recharge or refuel a vehicle used for transportation on roads that are not on the building site shall not be included in the *ERI reference design* or the *rated design*.

Reason: RESNET/ICC 301 uses the ASHRAE 62.2 ventilation rate not the IRC and IMC ventilation rate. Following the ASHRAE 62.2 ventilation rate results in over ventilation in hot humid climates and cold climates and excessive energy use in all climates. In hot humid climates the resulting part load humidity problems result in mold. In cold climates the high ventilation rates result in excessive dryness.

Beyond the problems created by over ventilation, this is also a policy issue. Ventilation rates are set in the I-code development process, not by RESNET. The ERI is being used to show compliance with the I-codes. The IRC and the IMC set building code ventilation rates not RESNET. The ERI should be determined using building code ventilation rates specified by the IRC and the IMC not by RESNET.

RESNET/ICC 301 by following ASHRAE 62.2 also modifies the mechanical ventilation rate required based on infiltration measurements and this results in discouraging better building practices. Tighter houses are penalized compared to leakier houses which makes no sense. If a builder constructs a leakier house then the mechanical ventilation rate is reduced according to RESNET/ICC 301 and ASHRAE 62.2. Infiltration should not be relied on to provide ventilation in new code compliant house construction where enclosures are constructed to 3 ach@50 Pa and 5 ach@50 Pa. Finally, ventilating at a higher, and unnecessary, ventilation rate wastes energy.

If RESNET has an issue with the IRC and the IMC ventilation rates then RESNET should change the ventilation rates using the ICC code change process and not force the use of the ASHRAE 62.2 ventilation rates to judge I-code compliance.

The existing wording has proved confusing. The proposed wording is much clearer. This code change requires that the IRC and IMC ventilation rates be used to determine the ERI.

Cost Impact: The code change proposal will decrease the cost of construction

For those who believe they have to use ASHRAE 62.2 ventilation rates this reduce costs. Even if done "right" over ventilation increases costs due to the costs of dealing with excessive moisture, overly dry air, or moisture damage in some climates.

Proposal # 5587

RE186-19

RE187-19

IECC: R406.3 (IRC N1106.3)

Proponent: Amanda Hickman, The Hickman Group, representing The Leading Builders of America (LBA) (amanda@thehickmangroup.com)

2018 International Energy Conservation Code

Revise as follows:

R406.3 (IRC N1106.3) Energy Rating Index. The Energy Rating Index (ERI) shall be determined in accordance with RESNET/ICC 301 ~~except for buildings covered by the International Residential Code, the ERI Reference Design Ventilation rate shall be in accordance with Equation 4-1.~~

~~Ventilation rate, CFM = (0.01 × total square foot area of house) + [7.5 × (number of bedrooms + 1)]~~

(Equation 4-1)

Exceptions:

1. The infiltration and ventilation rate calculated in accordance with ANSI/RESNET/ICC 301 section 4.3.3.2.5 shall be permitted to be less than the rate allowed in ANSI/RESNET/ICC 301, provided the actual whole-house ventilation rate complies with the mechanical ventilation requirements of the International Residential Code Section M1505 or the International Mechanical Code Section 403.3.3.2.1.
2. For the purposes of calculating the ERI of the rated home, the greater of either the minimum allowable *Air exchange rate* specified by ANSI/RESNET/ICC 301 Table 4.2.2 (1) or the proposed ventilation rate of the Rated Home shall be used for The *Air exchange rate* in ANSI/RESNET/ICC 301 Table 4.2.2 (1).

Reason: This proposal corrects language that was introduced to this section last cycle that was intended to address the over-ventilation issue that was occurring. However, what was intended to fix to this problem, ended up creating another one. Separating the ventilation rates out from the ANSI/RESNET/ICC 301 standard, created two sets of ERI scores (one in ICC and one in RESNET). This is causing huge confusion in the market and with enforcement.

This proposal introduces two exceptions that will simplify and clarify the language while resolving both issues. It corrects the over-ventilation problem while eliminating the double ERI scores. Exception 1 is for the HERS raters, while Exception 2 is for the software programmers.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal only clarifies how to apply actual ventilation rate in the proposed design.

Proposal # 5335

RE187-19

RE188-19

IECC: TABLE R406.4 (IRC N1106.4)

Proponent: Craig Conner, representing self (craig.conner@mac.com)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R406.4 (IRC N1106.4)
MAXIMUM ENERGY RATING INDEX**

CLIMATE ZONE	ENERGY RATING INDEX ^a
1	57
2	57
3	57
4	62
5	61
6	61
7	58
8	58

~~a. Where on-site renewable energy is included for compliance using the ERI analysis of Section R406.4, the building shall meet the mandatory requirements of Section R406.2, and the building thermal envelope shall be greater than or equal to the levels of efficiency and SHGC in Table R402.1.2 or Table R402.1.4 of the 2015 International Energy Conservation Code.~~

Reason: The ERI is supposed to be flexible. However, this footnote does not allow reduction in even a single component R-value, even if the reduction was more than made up by another energy saving change. Where is the flexibility in the ERI? Every insulation R-value is the same for both the 2015 and 2018 IECC, so none of the R-values can be reduced with the ERI. Section R402.1.5, "Total UA alternative", allows a UA tradeoff of one component U-factor provided it was made up by another component. Likewise the performance calculation in R405 would allow a component R-value below the R-value in the table, provided the overall building energy use met code. There is no such restriction on tradeoffs in RESNET 301. Why can't the "flexible" ERI in the IECC do the same?

There are multiple other reasons to delete the footnote. It is poor form to put significant requirements in a footnote, even more so for unneeded requirements. Is the SHGC even covered by the footnote? The footnote says to meet SHGC requirements in one of two tables, but Table 402.1.4 does not even have an SHGC requirement. Finally naming another year's IECC makes the code harder to use. Section R406 names both the 2009 and 2015 IECC. Is the code user supposed to keep the 2009, 2015 and the upcoming 2021 IECC in order to use Section 406? The footnote is unnecessary and should be deleted.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This removes a limitation on flexibility. If anything it will reduce costs.

Proposal # 5245

RE188-19

RE189-19

IECC: R406.3 (IRC N1106.3)

Proponent: Ted Williams, representing American Gas Association (twilliams@aga.org)

2018 International Energy Conservation Code

Revise as follows:

R406.3 (IRC N1106.3) Energy Rating Index. The Energy Rating Index (ERI) shall be determined in accordance with RESNET/ICC 301 except for buildings covered by the International Residential Code, the ERI Reference Design Ventilation rate shall be in accordance with Equation 4-1.

Ventilation rate, CFM = $(0.01 \times \text{total square foot area of house}) + [7.5 \times (\text{number of bedrooms} + 1)]$
(Equation 4-1)

~~Energy used to recharge or refuel a vehicle used for transportation on roads that are not on the building site shall not be included in the ERI reference design or the rated design.~~

Reason: This language is redundant with other rating requirements and is not necessary. The Energy Rating Index (ERI) is determined in accordance with RESNET/ICC 301 Standard, which does not include vehicle charging/refueling in the end use loads and the Home Energy Rating System (HERS) Index.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Since the proposed deletion addresses redundancy in requirements, it would neither increase nor decrease construction costs.

Proposal # 5593

RE189-19

RE190-19

IECC: R406.4 (IRC N1106.4), TABLE R406.4 (IRC N1106.4)

Proponent: Joseph H. Cain, Solar Energy Industries Association (SEIA), representing Solar Energy Industries Association (SEIA) (JoeCainPE@gmail.com)

2018 International Energy Conservation Code

Revise as follows:

R406.4 (IRC N1106.4) ERI-based compliance. Compliance based on an ERI analysis requires that the *rated design including renewable energy systems* be shown to have an ERI less than or equal to the appropriate value indicated in Table R406.4 when compared to the *ERI reference design*.

**TABLE R406.4 (IRC N1106.4)
MAXIMUM ENERGY RATING INDEX**

CLIMATE ZONE	ENERGY RATING INDEX*
1	57 52
2	57 52
3	57 51
4	62 54
5	61 55
6	61 54
7	58 53
8	58 53

~~a. Where on-site renewable energy is included for compliance using the ERI analysis of Section R406.4, the building shall meet the mandatory requirements of Section R406.2, and the building thermal envelope shall be greater than or equal to the levels of efficiency and SHGC in Table R402.1.2 or Table R402.1.4 of the 2015 International Energy Conservation Code.~~

Reason: The Energy Rating Index is a voluntary path that ensures robust insulation and envelope measures while enabling on-site renewables that enhance the affordability of a home in select climate zones.

In the process of development of the 2018 IECC, in the Public Comment version of RE173-16 the ERI target scores were increased (relaxed) and Footnote a was added to treat projects differently if they do or do not incorporate an on-site renewable energy system. Projects that include a renewable energy system to offset consumption of energy and reduce energy flows at the meter are not rewarded in this revised approach, but are penalized by requiring a higher level of envelope measures. Footnote a requires IECC 2015 envelope backstop for projects with on-site renewable energy systems or 2009 envelope backstop for projects without on-site renewable energy systems. The result is an ERI compliance option that focuses on the building envelope with less-stringent target scores that can be attained without renewable energy systems -- a disincentive for builders to use renewable energy systems in the ERI path.

As presented by the Building Technologies Office of the Department of Energy's 2018 National Energy Codes Conference, according to the U.S. Energy Information Administration's AEO 2018 report, typical Residential End Uses include Space heating at 24% and Space cooling at 11%, for a combined space heating/cooling at 35% of all Residential Energy End Uses. Water heating accounts for 13.5% of Residential Energy End Uses. These figures illustrate that we have done a very good job of reducing regulated loads, such that unregulated loads (such as lighting loads, appliance loads, and plug loads) now represent greater than 50% of all Residential Energy End Uses. Renewable energy systems can offset not only the unregulated loads, but can also offset the reduced regulated loads.

Compliance measures and compliance paths that focus only on building envelope measures and discourage or penalize renewable energy systems - or fail to make renewable energy systems attractive to builders as a compliance option -- are focused on solving 35% of the problem. The IECC should encourage the use of energy efficiency plus renewable energy, to solve 100% of the problem. In fact, new homes with PV systems and EV chargers can also power our consumer vehicles with sunlight, solving greater than 100% of the building energy problem.

This proposal restores the lower, more stringent ERI target values of the 2015 IECC and again makes renewable energy systems an attractive option for builders.

Effective integration of energy efficiency measures and renewable energy systems is critical to the future of energy codes and green/stretch/reach codes. At the time of submittal of these code change proposals, there are four states with 100% renewable energy goals: Hawaii, California, New Jersey, and New York. Other communities are committing to renewable energy goals through their own local renewable goals for power supply or

for installation of renewable energy systems. Distributed Generation (DG) is an important component of these overall portfolio standards.

Bibliography: U.S. Energy Information Administration Annual Energy Outlook 2018
<https://www.eia.gov/outlooks/aeo/index.php>

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal encourages the installation of renewable energy systems, which provides more flexibility to the builder and could result in either increased or decreased first cost of construction, depending on builder choices.

Proposal # 5582

RE190-19

RE191-19

IECC: TABLE R406.4

Proponent: Lauren Urbanek, representing Natural Resources Defense Council (lurbanek@nrdc.org)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R406.4 (IRC N1106.4)
MAXIMUM ENERGY RATING INDEX**

CLIMATE ZONE	ENERGY RATING INDEX ^a
1	57 56
2	57
3	57
4	62 57
5	61 58
6	61 54
7	58 55
8	58 55

- a. Where on-site renewable energy is included for compliance using the ERI analysis of Section R406.4, the building shall meet the mandatory requirements of Section R406.2, and the building thermal envelope shall be greater than or equal to the levels of efficiency and SHGC in Table R402.1.2 or Table R402.1.4 of the 2015 International Energy Conservation Code.

Reason: The purpose of this proposal is to increase the efficiency of homes built to the Energy Rating Index, to reflect average HERS scores already being achieved in each climate zone.

Data from RESNET shows that in 2017, the average HERS score being achieved in each climate zone is, in many cases, already lower than the requirements in the 2018 IECC. Homes are already being built to the proposed values in each of the climate zones, so the numbers proposed are inherently realistic. Therefore, it is appropriate to adjust the ERI scores to better reflect reality.

Furthermore, as building component technology and the efficiency of systems and equipment continues to improve, it is important to continue to promote ever-increasing levels of efficiency in the IECC. When the ERI targets were first set during the 2015 code cycle, the RESNET HERS system, could not calculate energy savings from certain hot water energy efficiency measures. The RESNET HERS system has since been modified to account for energy savings from certain hot water efficiency measures. These savings are based on simple and inexpensive measures such as lower-flow plumbing fittings and hot water layouts that minimize water waste.

The subsequent increase in HERS scores in the 2018 IECC made this path of the code less stringent – and in fact, builders in most climate zones already exceed the 2018 requirements. The values in this proposal are more stringent than the 2018 IECC, yet still not as stringent as the 2015 requirements.

By strengthening the ERI scores in Table R406.4, the IECC will drive further innovation, better building practices, and more energy cost savings for homeowners.

Bibliography: RESNET. "Breakdown of 2017 HERS Rated Homes by Type of Housing." Published January 30, 2018. Retrieved on January 14, 2019 from <http://www.resnet.us/blog/breakdown-of-2017-hers-rated-homes-by-type-of-housing/>

Cost Impact: The code change proposal will increase the cost of construction

This code change proposal requires more efficiency in the ERI path of the code, which means that the cost of construction may increase for builders following this path of code as compared to if they were meeting the minimum requirements of the 2018 ERI path. However, the ERI scores in this proposal are based off of the average values reported to RESNET in 2017 for homes being built in each climate zone. That means that builders are already building to these values – regardless of what values are in the code – and so the cost of construction will not go up in many cases. Furthermore, this proposal only affects the ERI compliance path, which is only one compliance option and will not increase the cost of construction available to the builder under other compliance options.

Proposal # 5055

RE191-19

RE192-19

IECC: TABLE R406.4 (IRC N1106.4)

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R406.4 (IRC N1106.4)
MAXIMUM ENERGY RATING INDEX**

CLIMATE ZONE	ENERGY RATING INDEX ^a
1	57 <u>52</u>
2	57 <u>52</u>
3	57 <u>51</u>
4	62 <u>54</u>
5	61 <u>55</u>
6	61 <u>54</u>
7	58 <u>53</u>
8	58 <u>53</u>

a. Where on-site renewable energy is included for compliance using the ERI analysis of Section R406.4, the building shall meet the mandatory requirements of Section R406.2, and the building thermal envelope shall be greater than or equal to the levels of efficiency and SHGC in Table R402.1.2 or Table R402.1.4 of the 2015 International Energy Conservation Code.

Reason: The purpose of this code change proposal is to establish lower, more efficient ERI target scores, improving efficiency for homes complying under the Energy Rating Index. More precisely, the proposal restores the lower ERI Index target scores from the 2015 IECC. Under the ERI, the lower the score, the more efficient the home. Although the ERI numbers were increased to the current levels as part of a broad compromise in the 2018 IECC, we believe that over time the ERI must continue to be improved, and improving the Index numbers by returning to the 2015 IECC levels at some point is a reasonable first step in the right direction.

Although a direct comparison between the ERI and other IECC compliance options is complicated, the ERI numbers proposed (and those in the 2015 IECC) are within the range of equivalence to other compliance paths under the IECC. U.S. DOE published an analysis that compared compliance under the IECC with HERS scores, using over 60,000 model runs to test the range of HERS scores that could apply to a 2012 IECC-compliant home. The study found that the 2015 ERI scores would be more likely to ensure compliance with the IECC, but even those scores could not guarantee compliance. "Thus, one can conclude that the [2015 IECC] ERIs are generally very near the conservative end of possible values, but not quite so low as to always guarantee that a home complying via the ERI path would also comply via the Performance Path." See U.S. Department of Energy, *Identification of RESNET HERS Index Values Corresponding to Minimal Compliance with the IECC Performance Path*, at 4.17 (May 2014). Given that the other compliance options in the IECC have moderately improved since the 2012 IECC, we believe that these more stringent ERI scores would be appropriate as an upgrade to the current less efficient ERI levels for 2021.

Bibliography: See U.S. Department of Energy, *Identification of RESNET HERS Index Values Corresponding to Minimal Compliance with the IECC Performance Path*, at 4.17 (May 2014).

Cost Impact: The code change proposal will increase the cost of construction

To achieve a lower ERI score, builders must install more efficient products or systems in homes, which will increase construction costs. Because the ERI is a performance-based path, the costs and benefits to the consumer will vary depending on which improvements are incorporated into the home design. However, since the ERI is not mandatory and is one of only several compliance options, builders are not required to use this option if they do not find it acceptable for a specific project.

Proposal # 4007

RE192-19

RE193-19

IECC: R406.2 (IRC N1106.2), ICC Chapter 6 (IRC Chapter 44)

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

R406.2 (IRC N1106.2) Mandatory requirements. Compliance with this section requires that the provisions identified in Sections R401 through R404 indicated as “Mandatory” and Section R403.5.3 be met. The *building thermal envelope* shall be greater than or equal to levels of efficiency and *Solar Heat Gain Coefficients* in Table 402.1.1 or 402.1.3 of the ~~2009~~ 2012 International Energy Conservation Code .

Exception: Supply and return ducts not completely inside the *building thermal envelope* shall be insulated to an *R*-value of not less than R-6.

ICC

International Code Council, Inc.
500 New Jersey Avenue NW 6th Floor
Washington DC 20001

~~IECC—09~~ IECC—12: ~~2009~~ 2012 International Energy Conservation Code®

Reason: The purpose of this code change proposal is to help ensure that homes built to the Energy Rating Index (ERI) incorporate a reasonably efficient thermal envelope by updating the minimum thermal envelope backstop from the prescriptive level in the 2009 IECC to the 2012 edition of the IECC. We view this improvement as part of a broader effort to gradually improve the efficiency of the IECC and to reduce the likelihood that homes will be built with below-average levels of efficiency in the thermal envelope. A robust thermal envelope is crucial to long-term energy conservation. The ERI gives builders an unprecedented amount of flexibility in achieving code compliance. Unlike other compliance methods, using the ERI compliance path, builders may take credit for efficiency improvements in HVAC equipment, appliances, and lighting. To help reduce the risk of a home being built with an exceptionally weak permanent thermal envelope, Section R406.2 currently requires an ERI-rated home to meet or exceed the prescriptive thermal envelope requirements of the 2009 IECC. We believe this requirement is very easily achieved by the vast majority of homebuilders (some of whom are building beyond the code’s base requirements), but it is an important consumer protection all the same. State and local policymakers agree – to our knowledge, in every state in which the ERI has been adopted as part of a 2015 or 2018 IECC update, the 2009 thermal envelope backstop has also been adopted.

The ERI thermal envelope backstop is now due for an update. By the time the 2021 IECC is finalized, the 2009 IECC will be 12 years old (and given the typical lag of state code adoption, the lag could be even longer).

The modification proposed above strikes a balance between efficiency and flexibility, while updating one of the IECC’s most important built-in backstops. The building’s permanent thermal envelope will outlast many of the shorter-term improvements (such as HVAC equipment, lighting, and appliances).

Bibliography: U.S. Department of Energy, *National Energy and Cost Savings for New Single- and Multifamily Homes: A Comparison of the 2006, 2009, and 2012 editions of the IECC* (April 2012) available at <https://www.energycodes.gov/sites/default/files/documents/NationalResidentialCostEffectiveness.pdf>.

Cost Impact: The code change proposal will increase the cost of construction. However, the prescriptive requirements (including those for the thermal envelope) of the 2012 IECC have been found cost-effective by US DOE. See U.S. Department of Energy, *National Energy and Cost Savings for New Single- and Multifamily Homes: A Comparison of the 2006, 2009, and 2012 editions of the IECC* (April 2012) available at <https://www.energycodes.gov/sites/default/files/documents/NationalResidentialCostEffectiveness.pdf>. We believe that those who currently use the ERI will be able to comply with 2012 IECC thermal envelope requirements with little or no additional effort. However, for those builders that would have traded away more of the thermal envelope efficiency, the proposal above will apply a reasonable limit to these trade-offs.

Proposal # 4008

RE193-19

RE194-19

IECC: R202 (IRC N1101.6), TABLE R406.4 (IRC N1106.4)

Proponent: Steven Rosenstock, Edison Electric Institute, representing Edison Electric Institute (srosenstock@eei.org)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R406.4 (IRC N1106.4)
MAXIMUM ENERGY RATING INDEX**

CLIMATE ZONE	ENERGY RATING INDEX ^{a,b}
1	57
2	57
3	57
4	62
5	61
6	61
7	58
8	58

a. Where on-site renewable energy is included for compliance using the ERI analysis of Section R406.4, the building shall meet the mandatory requirements of Section R406.2, and the building thermal envelope shall be greater than or equal to the levels of efficiency and SHGC in Table R402.1.2 or Table R402.1.4 of the 2015 International Energy Conservation Code.

b. In a state, region, or country that has a renewable portfolio standard of 50% or greater, on-site renewable electric energy production systems shall receive credit only where they are installed with an on-site energy storage system that has a rated capacity of at least 3.5 kWh.

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Add new definition as follows:

RENEWABLE PORTFOLIO STANDARD (RPS). A policy that requires electricity producers within a given jurisdiction to supply a certain minimum amount, capacity, or percentage of their electricity from designated renewable resources.

Reason: More states / areas of the United States are increasing their Renewable Portfolio Standards. As more distributed renewable electric energy systems are installed, there are situations where there is too much supply and too little demand, especially in the fall, winter, and spring. In California, this has been called the "duck curve". In Hawaii, this has been called the "Nessie curve". In these cases, the grids are dealing with the issue of oversupply. In 2018, the California ISO had to curtail over 461,000 MWh (461 Million kWh) of solar and wind electric generation.

Energy storage, both grid-side and customer-side, will be needed to help address this situation. With energy storage, there is much less likelihood (or even no chance) that renewable electricity will be curtailed or not used.

In the newest version of Title 24, builders are allowed to adjust the size of residential PV systems if they also installed energy storage systems in combination with the PV.

This proposal is forward looking and will help both homeowners and the grid in the future, especially in areas with aggressive Renewable Portfolio Standards.

The definition is needed for support of the new language in the proposal. This is an "umbrella" definition that encompasses all of the variations of RPS policies throughout the United States (and world). RPS policies vary on a state by state basis, as there is no federal standard in the United States. However, in other countries that use the IECC, there may be country-wide policies that would be in effect.

More details about RPS policies can be found on numerous web sites, including the following:

<https://www.eia.gov/todayinenergy/detail.php?id=4850> (US DOE/EIA article from 2012)

<http://ncsolarcen-prod.s3.amazonaws.com/wp-content/uploads/2018/10/Renewable-Portfolio-Standards-2018.pdf>

<http://programs.dsireusa.org/system/program?type=38&>

Bibliography: California ISO, "What the duck curve tells us about managing a green grid", 2016,

https://www.caiso.com/Documents/FlexibleResourcesHelpRenewables_FastFacts.pdf

NREL, "Overgeneration from Solar Energy in California: A Field Guide to the Duck Chart", November 2015

<https://www.nrel.gov/docs/fy16osti/65023.pdf>

GTM, "Hawaii's Solar-Grid Landscape and the 'Nessie Curve' ", February 10, 2014, <https://www.greentechmedia.com/articles/read/hawaiis-solar-grid-landscape-and-the-nessie-curve>

Cost Impact: The code change proposal will increase the cost of construction

Based on current battery technology and costs, the estimated cost impact will be approximately \$1750 (3.5 kWh * \$500/kWh installed) for homes that are located in areas with high RPS requirements and that install on-site renewable electric energy generation systems.

Proposal # 4675

RE194-19

RE195-19

IECC: TABLE R406.4 (IRC N1106.4)

Proponent: Steven Rosenstock, Edison Electric Institute, representing Edison Electric Institute (srosenstock@eei.org)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R406.4 (IRC N1106.4)
MAXIMUM ENERGY RATING INDEX**

CLIMATE ZONE	ENERGY RATING INDEX ^{a,b}
1	57
2	57
3	57
4	62
5	61
6	61
7	58
8	58

a. Where on-site renewable energy is included for compliance using the ERI analysis of Section R406.4, the building shall meet the mandatory requirements of Section R406.2, and the building thermal envelope shall be greater than or equal to the levels of efficiency and SHGC in Table R402.1.2 or Table R402.1.4 of the 2015 International Energy Conservation Code.

b. Where the installation of an on-site renewable energy system is a mandatory requirement in the code, the building shall receive credit only for the capacity installed that is above the minimum mandatory requirement.

Reason: In California, the latest version of Title 24 will go into effect on 1/1/2020. In the energy code, there is a requirement for new homes to install on-site PV systems, based on the following formula:

$kW PV = (CFA \times A) / 1000 + (NDwell \times B)$ where

kW PV = kWdc size of the PV system

CFA = Conditioned floor area

NDwell = Number of dwelling units

A = Adjustment factor from Table 150.1-C (range of 0.572 to 1.56)

B = Dwelling adjustment factor from Table 150.1-C (range of 1.06 to 1.51)

There are exceptions to the requirement, but most homes will be required to install systems that range in size from 2 to 5 kW.

Under the ERI compliance path, homes with such systems get credits (lower scores). However, if such systems are already required by the code, should they receive full credit?

With other efficiency programs, once the federal or state baseline is increased (e.g., 10 to 13 SEER, for example), the incentives for the 13 SEER system disappear, since it is no longer a "high efficiency" option, but a required minimum standard.

This proposal follows that precedent. Systems that meet the mandated minimum requirements should not receive credit, since they are not going "above and beyond" what is required. Only systems that exceed the minimum requirements should get credit for the incremental energy production they are providing.

Bibliography: California Energy Commission, "**2019 Standards Part 6 Chapter 8 (Section 150.1) Revised Express Terms**" TN-223257-3 Submitted 4/23/2018 https://www.energy.ca.gov/title24/2019standards/rulemaking/documents/2018-05-09_hearing/2019_Revised_EnergyCode.php NREL, "*U.S. Solar Photovoltaic System Cost Benchmark: Q1 2018*", November 2018 <https://www.nrel.gov/docs/fy19osti/72399.pdf>

Cost Impact: The code change proposal will increase the cost of construction

Where the PV system is sized larger than the required minimum, the extra cost will be on the order of \$2,700 per kW (DC) of incremental peak rated capacity. The value is based on the November 2018 NREL report on US solar installations at residential facilities.

For example, if the minimum requirement is 3 kW (DC), and a 5 kW (DC) system is installed, the extra cost will be approximately \$5,400.

Proposal # 4680

RE195-19

RE196-19

IECC: TABLE R406.4 (IRC N1106.4)

Proponent: Joel Martell, representing National Association of Home Builders (jmartell@nahb.org)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R406.4 (IRC N1106.4)
MAXIMUM ENERGY RATING INDEX**

CLIMATE ZONE	ENERGY RATING INDEX ^a
1	57
2	57
3	57
4	62
5	61
6	61
7	58
8	58

- a. Where on-site renewable energy is included for compliance using the ERI analysis of Section R406.4, the building shall meet the mandatory requirements of Section R406.2, and the building thermal envelope shall be ~~greater than or equal to~~ within 15% of the levels of efficiency and SHGC in Table R402.1.2 or Table R402.1.4 ~~of the 2015 International Energy Conservation Code.~~

Reason: This modification gives on-site renewable energy a 15% credit of the current edition of the code when using the Energy Rating Index. It clears up confusion about calling reference to past editions of the IECC and enables the code user to use one edition of the code instead of referencing a past edition. As the code is written right now there is no credit for installing onsite renewable energy while mandating rigorous prescriptive requirement of the 2015 IECC with no room for flexibility. The prescriptive tables have been virtually untouched in the 2018 edition and could potentially go unchanged for cycles to come. The ERI path is intended to allow for flexibility while constructing an energy efficient home. The proposal gives a reasonable amount of flexibility without jeopardizing the integrity or efficiency of the homes. The 15% allowance will prevent from installing single pane windows and prevent significant reductions in building thermal envelope components.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal does not change the cost of construction it increases the flexibility.

Proposal # 4323

RE196-19

RE197-19

IECC: R406.5 (IRC N1106.5)

Proponent: Ryan Meres, RESNET, representing RESNET (ryan.meres@gmail.com)

2018 International Energy Conservation Code

Revise as follows:

R406.5 (IRC N1106.5) Verification by approved agency. Verification of compliance with Section R406 shall be completed by an *approved* third party ~~party~~ working under the auspices of an approved rating provider as defined in ANSI/RESNET/ICC 301.

Reason: In the 2018 IECC, Standard 301 is only referenced for the calculation of the ERI. However, there are many other aspects of Standard 301 that address implementation items, like: inspection of minimum rated features, certified raters, approved rating providers and labeling. Without any reference to some of these items in the code, there are no requirements other than an “approved” third party to verify compliance. Unfortunately, that provides little guidance to the local code official. In addition, there is currently no quality assurance requirements under the ERI path. Homes complying with the ERI path will only be subject to quality assurance if they are using the HERS index and submit a “Confirmed” rating to RESNET. In Standard 301 an “Approved Rating Provider” is defined as: *An approved entity responsible for the certification of home energy raters working under its auspices and who is responsible for the quality assurance of such Certified Raters and for the quality assurance of home energy ratings produced by such home energy raters.*

In Standard 301 a “Certified Rater” is defined as: *An individual who has become qualified to conduct home energy ratings through certification by an Approved Rating Provider.*

In Standard 301 “Approved” is defined as: *shall mean approved by an entity adopting and requiring the use of this Standard as a result of investigation and tests conducted by the entity or by reason of accepted principles or tests by nationally recognized organizations.*

After having the ERI path in the code for two cycles now, it has become clear that there is confusion about the nuances of its implementation in the field. This change will help to clarify any confusion about who should be approved as a third party to verify compliance with the ERI path.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The Home Energy Rating System (HERS) Index is the most common option for ERI compliance. All RESNET Certified HERS Raters are required to work under the auspices of a Quality Assurance Provider. Therefore, this proposal is simply recognizing an industry practice that already exists and will not lead to any increase to the cost of construction.

Proposal # 4910

RE197-19

RE198-19

IECC: R406.5 (IRC N1106.5), ISO Chapter 6 (IRC Chapter 44)

Proponent: Aaron Gary, representing Self (aaron.gary@texenergy.org)

2018 International Energy Conservation Code

Revise as follows:

R406.5 (IRC N1106.5) Verification by approved agency. Verification of compliance with Section R406 shall be completed by an *approved* third party ~~party~~ that has been accredited to ISO/IEC 17065.

Reason: The ERI path has been a welcome addition of the IECC. The DOE Home Energy Rating Variability Study [https://www.energycodes.gov/sites/default/files/documents/NECC2018_11_Williams.pdf] showed unacceptably high levels of variance in ERI ratings however, which begs the question of if ERI is an acceptable and defensible means of consistently demonstrating CODE Compliance. I think the answer is that it CAN be oversight of the ERI is strengthened beyond what currently exists. Using an consensus body developed Standard, in the same vein as RESNET/ICC 380, NFRC 400 and HVI Standard 916, is a reasonable means of accomplishing this. Specifically using the ANSI-developed Standard (ISO/IEC 17065) that the EPA is already moving to include in to its ENERGY STAR for Homes program for the verifying the ERI of dwellings in the program is only logical choice.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The code change proposal will not increase or decrease the cost of construction but it will increase the quality of service and results expected of 3rd-party verifiers.

Proposal # 4045

RE198-19

RE199-19

IECC: R406.5 (IRC N1106.5)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

R406.5 (IRC N1106.5) Verification by approved agency. Verification of compliance with the Section R406 as outlined in Section R406.4 and R406.6 shall be completed by an *approved* third party. Verification of Section R406.2 shall be completed by the authority having jurisdiction or an approved third party inspection agency per Section R105.4.

Reason: R406.5 Verification by an approved agency. Currently, this section is causing confusion between jurisdictions and approved third parties. Many jurisdictions believe that the third party is verifying all aspects of the energy code while many approved third parties believe they should only generate the ERI score. This is leading to homes that are not getting fully code verified because fundamentally the development of an ERI score solely, and ERI Rating, is different from a full code compliance rating.

The HERS Index benchmarks the efficiency of a home in comparison to a reference home that is based on the 2006 IECC. A HERS Rating is an asset rating of the energy features in a home. This means that in the process of a HERS Rating to generate the HERS Index a Rater does not necessarily inspect to see if energy features governed by the code are installed according to requirements of the code. For example, the HERS Ratings systems' insulation installation grading criteria gives guidance on how to de-rate the R-value of poorly installed insulation. The Rater is required to give a grade 3 to poor installations. The HERS Index score is intended to evaluate the performance of what is installed. It is not intended to determine if it was installed per the requirement of code. A code rating or evaluation for the generation of the ERI score, on the other hand, should only use a grade 1 because only grade 1 installation of insulation meets the requirements of manufacturer instructions and therefore code. If a Rater were to evaluate a home for an ERI score and come across grade 3 installation of insulation, the installation should fail the inspection and be re-installed to meet code requirements.

In this way, an ERI rating and a HERS rating are fundamentally different. One is held to a pass/fail requirement of code and the other is a quantification and evaluation of energy assets or components of the home. This small example demonstrates how the HERS index score and the ERI score differ.

The language that is added to this section clearly defines that the generation of the ERI score is in the approved third parties' scope of work and that the remainder of the code compliance verification be performed by the third party or not, depending on the agreement between the jurisdiction and the third party.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This code change proposal does not increase the cost of construction or the utilization of this pathway in the code. It merely defines how to use the path to ensure compliance with the code.

Proposal # 5258

RE199-19

RE200-19

IECC: R406.5.1 (IRC N1106.5.1) (New)

Proponent: Ryan Meres, representing RESNET (ryan.meres@gmail.com)

2018 International Energy Conservation Code

Add new text as follows:

R406.5.1 (IRC N1106.5.1) Quality Assurance *Approved* third party verifiers and all *residential buildings* demonstrating compliance with Section R406 shall comply with the quality assurance requirements in accordance with ANSI/RESNET/ICC 301.

Reason: There has been confusion about the differences between ERI and HERS, especially when it comes to quality assurance requirements. Currently, under the 2018 IECC, a permit applicant could submit an ERI Compliance Report to demonstrate compliance with the energy code without any requirement subjecting that rating to quality assurance. The only way a home complying with the ERI path will be subject to quality assurance is if that home uses a HERS rating and a “confirmed” rating is submitted to RESNET. Sections 5.1.4.1.3 and 5.1.4.2.3 of ANSI/RESNET/ICC 301 require that “Confirmed” and “Sampled” ratings be subject to Quality Assurance requirements “equivalent to Section 900 of the *Mortgage Industry National Home Energy Rating Systems Standard*.”

One of the most important benefits of the ERI compliance path is the requirement for third party verification of compliance. Many local code officials are under the misconception that all homes using the ERI for compliance are subject to quality assurance. Unfortunately, this is not true.

This proposal would require that the approved third party verifiers are working under a program that has quality assurance requirements; and the homes they’re responsible for verifying are subject to those quality assurance standards.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The Home Energy Rating System (HERS) Index is the most common option for ERI compliance. All RESNET Certified HERS Raters are required to work under the auspices of a Quality Assurance Provider. Therefore, this proposal is simply recognizing an industry practice that already exists and will not lead to any increase to the cost of construction.

Proposal # 4911

RE200-19

RE201-19

IECC: R406.5.2 (IRC N1106.5.2) (New)

Proponent: Ryan Meres, RESNET, representing RESNET (ryan.meres@gmail.com)

2018 International Energy Conservation Code

Add new text as follows:

R406.5.2 (IRC N1106.5.2) Compliance documentation for certificate of occupancy. Third parties that have been approved to verify compliance with R406 shall provide the following documentation to the code official, prior to issuance of a certificate of occupancy:

1. Documentation that the approved third party is certified by an approved rating provider in accordance with ANSI/RESNET/ICC 301;
2. Documentation demonstrating that the mandatory requirements in R406.2 have been met;
3. A compliance report in accordance with R406.6.2 that is clearly indicated as a "Confirmed Rating" or "Sampled Rating" as defined by ANSI/RESNET/ICC 301;
4. Documentation of air leakage testing results in accordance with R402.4.1.2;
5. Documentation of duct leakage testing results in accordance with R403.3.3.

Reason: Despite education efforts, there is confusion among code officials and third party verifiers about the documentation that should be required, prior to the issuance of a certificate of occupancy, for compliance with the ERI path. Since this is still a relatively new compliance path for the IECC, the proponents of this proposal feel that it is necessary to provide guidance to local code officials and third party verifiers.

This proposal seeks to add each of the proposed documentation items for the following reasons:

1. This provision ensures that third party verifiers are subject to quality assurance procedures
2. This item ensures that third party verifiers are verifying the mandatory requirements of the IECC and not just what's required to conduct the rating
3. ANSI/RESNET/ICC 301 only requires "Confirmed" and "Sampled" ratings to be subject to quality assurance, so this item ensures that third parties are not submitting a "projected" rating to the code officials that is not subject to quality assurance
4. Documenting the envelope air leakage results ensures that those numbers are in alignment with the figures used in obtaining the ERI score
5. Documenting the duct leakage results ensures that those numbers are in alignment with the figures used in obtaining the ERI score.

Overall, this proposal will improve consistency among third parties and code officials in documenting compliance with the ERI path.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal does not add any construction requirements to the code. It simply requires that some basic documentation be submitted to demonstrate compliance with R406.

Proposal # 4912

RE201-19

RE202-19

IECC: R406.6.2

Proponent: Kirk Nagle, City of Aurora, representing Myself (knagle@auroragov.org)

2018 International Energy Conservation Code

Revise as follows:

R406.6.2 (IRC N1106.6.2) Compliance report. Compliance software tools shall generate a report that documents that the ERI of the *rated design* complies with Sections R406.3 and R406.4. The compliance documentation shall include the following information:

1. Address or other identification of the residential building.
2. Declare Energy Rating Index on title page
3. An inspection checklist documenting the building component characteristics of the *rated design*. The inspection checklist shall show results for both the *ERI reference design* and the *rated design*, and shall document all inputs entered by the user necessary to reproduce the results.
4. Name of individual completing the compliance report.
5. Name and version of the compliance software tool.

Exception: Where an otherwise identical building model is offered in multiple orientations, compliance for any orientation shall be permitted by documenting that the building meets the performance requirements in each of the four (north, east, south and west) cardinal orientations.

Reason: This code change is being proposed to clarify the energy path to the code official and the documentation for permit. Many reports do not specify the path that is being proposed and the code official has to contact the applicant to verify the energy path they are intending to use, to comply with the energy code. By providing the method of compliance the code official can focus on the details of the report and this information will expedite the permit process time.

Cost Impact: The code change proposal will increase the cost of construction
This will increase the cost of construction by a minor amount, adding a data entry to the report.

Proposal # 5668

RE202-19

RE203-19

IECC: R406.6.2 (IRC N1106.6.2)

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

R406.6.2 (IRC N1106.6.2) Compliance report. Compliance software tools shall generate a report that documents that the ERI of the *rated design* complies with Sections ~~R406.3~~ and R406.2 through R406.4. The compliance documentation shall include the following information:

1. Address or other identification of the residential building.
2. An inspection checklist documenting the building component characteristics of the *rated design*. The inspection checklist shall show results for both the *ERI reference design* and the *rated design*, and shall document all inputs entered by the user necessary to reproduce the results. The checklist shall document compliance with each requirement under Section R406.2
3. Name of individual completing the compliance report.
4. Name and version of the compliance software tool.

Exception: Where an otherwise identical building model is offered in multiple orientations, compliance for any orientation shall be permitted by documenting that the building meets the performance requirements in each of the four (north, east, south and west) cardinal orientations.

Reason: The purpose of this proposal is to correct what we believe to be an omission in the Energy Rating Index compliance report and to provide additional clarity and direction to software makers about how to incorporate the mandatory backstop provisions of the ERI into compliance software. The compliance report outlined in Section R406.6.2 does not currently require software to document whether the project complies with the mandatory provisions of Section R406.2. The proposal above corrects this by adding Section R406.2 to the list of sections to be included in the compliance report and adds the requirements of Section R406.2 to the inspection checklist.

Although mandatory provisions and backstops have been a part of the IECC for many years, software designed for voluntary or "above-code" programs (such as HERS rating software) may not directly address mandatory items or treat them with the appropriate level of importance. Code officials understand very well that when a provision is listed as "mandatory," the building simply cannot achieve compliance without meeting that provision. Now that more and more code users are turning to software and rating professionals for code compliance, it is important to provide additional details for software developers as to how to incorporate these important provisions.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. No code requirements are changed by this proposal, but the addition of the mandatory requirements to the compliance report and checklist will help ensure quality construction and facilitate code compliance.

Proposal # 4011

RE203-19

RE204-19

IECC: R202 (IRC N1101.6), R406.6.3 (IRC N1106.6.3) (New)

Proponent: jim edelson, representing New Buildings Institute (jim@newbuildings.org)

2018 International Energy Conservation Code

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Add new definition as follows:

RENEWABLE ENERGY CERTIFICATE (REC). An instrument that represents the environmental attributes of one megawatt hour of renewable energy; also known as an energy attribute certificate (EAC).

Add new text as follows:

R406.6.3 (IRC N1106.6.3) Renewable energy certificates (RECs) documentation. Where onsite renewable energy is included in the calculation of an ERI, one of the following forms of documentation shall be provided to the *code official*:

1. Substantiation that the RECs associated with the onsite renewable energy are owned by, or retired on behalf of, the homeowner.
2. A contract that conveys to the homeowner the RECs associated with the onsite renewable energy, or conveys to the homeowner an equivalent quantity of RECs associated with other renewable energy.

Reason: This proposal impacts who may claim the environmental attributes of an onsite-renewable energy system. The environmental attributes of solar power, or other renewable energy, have market value that is reflected and transacted in RECs.

When the installer, leasing company or financial agent in the solar panel transaction strips that value from the homeowner by taking possession of the RECs, according to the Federal Trade Commission the power produced by the solar panels on the house would have an "unqualified claim" as renewable energy. To prevent this, the proposal ensures that environmental attributes are not double counted towards compliance with the IECC. While this proposal does not cite Green-E, the Green-E Standard describes the double counting that occurs when RECs have been transferred to another party in the renewable transaction:

Examples of prohibited double uses include, but are not limited to:

- 1) When the same REC is sold by one party to more than one party, or any case where another party has a conflicting contract for the RECs or the renewable electricity;*
- 2) When the same REC is claimed by more than one party, including any expressed or implied environmental claims made pursuant to electricity coming from a renewable energy resource, environmental labeling or disclosure requirements. This includes representing the energy from which RECs are derived as renewable in calculating another entity's product or portfolio resource mix for the purposes of marketing or disclosure;*
- 3) When the same REC is used by an electricity provider or utility to meet an environmental mandate, such as an RPS, and is also used to satisfy customer sales under Green-e Energy; or*
- 4) Use of one or more attributes of the renewable energy or REC by another party This includes when a REC is simultaneously sold to represent "renewable electricity" to one party, and one or more Attributes associated with the same MWh of generation (such as CO2 reduction) are also sold, to another party.*

To prevent the situation where double counting is credited within the ERI calculation, thereby artificially reducing ERI scores and allowing the the home to install fewer energy efficiency features than otherwise would be required, this proposal ensures that the homeowner retains possession of the RECs associated with onsite renewable energy systems. In the case where those RECs for the onsite system cannot be transferred to the homeowner, an equivalent quantity of RECs must be provided.

Bibliography: Federal Register, Volume 77, Number 197; October 11, 2012; 16 CFR Part 260; "Guides for the Use of Environmental Marketing Plans".

Green-e Renewable Energy Standard for Canada and the United States, Version 3.2; March 20, 2018.

Cost Impact: The code change proposal will increase the cost of construction

This proposal impacts who may claim the environmental attributes of an onsite-renewable energy system. The environmental attributes of the solar power have market value, reflected in RECs. The cost of installing solar panels may be reduced when the installer, leasing company or financial agent strips that value from the homeowner by taking possession of the RECs.

Proposal # 5047

RE205-19

IECC: R406.6.2 (IRC N1106.6.2), R406.6.2.1 (IRC N1106.6.2.1) (New), R406.6.2.2 (IRC N1106.6.2.2) (New)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robb@nrglogic.com)

2018 International Energy Conservation Code

Revise as follows:

R406.4 (IRC N1106.4) ERI-based compliance. Compliance based on an ERI analysis requires that the *rated proposed design and confirmed built dwelling* be shown to have an ERI less than or equal to the appropriate value indicated in Table R406.4 when compared to the *ERI reference design*.

R406.6.2 (IRC N1106.6.2) Compliance report. Compliance software tools shall generate a report that documents that the home and the ERI score of the rated design complies with Sections R406.2, R406.3 and Section R406.4. The compliance Compliance documentation shall be created for the proposed design and shall be submitted with the application for the building permit. Confirmed compliance documents of the built dwelling unit shall be created and submitted to the code official for review before a certificate of occupancy is issued. Compliance reports shall include information in accordance with Sections R406.6.2.1 and R406.6.2.2, include the following information:

1. ~~Address or other identification of the residential building.~~
2. ~~An inspection checklist documenting the building component characteristics of the rated design. The inspection checklist shall show results for both the ERI reference design and the rated design, and shall document all inputs entered by the user necessary to reproduce the results.~~
3. ~~Name of individual completing the compliance report.~~
4. ~~Name and version of the compliance software tool.~~

~~**Exception:** Where an otherwise identical building model is offered in multiple orientations, compliance for any orientation shall be permitted by documenting that the building meets the performance requirements in each of the four (north, east, south and west) cardinal orientations.~~

Add new text as follows:

R406.6.2.1 (IRC N1106.6.2.1) Proposed compliance report for permit application. Compliance reports submitted with the application for a building permit shall include the following:

1. Building street address, or other building site identification.
2. The name of the individual performing the analysis and generating the compliance report.
3. The name and version of the compliance software tool.
4. If requested by the authority having jurisdiction, documentation of all inputs entered into the software used to produce the results for the reference design and/or the rated home.
5. A certificate indicating that the proposed design has an ERI less than or equal to the appropriate score indicated in Table R406.4 when compared to the ERI reference design. The certificate shall document the building component energy specifications that are included in the calculation including component level insulation R-values or U-factors, assumed duct system and building envelope air leakage testing results, as well as the type and rated efficiencies of proposed heating, cooling, mechanical ventilation, and service water heating equipment to be installed. If onsite renewable energy systems will be installed the certificate shall report the type and production size of the proposed system.
6. When a site-specific report is not generated, the proposed design shall be based on the worst-case orientation and configuration of the rated home.

R406.6.2.2 (IRC N1106.6.2.2) Confirmed compliance report for a certificate of occupancy. A confirmed compliance report submitted for obtaining the certificate of occupancy shall be made site and address specific and include the following:

1. Building street address or other building site identification.
2. The name of the individual performing the analysis and generating the report.
3. The name and version of the compliance software tool.
4. If requested by the authority having jurisdiction, documentation of all inputs entered into the software used to produce the results for the reference design and/or the rated home.
5. A final confirmed certificate indicating that the confirmed rated design of the built home complies with Sections R406.2 and R406.4. The certificate shall report the energy features that were confirmed to be in the home including component level insulation R- values or U-factors, results from any required duct system and building envelope air leakage testing, as well as, the type and rated efficiencies of the heating, cooling, mechanical ventilation, and service water heating equipment installed. When onsite renewable energy systems have been installed on or in the home the certificate shall report the type and production size of the installed system.

Reason: The word Rating defines a process by which one can systematically and repeatably assess and inspect a home. One can perform a code rating, an energy rating, a program or EnergyStar rating, and so on. In this way the process of evaluation may differ in that an Energy Rating is an asset rating while a Code Rating is a compliance rating. So, although the evaluation can be different Ratings ensure that verification of installed features is the same.

Section R405 Simulated Performance Alternative and Section R406 Energy Rating Index Compliance Alternative both use a rating process for verifying compliance of the home, so the bulk of this code change proposal adds language to this section that is the same as used in Section R405 to explain what is needed to demonstrate compliance for obtaining the building permit (proposed design) and what is needed in order to release the certificate of occupancy (confirmed Reports).

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This code change proposal does not increase the cost of construction or the utilization of this pathway in the code. It merely defines how to use the path to ensure compliance with the code.

Proposal # 5260

RE205-19

RE206-19

IECC: R401.2 (IRC N1101.13), R401.2.1 (IRC N1101.13.1) (New), R407 (IRC N1107) (New), R407.1 (IRC N1107.1) (New), R407.2 (IRC N1107.2) (New), TABLE R407.2 (IRC N1107.2) (New)

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org)

2018 International Energy Conservation Code

Revise as follows:

R401.2 (IRC N1101.13) Compliance. Projects shall comply with Section R401.2.1 and one of the following:

1. Sections R401 through R404.
2. Section R405 and the provisions of Sections R401 through R404 indicated as “Mandatory.”
3. The energy rating index (ERI) approach in Section R406.

Add new text as follows:

R401.2.1 (IRC N1101.13.1) Additional Energy Efficiency (Mandatory). This section establishes additional requirements applicable to all compliance approaches to achieve additional energy efficiency.

1. For buildings complying under Sections R401 through R404, one or more additional energy efficiency measures shall be installed in accordance with Section R407.2 that cumulatively equal or exceed 5 Flex Points.
2. For buildings complying under the simulated performance alternative in Section R405, the building shall meet one of the following:
 - 2.1. One or more additional energy efficiency measures in Section R407.2 shall be installed that cumulatively equal or exceed five Flex Points, without including such measures in the proposed design under Section R405; or
 - 2.2. The proposed design of the building under Section R405.3 shall have an annual energy cost that is less than or equal to 95 percent of the annual energy cost of the *standard reference design*.
 - 2.3. For buildings that comply under the energy rating index alternative in Section R406, the energy rating index value shall be at least 5 percent less than the energy rating index target specified in Table R406.4.

R407 (IRC N1107) FLEX POINTS FOR ADDITIONAL ENERGY EFFICIENCY

R407.1 (IRC N1107.1) Scope. This section establishes flex point alternatives to achieve additional energy efficiency in accordance with Section R401.2.

R407.2 (IRC N1107.2) Flex Points for additional energy efficiency. Measures shall be selected from Table R407.2. Each measure chosen shall receive credit for the Flex Points as indicated in the Table for the specific Climate Zone. Interpolation of points between measures shall not be permitted.

TABLE R407.2 (IRC N1107.2)
FLEX POINTS FOR ADDITIONAL ENERGY EFFICIENCY

Measure Number	Measure Description	Flex Point Value									
		Climate Zone 1	Climate Zone 2	Climate Zone 3	Climate Zone 4	Climate Zone 4C ^a	Climate Zone 5	Climate Zone 6	Climate Zone 7	Climate Zone 8	
		1a	≥ 2.5% reduction in total UA ^b	1	1	2	2	2	2	3	4
1b	≥ 5% reduction in total UA ^b	3	3	3	3	3	4	5	5	5	
1c	≥ 7.5% reduction in total UA ^b	5	5	5	5	5	6	7	8	8	
2a	≥ 10% reduction in glazed vertical fenestration area-weighted average SHGC	2	1	-	-	-	-	-	-	-	
2b	≥ 20% reduction in glazed vertical fenestration area-weighted average SHGC	4	1	-	-	-	-	-	-	-	
3a	≤ 3 ACH50 air leakage rate with ERV or HRV installed ^c	2	4	5	7	7	7	7	8	8	
3b	≤ 2 ACH50 air leakage rate with ERV or HRV installed ^c	2	5	7	9	9	9	10	11	11	

4a	<u>≤ 2 CFM of total duct leakage per 100 square feet of conditioned floor area when tested in accordance with Section R403.3.3</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>-</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>
4b	<u>100% of ductless thermal distribution system or hydronic thermal distribution system located completely inside the building thermal envelope or 100% of duct thermal distribution system located in conditioned space^d</u>	<u>8</u>	<u>8</u>	<u>9</u>	<u>11</u>	<u>8</u>	<u>12</u>	<u>15</u>	<u>17</u>	<u>17</u>
5a	<u>≥ 18 SEER and ≥ 14 EER cooling system efficiency^e</u>	<u>9</u>	<u>7</u>	<u>3</u>	<u>2</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
5b	<u>≥ 16 EER cooling system efficiency^e</u>	<u>10</u>	<u>7</u>	<u>3</u>	<u>2</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
6a	<u>≥ 96 AFUE heating system efficiency^f</u>	<u>-</u>	<u>2</u>	<u>6</u>	<u>9</u>	<u>10</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>14</u>
7a	<u>≥ 10.5 HSPF heating system efficiency^f</u>	<u>-</u>	<u>1</u>	<u>2</u>	<u>4</u>	<u>4</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>3</u>
7b	<u>≥ 3.5 COP heating system efficiency^f</u>	<u>-</u>	<u>2</u>	<u>4</u>	<u>6</u>	<u>6</u>	<u>8</u>	<u>7</u>	<u>6</u>	<u>5</u>
8a	<u>≥ 0.8 EF for fossil fuel service water heating system</u>	<u>7</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>1</u>	<u>1</u>
8b	<u>≥ 1.15 EF for electric service water heating system</u>	<u>7</u>	<u>7</u>	<u>7</u>	<u>4</u>	<u>5</u>	<u>3</u>	<u>3</u>	<u>2</u>	<u>2</u>
8c	<u>≥ 0.4 Solar Fraction for service water heating system</u>	<u>8</u>	<u>9</u>	<u>9</u>	<u>7</u>	<u>9</u>	<u>6</u>	<u>5</u>	<u>4</u>	<u>3</u>

a. Climate Zone 4C is Climate Zone Marine 4.

b. The Total UA shall be calculated in accordance with Section R402.1.5 Total UA alternative.

c. Minimum Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) requirements, measured at the lowest tested net supply airflow, shall be ≥ 75% Sensible Recovery Efficiency (SRE), ≤ 1.1 W/CFM Fan Energy and shall not use recirculation as a defrost strategy. In addition, the Energy Recovery Ventilator (ERV) shall be ≥ 50% Latent Recovery/Moisture Transfer (LRMT).

d. As defined by Section R403.3.7.

e. For multiple cooling systems, all systems shall meet or exceed the minimum efficiency requirements in Table R407.2 and shall be sized to serve 100% of the cooling design load. As an alternative, each system installed shall receive credit for the percentage of the Flex Points for the measure equal to the percentage of the cooling design load served by the system.

f. For multiple heating systems, all systems shall meet or exceed the minimum efficiency requirements in Table R407.2 and shall be sized to serve 100% of the heating design load. As an alternative, each system installed shall receive credit for the percentage of the Flex Points for the measure equal to the percentage of the heating design load served by the system.

Reason: The purpose of this code change proposal is to improve overall residential building efficiency (heating, cooling and water heating energy) by roughly 5% and to create a scalable, flexible means of improving residential building efficiency for future IECC updates. Instead of requiring efficiency improvements to specific building components, the new “Flex Points” approach in Section R407 provides a multitude of options for builders to achieve the efficiency requirements of the IECC. This approach is also scalable according to a jurisdiction’s needs – states or localities who need additional energy savings to meet energy or climate policy goals can adjust the number of required points accordingly. Package- or points-based approaches have been used for several years in Washington and Oregon. And since the 2012 IECC, the commercial provisions have included section C406 Additional Efficiency Package Options. We believe the updated approach in this proposal is a sensible means of achieving additional efficiency now and in the future.

This proposal is similar to the Flex Points proposal for the 2018 IECC in overall structure, but the points table has been simplified and updated based on feedback received in the previous Code Development Cycle. Like the previous version, this proposal also includes alternative compliance pathways for builders who select the simulated performance alternative or the Energy Rating Index, and will bring roughly equivalent improvements to all three compliance paths.

This Flex Points proposal is cost-effective, since it includes a number of options to achieve 5 points that are cost-effective.

The Flex Points proposal will provide three distinct benefits for jurisdictions adopting the 2021 IECC:

1. This proposal meets a clear need for efficiency improvements in the model energy code now and in the future.

Although the IECC has made small efficiency gains in the 2015 and 2018 editions, major gains have plateaued. Buildings still consume an estimated 42% of the nation’s energy, 54% of its natural gas, and 71% of its electricity. Governors, legislators, and mayors are increasingly turning to building energy codes to meet energy and climate goals, and those codes should continue to provide reasonable improvements going forward. The U.S. Conference of Mayors, in its fourth consecutive resolution on the subject, reiterated their “concerted support for putting future triennial IECC updates on a “glide path” of steady efficiency gains that will improve the efficiency performance of millions of U.S. residential, multi-family, and commercial

buildings.” See 2018 U.S.C.M. Resolution 86 (June 11, 2018).

Several jurisdictions have already created or are in the process of creating package-based compliance paths or improved code provisions to meet their policy needs. The result is improved efficiency, but a lack of consistency in both format and requirements. Incorporating Flex Points into the 2021 IECC will not only provide a 5% boost in energy conservation but will also provide a realistic map for additional improvements going forward. And by providing more uniform targets for the efficiency of building components, this proposal will contribute to economies of scale, potentially lowering prices for builders and ultimately consumers.

2. This proposal will provide maximum flexibility for builders to achieve improved efficiency.

Flex Points trusts that builders and design professionals will select the most cost-effective and sensible efficiency improvements for a given project. There are several alternatives for compliance in each climate zone, along with options to comply in a performance- or rating-based path. There are alternatives related to more insulation, more efficient windows, reduced air and duct leakage and improved equipment. We believe that this approach provides the right incentives for builders to make long-lasting improvements in residential buildings that are in the best interests of homeowners.

The point values have been calculated based on the present value of energy cost savings over the current code (including relevant federal equipment efficiency standards) and reflect the estimated useful life of each measure over an assumed 30-year life of the building. While a 30-year period is consistent with the typical life of a mortgage, it is a very conservative period given the likelihood that some measures will provide efficiency benefits for decades beyond the initial 30-year period.

The analysis behind the flex points is based on the methodology and assumptions included in the U.S. Department of Energy’s Methodology for Evaluating Cost-Effectiveness of Residential Energy Code Changes, including the economic equations to obtain the present value of energy costs within the calculation methodology. The energy consumption calculations take into consideration heating, cooling, and water heating energy, using DOE-2 energy simulation across 105 TMY3 weather locations and 12 building types to account for varying stories, foundations, and fuel types for each of the baseline and upgrade measures. The analysis compares the annual energy savings between a home with and without an efficiency measure over the useful life of the efficiency measure using useful life data from NAHB and other sources. Energy costs were calculated using the most recent national EIA projections for natural gas and electricity. Because the analysis uses readily-available and widely-accepted tools and methodologies, we expect that future additions or changes will be straightforward.

3. This proposal will encourage efficiency improvements in building components that are currently difficult to regulate.

Flex Points addresses two issues that have complicated model energy codes for many years. First, innovative building practices or emerging technologies can benefit from being listed in codes, but states (and national code developing organizations) are reluctant to require new technologies or practices before they are market-tested. As a result, there are high barriers to entry for new technologies, even when they could transform the marketplace and provide energy- or cost-saving benefits for homeowners. As an example, Heat Recovery Ventilators (HRVs) are cost-effective and reasonable for much of the country, but individual circumstances or climate conditions may favor another approach. Rather than require HRVs in every case, or most cases with exceptions, HRVs and Energy Recovery Ventilators are included as one of several options available to builders in every climate zone. Not only will Flex Points create an opportunity for good technology to be used in more buildings, but it will open the door for market forces to make these technologies more widely available (and presumably less expensive to consumers). As new technologies or practices become available, these advances can be quickly and easily added into the Flex Points table, fast-tracking technology that is good for consumers.

Second, much of the heating, cooling, and water heating equipment installed in residential buildings is subject to federal preemption under the National Appliance Energy Conservation Act. As has been debated at length in ICC Code Development hearings over the last 15 years, including equipment efficiencies in performance trade-offs tends to weaken the efficiency of the energy code, since federal minimum efficiencies for nearly every covered product is well below the efficiency levels of commonly installed products. When these efficiency levels are used in trade-off baselines, builders use the improved efficiency of common heating, cooling, and water heating products as a means of trading away efficiency of more permanent building components and features, even though the equipment would have been installed anyway. This “free ridership” may provide short-term cost savings for homebuilders, but it saddles homeowners with unexpected high energy costs over the entire useful life of the building. Moreover, this equipment often carries a much shorter useful life, which is not typically captured in code compliance simulations.

Flex Points creates a new incentive to improve the efficiency of covered products without resulting in efficiency rollbacks elsewhere in the code. Heating, cooling, and water heating improvements (among others) are included among the Flex Points options with points calculated according to climate-specific energy cost savings and the longevity of the equipment. As compared to the previous Flex Points proposal, the list of options has been simplified and refocused on the equipment most likely to provide meaningful energy savings. Each of these upgrades will build upon the current IECC efficiency, rather than trading it away.

In sum, we believe that this proposal will improve efficiency by roughly 5% while unlocking the competitive market for new technologies or building components that are difficult to regulate and will provide a useful new tool for policymakers across the country – all without rolling back the effectiveness or efficiency of the IECC.

Bibliography: *Uniting Cities to Accelerate Focus on the Economic and Climate Benefits of Boosting America’s Building Energy Efficiency*, 2019 U.S.C.M. Resolution 86 (June 11, 2018), available at <https://www.usmayors.org/the-conference/resolutions/>

category=c9211&meeting=86th%20Annual%20Meeting.

Cost Impact: The code change proposal will increase the cost of construction

Requiring additional efficiency measures, such as more insulation, more efficient windows, reduced air leakage and duct leakage, and/or more efficient equipment, to save 5% energy will increase the cost of construction, but the resulting energy and cost savings will recoup the initial costs and will continue to benefit consumers over the useful life of the home.

Proposal # 4253

RE206-19

RE207-19

IECC: R401.2 (IRC N1101.13.1), R401.2.1 (IRC N1101.13.1) (New), R407 (IRC N1107) (New), R407.1 (IRC N1107.1) (New), R407.2 (IRC N1107.2) (New), TABLE R407.2 (IRC N1107.2) (New)

Proponent: Eric Makela, New Buildings Institute, representing Northwest Energy Codes Group (ericM@newbuildings.org)

2018 International Energy Conservation Code

Revise as follows:

R401.2 (IRC N1101.13) Compliance. Projects shall comply with Section R401.2.1 one of the following:

1. Sections R401 through R404.
2. Section R405 and the provisions of Sections R401 through R404 indicated as “Mandatory.”
3. The energy rating index (ERI) approach in Section R406.

Add new text as follows:

R401.2.1 (IRC N1101.13.1) Additional Energy Efficiency (Mandatory) This section establishes additional requirements applicable to all compliance approaches to achieve additional energy efficiency.

1. For buildings complying under Sections R401 through R404, one or more additional energy efficiency measure(s) shall be installed in accordance with Section R407.2 that cumulatively equal or exceed 10 (ten) Flex Points.
2. For buildings complying under the simulated performance alternative in Section R405, the building shall meet one of the following: (a) one or more additional energy efficiency measure(s) in Section R407.2 shall be installed that cumulatively equal or exceed ten Flex Points, without including such measures in the proposed design under Section R405; or (b) the proposed design of the building under section R405.2 shall have an annual energy cost that is less than or equal to 90% of the annual energy cost of the *standard reference design*.
3. For buildings that comply under the energy rating index alternative in Section R406, the energy rating index value shall be at least 10% less than the energy rating index target specified in Table R406.4.

SECTION R407 (IRC N1107) **FLEX POINTS FOR ADDITIONAL ENERGY EFFICIENCY**

R407.1 (IRC N1107.1) Scope. This section establishes flex point alternatives to achieve additional energy efficiency in accordance with Section R401.2.1.

R407.2 (IRC N1107.2) Flex points for additional energy efficiency Measures shall be selected from Table R407.2.1. Each measure chosen shall receive credit for the Flex Points as indicated in the Table for the specific Climate Zone. Interpolation of points between measures shall not be permitted.

TABLE R407.2 (IRC N1107.2)
FLEX POINTS FOR ADDITIONAL ENERGY EFFICIENCY

Measure Number	Measure Description	Flex Point Value								
		CZ 1	CZ 2	CZ 3	CZ 4	CZ 4C _a	CZ 5	CZ 6	CZ 7	CZ 8
1a	≥ 2.5% reduction in total UA ^b	1	1	2	2	2	2	3	4	4
1b	≥ 5% reduction in total UA ^b	3	3	3	3	3	4	5	5	5
1c	≥ 7.5% reduction in total UA ^b	5	5	5	5	5	6	7	8	8
2a	≥ 10% reduction in glazed vertical fenestration area-weighted average SHGC	2	1	-	-	-	-	-	-	-
2b	≥ 20% reduction in glazed vertical fenestration area-weighted average SHGC	4	1	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
3a	≤ 3 ACH50 air leakage rate with ERV or HRV installed ^c	2	4	5	7	7	7	7	8	8
3b	≤ 2 ACH50 air leakage rate with ERV or HRV installed ^c	2	5	7	9	9	9	10	11	11
-	-	-	-	-	-	-	-	-	-	-
4a	≤ 2 CFM of total duct leakage per 100 square feet of conditioned floor area when tested in accordance with Section R403.3	1	1	1	1	-	1	1	1	1

4c	<u>100% of ductless thermal distribution system or hydronic thermal distribution system located completely inside the <i>building thermal envelope</i> or 100% of duct thermal distribution system located in <i>conditioned space</i>^d</u>	8	8	9	11	8	12	15	17	17
5a	<u>≥ 18 SEER and ≥ 14 EER cooling system efficiency^e</u>	9	7	3	2	-	-	-	-	-
5b	<u>≥ 16 EER cooling system efficiency^e</u>	10	7	3	2	-	-	-	-	-
6a	<u>≥ 96 AFUE heating system efficiency^f</u>	-	2	6	9	10	10	11	12	14
7a	<u>≥ 10.5 HSPF heating system efficiency^f</u>	-	1	2	4	4	5	4	3	3
7b	<u>≥ 3.5 COP heating system efficiency^f</u>	-	2	4	6	6	8	7	6	5
-	-	-	-	-	-	-	-	-	-	-
8a	<u>≥ 0.8 EF for fossil fuel service water heating system</u>	7	5	4	3	2	2	2	1	1
8b	<u>≥ 1.15 EF for electric service water heating system</u>	7	7	7	4	5	3	3	2	2
8c	<u>≥ 0.4 Solar Fraction for service water heating system</u>	8	9	9	7	9	6	5	4	3

a. Climate Zone 4C is Climate Zone Marine 4.

b. The Total UA shall be calculated in accordance with Section R402.1.5 Total UA alternative.

c. Minimum Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) requirements, measured at the lowest tested net supply airflow, shall be ≥ 75% Sensible Recovery Efficiency (SRE), ≤ 1.1 W/CFM Fan Energy and shall not use recirculation as a defrost strategy. In addition, the Energy Recovery Ventilator (ERV) shall be ≥ 50% Latent Recovery/Moisture Transfer (LRMT).

d. As defined by Section R403.3.7.

e. For multiple cooling systems, all systems shall meet or exceed the minimum efficiency requirements in Table R407.2.1 and shall be sized to serve 100% of the cooling design load. As an alternative, each system installed shall receive credit for the percentage of the Flex Points for the measure equal to the percentage of the cooling design load served by the system.

f. For multiple heating systems, all systems shall meet or exceed the minimum efficiency requirements in Table R407.2.1 and shall be sized to serve 100% of the heating design load. As an alternative, each system installed shall receive credit for the percentage of the Flex Points for the measure equal to the percentage of the heating design load served by the system.

Reason: This proposal, submitted by the Northwest Energy Codes Group, provides an alternative to the Flex Point proposal submitted by the Energy Efficient Codes Coalition by requiring ten flex points for an efficiency increase of ten (10) percent over the base prescriptive codes. The Northwest pioneered the use of the prescriptive residential options that are currently in place in Washington, and formally were used in Oregon, and found them to be an effective method of increasing efficiency for residential construction using the prescriptive approach. This option does not require performance energy modeling or HERS verification which will increase its usefulness. This type of points based option can also be easily implemented in the U.S. DOE REScheck software. This approach is also similar in structure to the Points Option code change proposal that has been submitted by the Northwest Energy Codes Group to C407 in the commercial provisions of the 2018 IECC. This proposal will provide more consistency between the IECC and the Washington State Residential Energy Code which is based on the IECC.

The purpose of this code change proposal is to improve overall residential building efficiency (heating, cooling and water heating energy) by roughly 10% and to create a scalable, flexible means of improving residential building efficiency for future IECC updates. Instead of requiring efficiency improvements to specific building components, the new "Flex Points" approach in Section R407 provides a multitude of options for builders to achieve the efficiency requirements of the IECC. This approach is also scalable according to a jurisdiction's needs – states or localities who need additional energy savings to meet energy or climate policy goals can adjust the number of required points accordingly. Package- or points-based approaches have been used for several years in Washington and Oregon.

This proposal is similar to the Flex Points proposal for the 2018 IECC in overall structure, but the points table has been simplified and updated based on feedback received in the previous Code Development Cycle. Like the previous version, this proposal also includes alternative compliance pathways for builders who select the simulated performance alternative or the Energy Rating Index, and will bring roughly equivalent improvements to all three compliance paths.

This Flex Points proposal is cost-effective, since it includes a number of options to achieve 10 points that are cost-effective.

The Flex Points proposal will provide three distinct benefits for jurisdictions adopting the 2021 IECC:

1. This proposal meets a clear need for efficiency improvements in the model energy code now and in the future.

Although the IECC has made small efficiency gains in the 2015 and 2018 editions, major gains have plateaued. Buildings still consume an estimated

42% of the nation's energy, 54% of its natural gas, and 71% of its electricity. Governors, legislators, and mayors are increasingly turning to building energy codes to meet energy and climate goals, and those codes should continue to provide reasonable improvements going forward. The U.S. Conference of Mayors, in its fourth consecutive resolution on the subject, reiterated their "concerted support for putting future triennial IECC updates on a "glide path" of steady efficiency gains that will improve the efficiency performance of millions of U.S. residential, multi-family, and commercial buildings." See 2018 U.S.C.M. Resolution 86 (June 11, 2018).

Several jurisdictions have already created or are in the process of creating package-based compliance paths or improved code provisions to meet their policy needs. The result is improved efficiency, but a lack of consistency in both format and requirements. Incorporating Flex Points into the 2021 IECC will not only provide a 10% boost in energy conservation but will also provide a realistic map for additional improvements going forward. And, by providing more uniform targets for the efficiency of building components, this proposal will contribute to economies of scale, potentially lowering prices for builders and ultimately consumers.

2. This proposal will provide maximum flexibility for builders to achieve improved efficiency.

Flex Points trusts that builders and design professionals will select the most cost-effective and sensible efficiency improvements for a given project. There are several alternatives for compliance in each climate zone, along with options to comply in a performance- or rating-based path. There are alternatives related to more insulation, more efficient windows, reduced air and duct leakage and improved equipment. We believe that this approach provides the right incentives for builders to make long-lasting improvements in residential buildings that are in the best interests of homeowners.

The point values have been calculated based on the present value of energy cost savings over the current code (including relevant federal equipment efficiency standards) and reflect the estimated useful life of each measure over an assumed 30-year life of the building. While a 30-year period is consistent with the typical life of a mortgage, it is a very conservative period given the likelihood that some measures will provide efficiency benefits for decades beyond the initial 30-year period.

The analysis behind the flex points is based on the methodology and assumptions included in the U.S. Department of Energy's Methodology for Evaluating Cost-Effectiveness of Residential Energy Code Changes, including the economic equations to obtain the present value of energy costs within the calculation methodology. The energy consumption calculations take into consideration heating, cooling, and water heating energy, using DOE-2 energy simulation across 105 TMY3 weather locations and 12 building types to account for varying stories, foundations, and fuel types for each of the baseline and upgrade measures. The analysis compares the annual energy savings between a home with and without an efficiency measure over the useful life of the efficiency measure using useful life data from NAHB and other sources. Energy costs were calculated using the most recent national EIA projections for natural gas and electricity. Because the analysis uses readily-available and widely-accepted tools and methodologies, we expect that future additions or changes will be straightforward.

3. This proposal will encourage efficiency improvements in building components that are currently difficult to regulate.

Flex Points addresses two issues that have complicated model energy codes for many years. First, innovative building practices or emerging technologies can benefit from being listed in codes, but states (and national code developing organizations) are reluctant to require new technologies or practices before they are market-tested. As a result, there are high barriers to entry for new technologies, even when they could transform the marketplace and provide energy- or cost-saving benefits for homeowners. As an example, Heat Recovery Ventilators (HRVs) are cost-effective and reasonable for much of the country, but individual circumstances or climate conditions may favor another approach. Rather than require HRVs in every case, or most cases with exceptions, HRVs and Energy Recovery Ventilators are included as one of several options available to builders in every climate zone. Not only will Flex Points create an opportunity for good technology to be used in more buildings, but it will open the door for market forces to make these technologies more widely available (and presumably less expensive to consumers). As new technologies or practices become available, these advances can be quickly and easily added into the Flex Points table, fast-tracking technology that is good for consumers.

Second, much of the heating, cooling, and water heating equipment installed in residential buildings is subject to federal preemption under the National Appliance Energy Conservation Act. As has been debated at length in ICC Code Development hearings over the last 15 years, including equipment efficiencies in performance trade-offs tends to weaken the efficiency of the energy code, since federal minimum efficiencies for nearly every covered product is well below the efficiency levels of commonly installed products. When these efficiency levels are used in trade-off baselines, builders use the improved efficiency of common heating, cooling, and water heating products as a means of trading away efficiency of more permanent building components and features, even though the equipment would have been installed anyway. This "free ridership" may provide short-term cost savings for homebuilders, but it saddles homeowners with unexpected high energy costs over the entire useful life of the building. Moreover, this equipment often carries a much shorter useful life, which is not typically captured in code compliance simulations.

Flex Points creates a new incentive to improve the efficiency of covered products without resulting in efficiency rollbacks elsewhere in the code. Heating, cooling, and water heating improvements (among others) are included among the Flex Points options with points calculated according to climate-specific energy cost savings and the longevity of the equipment. As compared to the previous Flex Points proposal, the list of options has been simplified and refocused on the equipment most likely to provide meaningful energy savings. Each of these upgrades will build upon the current IECC efficiency, rather than trading it away.

In sum, we believe that this proposal will improve efficiency by roughly 10% while unlocking the competitive market for new technologies or building

components that are difficult to regulate and will provide a useful new tool for policymakers across the country – all without rolling back the effectiveness or efficiency of the IECC.

Bibliography: *Uniting Cities to Accelerate Focus on the Economic and Climate Benefits of Boosting America's Building Energy Efficiency*, 2019 U.S.C.M. Resolution 86 (June 11, 2018), available at <https://www.usmayors.org/the-conference/resolutions/?category=c9211&meeting=86th%20Annual%20Meeting>.

Cost Impact: The code change proposal will increase the cost of construction

The code change proposal will increase the cost of construction. Requiring additional efficiency measures, such as more insulation, more efficient windows, reduced air leakage and duct leakage, and/or more efficient equipment, to save 10% energy will increase the cost of construction, but the resulting energy and cost savings will recoup the initial costs and will continue to benefit consumers over the useful life of the home.

Proposal # 5152

RE207-19

RE208-19

IECC: R401.2 (IRC N1101.13), R407 (IRC N1107) (New), R407.1 (IRC N1107.1) (New), Table R407.1 (IRC N1107.1) (New), R407.2 (IRC N1107.2) (New)

Proponent: Amanda Hickman, The Hickman Group, representing The Leading Builders of America (LBA) (amanda@thehickmangroup.com)

2018 International Energy Conservation Code

Revise as follows:

R401.2 (IRC N1101.13) Compliance. Projects shall comply with one of the following:

1. Sections R401 through R404 and Section R407.
2. Section R405, Section R407 and the provisions of Sections R401 through R404 indicated as "Mandatory."
3. The energy rating index (ERI) approach in Section R406.

Add new text as follows:

R407 (IRC N1107) ADDITIONAL ENERGY EFFICIENCY REQUIREMENTS

R407.1 (IRC N1107.1) Scope. This section establishes options for additional criteria to be met for one- and two-family dwellings and townhouses, as defined in Section 101.2 of the *International Residential Code* to demonstrate compliance with this code.

Exception: These requirements shall not apply to:

1. Homes complying under the Energy Rating Index (R406)
2. Alternations, renovations and repairs to an existing building
3. Additions with a conditioned floor area of less than 1,200 square feet.

R407.2 (IRC N1107.2) Requirements In order to comply with this code:

1. Building utilizing the prescriptive path to comply with this code shall also comply with sufficient energy efficiency options from Table R407.1 in order to achieve a minimum of 3 energy credits.
2. Building utilizing the performance path to comply with this code shall use an adjusted annual energy cost that is 97% of the annual energy cost of the standard reference design when calculating Performance-based compliance (R405.3).

**Table R407.1 (IRC N1107.1)
ENERGY EFFICIENCY MEASURES**

		Climate Zone	1	2	3	4	5	6	7,8
CATEGORY	OPT	DESCRIPTION	CREDITS						
1	a	Attic Insulation R-38	0.5	-	-	-	-	-	-
1	b	Attic Insulation R-49	0.5	0.5	1	-	-	-	-
1	c	Attic Insulation R-60	1	1	1	0.5	0.5	0.5	0.5
1	d	Attic Insulation R-71	1	1	1.5	1	1	1	1
2	a	Wall Insulation (16 o.c.) R-15	0.5	0.5	-	-	-	-	-
2	b	Wall Insulation (16 o.c.) R-13+3	2	2.5	-	-	-	-	-
2	c	Wall Insulation (16 o.c.) R-20	2.5	3.5	-	-	-	-	-
2	d	Wall Insulation (16 o.c.) R-21	2.5	3.5	-	-	-	-	-
2	e	Wall Insulation (16 o.c.) R-13+5	2.5	3.5	-	-	-	-	-
2	f	Wall Insulation (16 o.c.) R-15+5	2.5	3.5	1	1	1	-	-
2	g	Wall Insulation (16 o.c.) R-23 BIB	3	3.5	-	-	-	-	-
2	h	Wall Insulation (16 o.c.) R-13+10	3	3.5	3	3	3	-	-
2	i	Wall Insulation (16 o.c.) R-20+5	3	3.5	3	2.5	3	-	-
2	j	Wall Insulation (16 o.c.) R-15+10	3	3.5	3.5	3	3.5	0.5	0.5
2	k	Wall Insulation (16 o.c.) R-20+10	3	3.5	3.5	3	4.5	1.5	1.5
2	l	Wall Insulation (24 o.c.) R-20	3	3.5	0.5	0.5	-	-	-
2	m	Wall Insulation (24 o.c.) R-21	3	3.5	0.5	0.5	1	-	-

2	n	Wall Insulation (24 o.c.) R-23 BIB	3	4	1.5	1	1	-	-
2	o	Wall Insulation (24 o.c.) R-20+5	3	4	3	3	3	0.5	0.5
2	p	Wall Insulation (24 o.c.) R-20+10	3	4	3	4.5	4.5	2	2
2	q	Wall Insulation (24 o.c.) R-30+10	3	4	3	4.5	4.5	3	3.5
3	a	Mass Wall R-6 c.i.	2	-	-	-	-	-	-
3	b	Mass Wall (16 o.c.) R-13	4.5	3	-	-	-	-	-
3	c	Mass Wall (16 o.c.) R-20	4.5	6	-	-	-	-	-
3	d	Mass Wall R-12 c.i.	6	5.5	-	-	-	-	-
4	a	Basement Wall R-5 ci	-	-	-	-	-	-	-
4	b	Basement Wall R-10 ci	-	-	3.5	-	-	-	-
4	c	Basement Wall R-13	-	-	4	0.5	-	-	-
4	d	Basement Wall R-15	-	-	5	2	-	-	-
4	e	Basement Wall R-19	-	-	5	2	-	0.5	0.5
4	f	Basement Wall R-20	-	-	5.5	2.5	0.5	0.5	0.5
4	g	Basement Wall R-21	-	-	5.5	2.5	0.5	1	1
4	h	Basement Wall R-23 BIB	-	-	5.5	3	1	1.5	1.5
4	i	Basement Wall R-30 ccSPF	-	-	6.5	4	2	2.5	2.5
5	a	Slab Edge R-10. 2 ft depth	0.5	1.5	2.5	-	-	-	-
5	b	Slab Edge R-10. 4 ft depth	0.5	2	3.5	1	1	-	-
5	c	Slab Edge R-15. 4 ft depth	1	2	0.5	1.5	1.5	0.5	0.5
6	a	Windows U-0.40, SHGC-0.25	0.5	-	-	-	-	-	-
6	b	Windows U-0.32, SHGC-0.25	1.5	1.5	-	-	-	-	-
6	c	Windows U-0.30, SHGC-0.25	(1.5)	2	0.5	-	-	-	-
6	d	Windows U-0.27, SHGC-0.25	-	-	1.5	-	-	-	-
6	e	Windows U-0.30, SHGC-0.40	-	-	-	0.5	-	-	-
6	f	Windows U-0.27, SHGC-0.40	-	-	-	2	1.5	1.5	1.5
6	g	Windows U-0.23, SHGC-0.40	-	-	-	3.5	3	4	4
6	h	Windows U-0.18, SHGC-0.40	-	-	-	5.5	5	6.5	7
6	i	Windows U-0.12, SHGC-0.40	-	-	-	8	8	10	10.5
7	a	Tightness- 4 ACH50	0.5	0.5	-	-	-	-	-
7	b	Tightness- 3 ACH50	0.5	1.5	-	-	-	-	-
7	c	Tightness- 2 ACH50	-	-	1.5	2.5	3.5	3	4.5
7	d	Tightness- 1.5 ACH50	-	-	2	3.5	5	4.5	6.5
7	e	Tightness- 0.6 ACH50	-	-	3	5	6.5	6.5	9
8	a	Ducts in Attic: Reduced Leakage $\leq 2\text{cfm}/100\text{@}25^i$	2	2.5	2	1.5	2	2	2
8	b	Compact Layout: duct surface area $\leq 15\%$ of conditioned floor area for supply ducts and $\leq 4\%$ for return ducts	0.5	0.5	0.5	0.5	1	1	1
8	c	Compact Layout + Reduced Leakage	2.8	2.5	2.5	2.5	3	3	3
8	d	Deeply Buried Ducts, in accordance with 2018 IECC section R403.3.6.1	1	1.5	1.5	1.5	2	2.5	2.5
8	e	Compact Layout + Deeply Buried	1	1.5	2	2	2.5	3	3
8	f	Compact + Deeply Buried Ducts + Reduced Leakage	3.5	3.5	4	3.5	4.5	4.5	4.5
8	g	Ducts 100% Inside Conditioned Space	6.5	6.5	7.5	7.5	9	9	9
9	a	Radiant Barrier- Roof Deck ^k	0.5	0.5	-	-	-	-	-
10	a	Furnace or Boiler- 92 AFUE, PSC	-	1	3	4	4.5	5	6
10	b	Furnace or Boiler- 92 AFUE, ECM	-	1	3.5	4.5	5	5.5	7

10	c	Furnace or Boiler- 95 AFUE, ECM	0.5	1.5	4.5	5.5	6	7	8
10	d	Furnace or Boiler- 96 AFUE, ECM	0.5	1.5	5	5.5	6.5	7	8
10	e	Furnace or Boiler- 97 AFUE, ECM	0.5	1.5	5	6	7	7.5	9
11	a	Air Conditioner 14 SEER	-	-	-	-	0.5	0.5	-
11	b	Air Conditioner 15 SEER	2	2.5	0.5	0.5	1	0.5	-
11	c	Air Conditioner 16 SEER	4	4	1.5	1	1	0.5	0.5
11	d	Air Conditioner 18 SEER	7	6.5	2.5	1.5	-	-	-
11	e	Air Conditioner 19 SEER	8	7.5	3	2	-	-	-
11	f	Air Conditioner 20 SEER	9.5	8.5	3.5	2.5	-	-	-
11	g	Air Conditioner 24 SEER	13	11.5	5	3	-	-	-
12	a	Heat Pump 15 SEER/8.5 HSPF	2	3	1.5	1.5	1	0.5	2
12	b	Heat Pump 16 SEER/9 HSPF	4	5	3.5	3	3	2	2
12	c	Heat Pump 18 SEER/10 HSPF	7.5	8.5	7	6.5	6	5	5
12	d	Heat Pump 20 SEER/10 HSPF	10	10.5	7.5	7	6.5	5	5
12	e	Heat Pump 24 SEER/10 HSPF	13.5	13.5	9	7.5	7	5.5	5.5
13	a	Energy Star Gas, 40 gal. med draw, 0.65 UEF/0.64 EF	0.5	0.5	0.5	0.5	0.5	0.5	0.5
13	b	Gas instantaneous, 0.81 UEF/EF	2	2	2	1.5	1	1	1
13	c	Energy Star Gas instantaneous, 0.87 UEF/EF	2	2	2	1.5	1.5	1.5	1.5
13	d	High Eff Gas instantaneous, 0.9 UEF/EF	2.5	2	2	2	1.5	1.5	1.5
13	e	Energy Star elec heat pump, 50 gal. 2.0 UEF/1.82 EF	4	5	6	5.5	5	5	4
13	f	High Eff elec heat pump, 50 gal. 3.1 UEF/3.2 EF	5.5	7	8.5	8	7	7	6
14	a	LED 95% interior, exterior, garage	2.5	2.5	2.5	2.5	2.5	2.5	2.5

a. Only one item in each Category can be counted.

b. CZ4 includes Climate Zone 4 except Climate Zone 4 Marine.

c. CZ5 includes Climate Zone 5 and Climate Zone 4 Marine.

d. R-values are minimum averages.

e. U-factors and SHGC are maximum weighted averages (exception: SHGC permitted to be higher in climate zones 5-8).

f. Building tightness and duct tightness are maximum.

g. Effectiveness, AFUE, SEER, HSPF, EF are minimums.

h. Cells containing a dash (-), indicate zero credits because that measure is the baseline requirement or was not shown to improve energy savings.

i. For any measure where the installed efficiency value falls between two thresholds from the table, credit shall be taken for the highest threshold that the installed value meets or exceeds.

j. Measured leakage is outside conditioned space.

k. Radiant Barriers shall comply with with IBC Section 1509 and shall be installed over the entire roof deck over conditioned space.

Revise as follows:

TABLE R405.5.2(1) [IRC N1105.5.2(1)]

SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Above-grade walls	Type: mass, where the proposed wall is a mass wall; otherwise, wood frame.	As proposed
	Gross area: same as proposed.	As proposed
	U-factor: as specified in Table R402.1.4.	As proposed
	Solar absorptance = 0.75.	As proposed
	Emittance = 0.90.	As proposed
Basement and crawl space walls	Type: same as proposed.	As proposed
	Gross area: same as proposed.	As proposed
	U-factor: as specified in Table R402.1.4, with the insulation layer on the interior side of the walls.	As proposed
Above-grade floors	Type: wood frame.	As proposed
	Gross area: same as proposed.	As proposed
	U-factor: as specified in Table R402.1.4.	As proposed
Ceilings	Type: wood frame.	As proposed
	Gross area: same as proposed.	As proposed
	U-factor: as specified in Table R402.1.4.	As proposed
Roofs	Type: composition shingle on wood sheathing.	As proposed
	Gross area: same as proposed.	As proposed
	Solar absorptance = 0.75.	As proposed
	Emittance = 0.90.	As proposed
Attics	Type: vented with an aperture of 1 ft ² per 300 ft ² of ceiling area.	As proposed
Foundations	Type: same as proposed.	As proposed
	Foundation wall area above and below grade and soil characteristics: same as proposed.	As proposed
Opaque doors	Area: 40 ft ² .	As proposed
	Orientation: North.	As proposed
	U-factor: same as fenestration as specified Table R402.1.4.	As proposed
Vertical fenestration other than opaque doors	Total area ^h = (a) The proposed glazing area, where the proposed glazing area is less than 15 percent of the conditioned floor area (b) 15 percent of the conditioned floor area, where the proposed glazing area is 15 percent or more of the conditioned floor area.	As proposed
	Orientation: equally distributed to four cardinal compass orientations (N, E, S & W).	As proposed
	U-factor: as specified in Table R402.1.4.	As proposed
	SHGC: as specified in Table R402.1.2 except for climate zones without an SHGC requirement, the SHGC shall be equal to 0.40.	As proposed
	Interior shade fraction: 0.92-(0.21 × SHGC for the standard reference design).	Interior shade fraction: 0.92-(0.21 × SHGC as proposed)
	External shading: none.	As proposed
Skylights	None.	As proposed
Thermally isolated sunrooms	None.	As proposed

Air exchange rate	<p>The air leakage rate at a pressure of 0.2 inch w.g. (50 Pa) shall be Climate Zones 1 and 2: 5 air changes per hour. Climate Zones 3 through 8: 3 air changes per hour.</p> <p>The mechanical ventilation rate shall be in addition to the air leakage rate and shall be the same as in the proposed design, but not greater than $0.01 \times CFA + 7.5 \times (N_{br} + 1)$</p> <p>where:</p> <p>CFA = conditioned floor area, ft².</p> <p>N_{br} = number of bedrooms.</p> <p>Energy recovery shall not be assumed for mechanical ventilation.</p>	<p>The measured air exchange rate.^a</p> <p>The mechanical ventilation rate^b shall be in addition to the air leakage rate and shall be as proposed.</p>
Mechanical ventilation	<p>Where mechanical ventilation is not specified in the proposed design: None</p> <p>Where mechanical ventilation is specified in the proposed design, the annual vent fan energy use, in units of kWh/yr, shall equal:</p> $(1/e_f) \times [0.0876 \times CFA + 65.7 \times (N_{br} + 1)]$ <p>where:</p> <p>e_f = the minimum exhaust fan efficacy, as specified in Table R403.6.1, corresponding to a flow rate of $0.01 \times CFA + 7.5 \times (N_{br} + 1)$</p> <p>CFA = conditioned floor area, ft².</p> <p>N_{br} = number of bedrooms.</p>	As proposed
Internal gains	<p>IGain, in units of Btu/day per dwelling unit, shall equal: $17,900 + 23.8 \times CFA + 4,104 \times N_{br}$</p> <p>where:</p> <p>CFA = conditioned floor area, ft².</p> <p>N_{br} = number of bedrooms.</p>	Same as standard reference design.
Internal mass	Internal mass for furniture and contents: 8 pounds per square foot of floor area.	Same as standard reference design, plus any additional mass specifically designed as a thermal storage element ^c but not integral to the building envelope or structure.
Structural mass	For masonry floor slabs: 80 percent of floor area covered by R-2 carpet and pad, and 20 percent of floor directly exposed to room air.	As proposed
	For masonry basement walls: as proposed, but with insulation as specified in Table R402.1.4, located on the interior side of the walls.	As proposed
	For other walls, ceilings, floors, and interior walls: wood frame construction.	As proposed

Heating systems ^{d, e}	<p>For other than electric heating without a heat pump: as proposed. Where the proposed design utilizes electric heating without a heat pump, the standard reference design shall be an air source heat pump meeting the requirements of Section G403 of the IECC—Commercial Provisions.</p> <p>Capacity: sized in accordance with Section R403.7.</p> <p>Fuel Type/Capacity: Same as proposed design.</p> <p>Efficiencies:</p> <p>Electric: air source heat pump complying with prevailing federal minimum standards.</p> <p>Nonelectric furnaces: natural gas furnace complying with prevailing federal minimum standards.</p> <p>Nonelectric boilers: natural gas boiler complying with prevailing federal minimum efficiencies.</p>	<p>As proposed</p> <p>As proposed</p> <p>As proposed</p> <p>As proposed</p> <p>As proposed</p>
Cooling systems ^{d, f}	<p>As proposed. Capacity: sized in accordance with Section R403.7.</p> <p>Fuel Type/Capacity: Same as proposed design.</p> <p>Efficiency: complying with federal minimum standards.</p>	<p>As proposed</p> <p>As proposed</p> <p>As proposed</p>
Service water heating ^{d, e, f, g}	<p>As proposed. Use: same as proposed design.</p> <p>Fuel type: Same as proposed design.</p> <p>Efficiency: complying with prevailing federal minimum standards.</p> <p>Use: gal/day = 30 + 10 x N_{br}</p> <p>Tank temperature: 120° F</p>	<p>As proposed</p> <p>Use, in units of gal/day = 30 + (10 × N_{br})</p> <p>where:</p> <p>N_{br} = number of bedrooms.</p> <p>As proposed</p> <p>As proposed</p> <p>Same as standard reference</p> <p>Same as standard reference</p>
Thermal distribution systems	<p>Duct insulation: in accordance with Section R403.3.1. A thermal distribution system efficiency (DSE) of 0.88 shall be applied to both the heating and cooling system efficiencies for all systems other than tested duct systems.</p> <p>Exception: For nonducted heating and cooling systems that do not have a fan, the standard reference design thermal distribution system efficiency (DSE) shall be 1.</p> <p>For tested duct systems, the leakage rate shall be 4 cfm (113.3 L/min) per 100 ft² (9.29 m²) of conditioned floor area at a pressure of differential of 0.1 inch w.g. (25 Pa).</p>	<p>Duct insulation: as proposed.</p> <p>As tested or, where not tested, as specified in Table R405.5.2(2)</p>
Thermostat	<p>Type: Manual, cooling temperature setpoint = 75° F; heating temperature setpoint = 72° F.</p>	<p>Same as standard reference design.</p>

For SI: 1 square foot = 0.93 m², 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m², 1 gallon (US) = 3.785 L,

°C = (°F-32)/1.8, 1 degree = 0.79 rad.

- a. Where required by the *code official*, testing shall be conducted by an *approved party*. Hourly calculations as specified in the *ASHRAE Handbook of Fundamentals*, or the equivalent, shall be used to determine the energy loads resulting from infiltration.

- b. The combined air exchange rate for infiltration and mechanical ventilation shall be determined in accordance with Equation 43 of 2001 ASHRAE *Handbook of Fundamentals*, page 26.24 and the “Whole-house Ventilation” provisions of 2001 ASHRAE *Handbook of Fundamentals*, page 26.19 for intermittent mechanical ventilation.
- c. Thermal storage element shall mean a component that is not part of the floors, walls or ceilings that is part of a passive solar system, and that provides thermal storage such as enclosed water columns, rock beds, or phase-change containers. A thermal storage element shall be in the same room as fenestration that faces within 15 degrees (0.26 rad) of true south, or shall be connected to such a room with pipes or ducts that allow the element to be actively charged.
- d. For a proposed design with multiple heating, cooling or water heating systems using different fuel types, the applicable standard reference design system capacities and fuel types shall be weighted in accordance with their respective loads as calculated by accepted engineering practice for each equipment and fuel type present.
- e. For a proposed design without a proposed heating system, a heating system having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and proposed design.
- f. For a proposed design home without a proposed cooling system, an electric air conditioner having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and the proposed design.
- g. For a proposed design with a nonstorage-type water heater, a 40-gallon storage-type water heater having the prevailing federal minimum energy factor for the same fuel as the predominant heating fuel type shall be assumed. For a proposed design without a proposed water heater, a 40-gallon storage-type water heater having the prevailing federal minimum efficiency for the same fuel as the predominant heating fuel type shall be assumed for both the proposed design and standard reference design.
- h. For residences with conditioned basements, R-2 and R-4 residences, and for townhouses, the following formula shall be used to determine glazing area:

$$AF = A_s \times FA \times F$$

where:

AF = Total glazing area.

A_s = Standard reference design total glazing area.

FA = (Above-grade thermal boundary gross wall area)/(above-grade boundary wall area + 0.5 × below-grade boundary wall area).

F = (above-grade thermal boundary wall area)/(above-grade thermal boundary wall area + common wall area) or 0.56, whichever is greater.

and where:

Thermal boundary wall is any wall that separates conditioned space from unconditioned space or ambient conditions.

Above-grade thermal boundary wall is any thermal boundary wall component not in contact with soil.

Below-grade boundary wall is any thermal boundary wall in soil contact.

Common wall area is the area of walls shared with an adjoining dwelling unit.

L and CFA are in the same units.

Reason: This proposal introduces a new section within the code that will require additional efficiency measures (options) for residential buildings. When taking the prescriptive approach, options from the table with assigned credit values must be selected in order to achieve 3 credits. For the performance approach, the same number of percentage number will reduce the annual energy cost for the standard reference design. The ERI path has not been included in this proposal as it is currently the most stringent path in the code.

The energy efficiency measures listed in Table 407.1 were analyzed using Ekotrope Rater modeling software (v3.1.0) to estimate energy savings relative to a 2018 IECC prescriptive reference house baseline. The energy modeling was performed by Home Innovation Research Labs. For all building characteristics not defined in the IECC, the “Methodology for Calculating Energy Use in Residential Buildings” was followed. This Methodology was developed in 2012 by Home Innovation Research Labs (formerly NAHB Research Center) to provide guidance, uniformity, and practical construction and equipment choices for researchers comparing the energy performance differences resulting from potential code changes.

A two-story single-family house (2,352 square feet above grade) was analyzed in 9 different locations across climate zones 1 through 7. For each location, multiple house configurations were analyzed to capture the effects of regionally-typical foundations and wall construction types. An all-electric house and a house with gas space heating and gas water heating were analyzed, resulting in 48 baseline designs for each of these configurations. Climate-appropriate energy conservation measures (ECMs) were analyzed individually for each unique house configuration for each location, resulting in more than 2,200 discrete designs covering all major aspects of building envelope construction, air tightness, equipment efficiencies and lighting and appliances. The credits in Table 407.1 were assigned as the weighted averages of the estimated whole-building energy savings (%) for each house configuration for the location. The weighting was based on regional market data. The credits are the result of weighted average whole-building energy savings rounded down to a 0.5% increment; except where the total energy savings ranged between 0.4% and 0.5%,

the values were rounded up to 0.5%.

In addition to individual measures, select packages of measures were also simulated for analysis across several climate zones. The comparison of additive energy savings from individual measures and the modeled net savings from packages of the same measures indicated that at the proposed 3% incremental levels of improvement, a simple addition of energy savings from individual measures is an adequate representation of their combined efficiency.

The energy performance target of 3% (or 3 credits) represents an incremental level of improvement that can be achieved through one or more compliance options (individual measures or a combination of measures) that meet the cost effectiveness metrics of simple payback of 10-15 years depending on the type of the measure.

The required credits and the paths to achieve these efficiency gains have been determined using current cost data provided by homebuilders from across the U.S. to have at a minimum a 10-year simple payback and to be cost effective when using the life cycle analysis method.

Cost Impact: The code change proposal will increase the cost of construction

This proposal will increase the cost of construction. However, it has been determined, using current homebuilder cost data, that this proposal provides paths with at least a 10-year (or better) simple payback. This proposal has also been determined to be cost effective using the life cycle analysis method.

Proposal # 5329

RE208-19

RE209-19

IECC: R401.2, R401.2.1 (New), SECTION R407 (New), R407.1 (New), R407.2 (New), R407.2.1 (New), R407.2.2 (New), R407.2.3 (New), R407.2.4 (New), R407.2.5 (New)

Proponent: Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

R401.2 Compliance. Projects shall comply with Section R401.2.1 and one of the following:

1. Sections R401 through R404.
2. Section R405 and the provisions of Sections R401 through R404 indicated as "Mandatory."
3. The energy rating index (ERI) approach in Section R406.

Add new text as follows:

R401.2.1 Additional Energy Efficiency (Mandatory). This section establishes additional requirements applicable to all compliance approaches to achieve additional energy efficiency.

1. For buildings complying under Sections R401 through R404, one of the Additional Efficiency Package Options shall be installed according to Section R407.2.
2. For buildings complying under the simulated performance alternative in Section R405, the building shall meet one of the following::
 - 2.1. One of the Additional Efficiency Package Options in Section R407.2 shall be installed without including such measures in the proposed design under Section R405; or
 - 2.2. The proposed design of the building under Section R405.3 shall have an annual energy cost that is less than or equal to 95 percent of the annual energy cost of the *standard reference design*.
3. For buildings complying under the energy rating index alternative in Section R406, the energy rating index value shall be at least 5 percent less than the energy rating index target specified in Table R406.4.

The option selected for compliance shall be identified in the Certificate required by Section R401.3.

SECTION R407 **ADDITIONAL EFFICIENCY PACKAGE OPTIONS**

R407.1 Scope. This section establishes Additional Efficiency Package Options to achieve additional energy efficiency in accordance with Section R401.2.1.

R407.2 Additional Efficiency Package Options. Additional efficiency package options for compliance with Section R401.2.1 are set forth in Sections R407.2.1 through R407.2.5.

R407.2.1 Enhanced envelope performance option. The total building thermal envelope UA, the sum of U-factor times assembly area, shall be less than or equal to 95 percent of the total UA resulting from multiplying the U-factors in Table R402.1.4 by the same assembly area as in the proposed building. The UA calculation shall be performed in accordance with Section R402.1.5. The area-weighted average SHGC of all glazed fenestration shall be less than or equal to 95 percent of the maximum glazed fenestration SHGC in Table R402.1.2.

R407.2.2 More efficient HVAC equipment performance option. Heating and cooling equipment shall meet or exceed one of the following efficiencies:

1. Greater than or equal to 95 AFUE natural gas furnace and 16 SEER air conditioner.
2. Greater than or equal to 10 HSPF / 16 SEER air source heat pump.
3. greater than or equal to 3.5 COP ground source heat pump.

For multiple cooling systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the cooling design load. For multiple heating systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the heating design load.

R407.2.3 Reduced energy use in service water heating option. The hot water system shall meet or exceed one of the following efficiencies:

1. Greater than or equal to 82 EF fossil fuel service water heating system.
2. Greater than or equal to 2.0 EF electric service water heating system.
3. Greater than or equal to 0.4 Solar Fraction solar water heating system.

R407.2.4 More efficient duct thermal distribution system option. The thermal distribution system shall meet or exceed one of the following efficiencies:

1. 100 percent of ducts and air handlers located entirely within the *building thermal envelope*.
2. 100 percent of ductless thermal distribution system or hydronic thermal distribution system located completely inside the *building thermal envelope*.
3. 100 percent of duct thermal distribution system located in *conditioned space* as defined by Section R403.3.7.

R407.2.5 Improved air sealing and efficient ventilation system option. The measured air leakage rate shall be less than or equal to 3.0 ACH50, with either an Energy Recovery Ventilator (ERV) or Heat Recovery Ventilator (HRV) installed. Minimum HRV and ERV requirements, measured at the lowest tested net supply airflow, shall be greater than or equal to 75 percent Sensible Recovery Efficiency (SRE), less than or equal to 1.1 W/CFM Fan Energy and shall not use recirculation as a defrost strategy. In addition, the ERV shall be greater than or equal to 50 percent Latent Recovery/Moisture Transfer (LRMT).

Reason: The purpose of this code change proposal is to improve the energy efficiency of residential buildings by roughly 5% or more, and to provide code users with flexibility to select the measures that make the most sense for each project. This proposal largely mirrors the format of Section C406 Additional Efficiency Package Options—an approach to improving commercial buildings that has been included in the commercial energy code since the 2012 IECC. Like Section C406, new Section R407 offers multiple straightforward improvements that will increase energy savings and reduce costs to the homeowner over the useful life of the building. In addition, Section R401.2.1 provides two additional means of demonstrating compliance: 1) code users may achieve a 5% improvement in the performance path; or 2) code users may comply by applying a 5% improvement in ERI Target score. The range of options will provide multiple paths for projects to achieve the intended improvement in the code. The technologies included in the packages of improvements are currently available in the relevant markets and the improved building practices have been proven feasible in residential buildings. However, many of these measures would be difficult to include in the current code format because of federal preemption of covered products, inapplicability to certain home designs, or other limitations. This proposal follows the lead of states like Oregon and Washington that have successfully created a list of options available to builders to meet the residential code improvements. This approach increases flexibility for code users while advancing the code's efficiency baseline.

Although the historic energy efficiency gains in the 2009 and 2012 IECC have been largely maintained in the 2015 and 2018 IECC, there is a clear need for more substantial improvements in the 2021 IECC. It is well understood that buildings have an outsized impact on the nation's energy demands. Buildings consume 42% of the nation's energy, including 54% of the nation's natural gas and 71% of its electricity. The nation's policymakers are increasingly turning to building energy codes as a means of addressing energy and climate goals. Several states have adopted improvements beyond the 2018 IECC, and the U.S. Conference of Mayors recently called for "putting future triennial IECC updates on a 'glide path' of steady efficiency gains that will improve the efficiency performance of millions of U.S. residential, multi-family, and commercial buildings." See 2018 U.S.C.M. Resolution 86 (June 11, 2018). While a much larger improvement in overall efficiency is warranted, a roughly 5% improvement through the adoption of this proposal would be a step in the right direction.

This proposal provides policymakers with additional options for improving the code going forward. A jurisdiction could increase the number of required options (and make a corresponding increase in the performance path and ERI required improvement). And as additional technologies and building methods become available, more options may be added to the initial list of improvements. (For example, Section C406 was expanded from 5 to 8 options in the 2018 IECC.) In sum, this proposal will allow the IECC to build upon recent improvements and create a new model for improving and adding flexibility to residential building energy codes going forward.

Bibliography: *Uniting Cities to Accelerate Focus on the Economic and Climate Benefits of Boosting America's Building Energy Efficiency*, 2019 U.S.C.M. Resolution 86 (June 11, 2018), available at <https://www.usmayors.org/the-conference/resolutions/?category=c9211&meeting=86th%20Annual%20Meeting>.

Cost Impact: The code change proposal will increase the cost of construction. For each climate zone, there are cost-effective options available that will generate energy savings and be cost effective over the useful life of the building. Although the savings will vary based on the option selected and design choices made in the building, there are multiple sensible options for achieving improved efficiency in each climate zone. On a broader scale, these improvements will help curb the nation's increasing demands for energy and contribute to a more secure energy future.

Proposal # 4685

RE209-19

RE210-19

IECC: R407 (IRC N1107) (New)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com)

2018 International Energy Conservation Code

Add new text as follows:

SECTION R407 (IRC N1107) **PATHWAY TO ZERO, ENERGY RATING INDEX COMPLIANCE ALTERNATIVE**

R407.1 (IRC N1107.1) Scope. This section establishes criteria for jurisdictions to attain zero energy compliance using an Energy Rating Index (ERI) analysis by the year 2042.

R407.2 (N1107.2) Mandatory requirements. Compliance with this section requires that the provisions identified in Sections R401 through R404 indicated as "Mandatory" be met.

Exception: Supply and return ducts not completely inside the *building thermal envelope* shall be insulated to an *R*-value of not less than R-8.

R407.3 (IRC N1107.3) Energy Rating Index. The Energy Rating Index (ERI) shall be determined in accordance with RESNET/ANSI/ICC 301 except for buildings covered by the *International Residential Code*. the ERI Reference Design Ventilation rate shall be in accordance with Equation 4-2.

Ventilation rate, CFM = (0.01 × total square foot area of house) + [7.5 × (number of bedrooms + 1)] (**Equation 4-2**)

Energy used to recharge or refuel a vehicle used for transportation on roads that are not on the building site shall not be included in the *ERI reference design* or the *rated design*.

R407.4 (IRC N1107.4) ERI-based compliance. Compliance based on an ERI analysis requires that the *rated proposed design* and confirmed built dwelling be shown to have a score less than or equal to the values in Table R407.4, for the ERI implementation date, when compared to the *ERI reference design* for each of the following conditions:

1. ERI value without on-site renewable energy generation
2. ERI value with on-site renewable energy generation

TABLE R407.4 (IRC N1107.4)
MAXIMUM ENERGY RATING INDEX

<u>ERI Implementation date</u>	<u>ENERGY RATING INDEX WITHOUT</u>	<u>ENERGY RATING INDEX WITH</u>
	<u>ON-SITE RENEWABLES ^a</u>	<u>ON-SITE RENEWABLES ^b</u>
<u>January 1st 2021</u>	60	55
<u>January 1st 2024</u>	55	50
<u>January 1st 2027</u>	50	45
<u>January 1st 2030</u>	45	40
<u>January 1st 2033</u>	40	30
<u>January 1st 2036</u>	--	20
<u>January 1st 2039</u>	--	10
<u>January 1st 2042</u>	--	0

a. The maximum ERI without on-site renewables is fixed at an ERI of 40 after January 1st 2036, because thermal envelope and mechanical improvements cannot lower the ERI score significantly below that level.

b. The maximum ERI with on-site renewables can be achieved with or without installing onsite renewables until January 1st 2033 when on-site renewables are required to be used to lower the ERI below 40.

R407.5 (IRC N1107.5) Verification by an approved agency. Verification of compliance with the Section R407 as outlined in Section R407.4 and R407.6 shall be completed by an *approved* third party. Verification of Section R407.2 shall be completed by the authority having jurisdiction or an approved third party inspection agency per Section R105.4.

R407.6 (IRC N1107.6) Documentation. Documentation of the software used to determine the ERI and the parameters for the *residential building* shall be in accordance with Sections R407.6.1 through R407.6.3.

R407.6.1 (IRC N1107.6.1) Compliance software tools. Software tools used for determining ERI shall be approved software rating tools in accordance with RESNET/ICC 301.

R407.6.2 (IRC N1107.6.2) Compliance report. Compliance software tools shall generate a report that documents that the home and ERI score complies with Sections R407.2 through Section R407.4. The compliance documentation shall be created for the proposed design and submitted with the application for the building permit. Confirmed compliance documents of the built dwelling unit shall be created and submitted to the *code official for review* before a certificate of occupancy is issued. Compliance reports shall include information in accordance with Sections R407.6.2.1 and R407.6.2.2.

R407.6.2.1 (IRC N1107.6.2.1) Proposed Compliance report for permit application. Compliance reports submitted with the application for a building permit shall include the following:

1. Building street address, or other building site identification.
2. The name of the individual performing the analysis and generating the compliance report.
3. The name and version of the compliance software tool.
4. If Requested by the authority having jurisdiction, documentation of all inputs entered into the software used to produce the results for the reference design and/or the rated home.
5. A certificate indicating that the proposed design has an ERI less than or equal to the appropriate scores indicated in Table R407.4 when compared to the ERI reference design. The certificate shall document the building component energy specifications that are included in the calculation including, component level insulation R-values or U-factors, assumed duct system and building envelope air leakage testing results, as well as the type and rated efficiencies of proposed heating, cooling, mechanical ventilation, and service water heating equipment to be installed. The type and production size of the proposed onsite renewable Energy systems shall be reported.
6. When a site-specific report is not generated, the proposed design shall be based on the worst-case orientation and configuration of the rated home.

R407.6.2.2 (IRC N1107.6.2.2) Confirmed Compliance report for a certificate of occupancy. A confirmed compliance report submitted for obtaining the certificate of occupancy shall be made site and address specific and include the following:

1. Building street address or other building site identification.
2. The name of the individual performing the analysis and generating the report.
3. The name and version of the compliance software tool.
4. If requested by the authority having jurisdiction, documentation of all inputs entered into the software used to produce the results for the reference design and/or the rated home.
5. A final confirmed certificate indicating that the confirmed rated design of the built home complies with Sections R407.2 and R407.4. The certificate shall report the energy features that were confirmed to be in the home including component level insulation R- values or U-factors, results from any required duct system and building envelope air leakage testing, as wells as, the type and rated efficiencies of the heating, cooling, mechanical ventilation, and service water heating equipment installed. The type and production size of the confirmed onsite renewable energy systems shall be reported.

R407.6.3 (IRC N1107.6.3) Additional Documentation. The code official shall be permitted to require the following Documents:

1. Documentation of the building component characteristics of the ERI reference design.
2. A certification signed by the builder providing the building component characteristics of the rated design.
3. Documentation of the actual values used in the software calculation for the rated design.

R407.6.4 (IRC N1107.6.4) Specific Approval. Performance analysis tools meeting the applicable section of Section R407 shall be approved. Documentation demonstrating the approval of the performance analysis with Section R407.6.1 shall be provided

R407.6.5 (IRC N407.6.5) Input values. Where calculation require input values not specified by Sections R402, R403, R404 and R405, those input values shall be taken from RESNET/ICC 301.

Reason: As the Energy Rating Index (ERI) diverges from the Home Energy Rating System Index (HERS) it becomes important to realize that although there are commonalities between the two, they are ultimately different from each other and should be thought of separately. As soon as the R406 ERI pathway was codified it locked in the ERI to a specific version of the RESNET/ANSI/ICC 301 standard while the HERS Index is based on a continually maintained version of the same ANSI 301 standard. Therefore, we now have divergent Index scores that mean different things. The HERS Index benchmarks the efficiency of a home in comparison to a reference home that is based on the 2006 IECC. A HERS Rating is an asset rating of the energy features in a home. This means that in the process of a HERS Rating to generate the HERS Index a Rater does not necessarily inspect to see if energy features governed by the code are installed according to requirements of the code. For example, the HERS Ratings systems' insulation installation grading criteria gives guidance on how to de-rate the R-value of poorly installed insulation. The Rater is required to give a grade 3 to poor installations. The HERS Index score is intended to evaluate the performance of what is installed. It is not intended to determine if it was installed per the requirement of code. A code rating or evaluation for the generation of the ERI score, on the other hand, should only use a grade 1 because only grade 1 installation of insulation meets the requirements of manufacturer instructions and therefore code. If a Rater were to evaluate a home for an ERI score and come across grade 3 installation of insulation, the installation should fail the inspection and be re-installed to meet code requirements. In this way, an ERI rating and a HERS rating are fundamentally different. One is held to a pass/fail requirement of code and the other is a quantification and evaluation of energy assets or components of the home. This small example demonstrates how the HERS index score and the ERI score differ.

Another example that demonstrates a more pronounced difference between the indices is the codified ventilation requirements for the ERI score vs. the ventilation requirements for the HERS Index score. The ERI score uses the ASHRAE 62.2-2010 ventilation requirements while the HERS Index uses the ASHRAE62.2-2013 ventilation requirements. This difference can result in over a 10-point difference in the scores.

Many are troubled by this divergence in the index scores, but I am not because the ERI and the HERS Index are fundamentally different if related systems. The HERS Index has been adopted by builders and the public primarily as a sales and marketing tool and a means to compare the performance of houses. The HERS Index score is quite good for these purposes. The ERI, like the area weighted u-values in section R402.1.5 Total U-factor Alternative, or cost comparison in section R405 Simulated Performance Alternative is a matrix by which a home's performance can be compared to demonstrate compliance with the code. It is not intended for marketing or public consumption and as the scores continue to diverge the public will continue to be unaware of the ERI score just as they are unaware of area weighted u-values and cost compliance. If a common understanding can be created regarding this point then the ERI score can be a powerful tool to offer great flexibility for builders as well as a path forward for the code and municipalities who choose to use it to achieve greater energy efficiency.

This proposal has been designed to leverage the unique nature of the ERI and the already codified mandatory aspects of the IECC, so as to offer municipalities and builders an option that will continue the trend toward zero energy homes. As Section R407 is an optional pathway municipalities and builders can choose a code compliance path that allows great flexibility in energy specifications and design while the homebuilding industry learns how to incorporate new technologies or better use old ones. The IECC's emphasis on protecting the thermal envelope is protected not by a punitive R-value backstop, but rather by a before renewables ERI requirement. A Pre-renewables ERI score opens up flexibility through cost-effective energy tradeoffs that are the most flexible for the builder as they would include mechanical, thermal or conductive, convective losses through envelope, along with duct tightness, lights, appliances, and more. Any feature that lowers the ERI can be used. This integrated energy evaluation acknowledges that the ERI of a home cannot be lowered beyond a certain threshold unless renewables are installed, but also sets the pre-renewable ERI at a level that ensures current levels of efficiency will be created as the starting point. For example, when a builder maximizes the thermal envelope and mechanical efficiencies of their design the ERI cannot go lower than approximately 35-40. To get an ERI score below that range on-site renewables must be installed. In this way, R407, as proposed, ensures a sound building envelope and efficient mechanical systems before renewables are considered.

The uniqueness of this proposal is that it creates a timeline by which a clear incremental approach for achieving increases in efficiencies that would lead to zero energy homes can be achieved. Although this will be new to the code development world, it is tremendously important to allow the path to zero to be phased in and for giving builders and jurisdictions a timeline for planning to achieve the ultimate goal. This phased-in approach has precedence in two Colorado jurisdictions. The City of Boulder and Boulder County have both set a phased approach for attaining zero energy in their municipalities.

Section R407 is optional so only those municipalities and builders that are searching for code compliant incremental approaches need take part. It has become a difficult argument to increase R-values, house tightness or duct leakage requirements in the 2021 IECC development cycle. This ERI approach to Zero Energy offers a logical, market-driven approach that creates a timeline for achieving significant increases in efficiency while simultaneously giving industry time to adjust and provide cost-effective solutions. This proposal also guards against building poor thermal envelopes and offsetting with on-site renewable systems. This proposal offers builders the greatest flexibility to choose how to build to meet the requirements of code.

Cost Impact: The code change proposal will increase the cost of construction

This **R407 PATHWAY TO ZERO, ENERGY RATING INDEX COMPLIANCE ALTERNATIVE** is just that and optional alternative path way to not only demonstrate compliance with the IECC but to help jurisdictions that are interested define a measurable and incremental approach to create zero energy homes. This approach is being used in Colorado although it is true that cost of construction increases it is only required if the jurisdiction chooses to adopt the pathway.

Proposal # 5283

RE210-19

RE211-19

IECC: R501.2 (IRC N1107.2), R501.4 (IRC N1107.4), R502.1 (IRC N1108.1), R502.1.1 (IRC N1108.1.1), R502.1.1.1 (IRC N1108.1.1.1), R502.1.1.2 (IRC N1108.1.1.2), R502.1.1.3 (IRC N1108.1.1.3), R502.1.1.4 (IRC N1108.1.1.4), R502.1.2 (IRC 1102.1.2), R503.2 (IRC N1109.2), R503.1.2 (IRC N1109.1.2), R505.1 (IRC N1111.1), R505.2 (IRC N1111.2), R505.1.1 (IRC N1111.1.1)

Proponent: David Collins, representing SEHPCAC (SEHPCAC@iccsafe.org); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Energy Conservation Code

SECTION R501 (IRC N1107) GENERAL

R501.1 (IRC N1107.1.1) Scope. The provisions of this chapter shall control the *alteration, repair, addition* and change of occupancy of existing *buildings* and structures.

Revise as follows:

~~**R501.2 (IRC N1107.2) R501.1.1 (IRC N1107.1.1) Existing buildings. General**~~ Except as specified in this chapter, this code shall not be used to require the removal, *alteration* or abandonment of, nor prevent the continued use and maintenance of, an existing *building* or *building* system lawfully in existence at the time of adoption of this code. Unaltered portions of the existing *building* or *building* supply system shall not be required to comply with this code.

~~**R501.4 (IRC N1107.4) R501.2 (IRC N1107.2) Compliance.**~~ ~~*Alterations*~~ *Additions, alterations, repairs, additions* and or changes of occupancy to, or relocation of; existing *buildings* and structures shall comply with the provisions for ~~*alterations, repairs, additions*~~ and changes of occupancy or relocation, respectively, in this code and the International Residential Code; International Building Code; International Existing Building Code; International Fire Code; International Fuel Gas Code; International Mechanical Code; International Plumbing Code; International Property Maintenance Code; International Private Sewage Disposal Code and NFPA 70: Sections R502, R503, R504, or R505 respectively in this code. Changes where unconditioned space is changed to *conditioned* space shall comply with Section R502.

SECTION R502 (IRC N1108) ADDITIONS

Revise as follows:

R502.1 (IRC N1108.1) General. *Additions* to an existing *building, building* system or portion thereof shall conform to the provisions of this code as those provisions relate to new construction without requiring the unaltered portion of the existing *building* or *building* system to comply with this code. *Additions* shall not create an unsafe or hazardous condition or overload existing *building* systems. An *addition* shall be deemed to comply with this code where the *addition* alone complies, where the existing *building* and *addition* comply with this code as a single building, or where the *building* with the *addition* does not use more energy than the existing *building*. *Additions* shall be in accordance with Section ~~R502.1.1~~ R502.2 or ~~R502.1.2~~ R502.3

~~**R503.2 (IRC N1109.2) R502.2 (IRC N1108.2) Change in space conditioning.**~~ Any nonconditioned or low-energy space that is altered to become *conditioned space* shall be required to be brought into full compliance with this code.

Exception Exceptions:

1. Where the simulated performance option in Section R405 is used to comply with this section, the annual energy cost of the *proposed design* is permitted to be 110 percent of the annual energy cost otherwise allowed by Section R405.3.
2. Where *unconditioned space* is changed to *conditioned space*, and the *building* envelope of the addition shall comply where the Total UA, as determined in Section R402.1.5, of the existing *building* and the *addition*, and any *alterations* that are part of the project, is less than or equal to the Total UA generated for the existing *building*.
3. Where *unconditioned space* is changed to *conditioned space*, the *addition* shall comply where the annual energy cost or energy use of the *addition* and the existing *building*, and any *alterations* that are part of the project, is less than or equal to the annual energy cost of the existing *building* when modeled in accordance with Section R405. The *addition* and any *alterations* that are part of the project shall comply with Section R405 in its entirety.

~~**R502.1.1 (IRC N1108.1.1) R502.3 (IRC N1108.3) Prescriptive compliance.**~~ *Additions* shall comply with Sections ~~R502.1.1.1~~ R502.3.1 through ~~R502.1.1.4~~ R502.3.4

~~**R502.1.1.1 (IRC N1108.1.1.1) R502.3.1 (IRC N1108.3.1) Building envelope.**~~ New *building* envelope assemblies that are part of the *addition* shall comply with Sections R402.1, R402.2, R402.3.1 through R402.3.5, and R402.4.

Exception: New envelope assemblies are exempt from the requirements of R402.4.1.2. Where *unconditioned space* is changed to *conditioned*

space, the *building envelope* of the addition shall comply where the Total UA, as determined in Section R402.1.5, of the existing building and the addition, and any *alterations* that are part of the project, is less than or equal to the Total UA generated for the existing *building*.

~~R502.1.1.2 (IRC N1108.1.1.2) R502.3.2 (IRC N1108.3.2) Heating and cooling systems.~~ New heating, cooling and duct systems that are HVAC ducts newly installed as part of the an addition shall comply with Section R403.

~~Exception:~~ Where ducts from an existing heating and cooling system are extended to an *addition*, duct systems with less than 40 linear feet (12.19 m) in *unconditioned spaces* shall not be required to be tested in accordance with Section R403.3.3. ~~..~~

~~R502.1.1.3 (IRC N1108.1.1.3) R502.3.3 (IRC 1108.3.3) Service hot water systems.~~ New service hot water systems that are part of the *addition* shall comply with Section R403.4.

~~R502.1.1.4 (IRC N1108.1.1.4) R502.3.4 (IRC N1108.3.4) Lighting.~~ New lighting systems that are part of the *addition* shall comply with Section R404.1.

~~R502.1.2 (IRC N1108.1.2) Existing plus addition compliance (Simulated Performance Alternative).~~ Where *unconditioned space* is changed to *conditioned space*, the *addition* shall comply where the annual energy cost or energy use of the *addition* and the existing *building*, and any *alterations* that are part of the project, is less than or equal to the annual energy cost of the existing *building* when modeled in accordance with Section R405. The *addition* and any *alterations* that are part of the project shall comply with Section R405 in its entirety.

SECTION R503 (IRC 1109) ALTERATIONS

Revise as follows:

~~R503.1.2 (IRC N1109.1.2) Heating and cooling systems.~~ New heating, cooling and duct systems that are part of the HVAC ducts newly installed, as part of an alteration shall comply with Section R403.

~~Exception:~~ Where ducts from an existing heating and cooling system are extended, duct systems with less than 40 linear feet (12.19 m) in *unconditioned spaces* shall not be required to be tested in accordance with Section R403.3.3. ~~extended.~~

SECTION R505 (IRC N1111) CHANGE OF OCCUPANCY OR USE

Delete without substitution:

~~R505.1 General.~~ Spaces undergoing a change in occupancy that would result in an increase in demand for either fossil fuel or electrical energy shall comply with this code.

Revise as follows:

~~R505.2 (IRC N1111.2) R505.1 (IRC N1111.1) General.~~ Any space that is converted to a dwelling unit or portion thereof from another use or occupancy shall comply with this code.

~~Exception:~~ Where the simulated performance option in Section R405 is used to comply with this section, the annual energy cost of the *proposed design* is permitted to be 110 percent of the annual energy cost allowed by Section R405.3.

Add new text as follows:

R505.1.1 (IRC N1111.1.1) Nonconditioned Space Any nonconditioned or low-energy space that is altered to become a conditioned space shall comply with Section R502.

Reason: No advantage to any proprietary interests governed by the code is intended. The intent is strictly to make the IECC more understandable and easier to use; or, where technical change is proposed, to make the code more reasonable.

Unlike the bulk of proposed SEHPCAC changes this proposal does have two technical changes incorporated:

- It removes the requirement for additions to be air leakage tested per Sec. R402.4.1.2 Testing. It is unreasonable to expect an addition to comply with air leakage testing when it is likely open to existing, and potentially much older, unsealed residential space.
- It removes the requirement for duct leakage testing on duct extensions. It is unreasonable to expect the sealing of sections of older, potentially concealed, existing ducts from which new duct is to extend.

This change also:

- Clarifies changes from unconditioned space to condition space must comply as additions.
- Consolidates all compliance provisions related to changes from unconditioned to conditioned space

This proposal is submitted by the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx> (<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>)

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The two exemptions provided do not functionally change construction practices, neither the duct leakage of duct extensions and air leakage testing of envelope assemblies on additions is not feasible and therefor not current practice.

Proposal # 4699

RE211-19

RE212-19

IECC: R502.1 (IRC N1108.1), R502.1.1 (IRC N1108.1.1), R502.1.1.1 (IRC N1108.1.1.1), R502.1.2 (IRC N1108.1.2), R502.1.2.1 (IRC N1108.1.2.1) (New), R502.1.3 (IRC N1108.1.3) (New), R502.1.3.1 (IRC N1108.1.3.1) (New), R502.1.4 (IRC N1108.1.4) (New), R502.1.4.1 (IRC N1108.1.4.1) (New)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com); Shaunna Mozingo (sdmozingo@shaunnamozingo.com)

2018 International Energy Conservation Code

SECTION R502 ADDITIONS

Revise as follows:

R502.1 (IRC N1108.1) General. *Additions* to an existing *building*, *building* system or portion thereof shall conform to the provisions of this code as those provisions relate to new construction without requiring the unaltered portion of the existing *building* or *building* system to comply with this code. code unless required to do so by the chosen compliance pathway. *Additions* shall not create an unsafe or hazardous condition or overload existing *building* systems. An *addition* shall be deemed to comply with this code where the *addition* alone complies, ~~where the existing *building* and *addition* comply with this code as a single building, or where the *building* with the *addition* does not use more energy than the existing *building*.~~ *Additions* shall be in accordance with Section R502.1.1 or R502.1.2 by using either the prescriptive path in Section R502.1.1, simulated performance path in Section R502.1.2, or the energy rating index path in Section R502.1.3.

R502.1.1 (IRC N1108.1.1) Prescriptive Additions prescriptive compliance. *Additions* shall comply with Sections R502.1.1.1 through R502.1.1.4.

R502.1.1.1 (IRC N1108.1.1.1) Building envelope. New *building* envelope assemblies that are part of the *addition* alone shall comply with the prescriptive Sections R402.1, R402.2, ~~R402.3.1 through R402.3.5, and R402.4, R402.3, and R402.4.1.1.~~

Exception: Where *unconditioned space* is changed to *conditioned space*, the *building* envelope of the *addition* shall comply where the Total UA, as determined in Section R402.1.5, of the existing *building* and the *addition*, and any *alterations* that are part of the project, is less than or equal to the Total UA generated for the existing *building*.

R502.1.1.2 (IRC N1108.1.1.2) Heating and cooling systems. New heating, cooling and duct systems that are part of the *addition* shall comply with Section R403.

Exception: Where ducts from an existing heating and cooling system are extended to an *addition*, duct systems with less than 40 linear feet (12.19 m) in *unconditioned spaces* shall not be required to be tested in accordance with Section R403.3.3.

R502.1.1.3 (IRC N1108.1.1.3) Service hot water systems. New service hot water systems that are part of the *addition* shall comply with Section R403.4.

R502.1.1.4 (IRC N1108.1.1.4) Lighting. New lighting systems that are part of the *addition* shall comply with Section R404.1.

Revise as follows:

R502.1.2 (IRC N1108.1.2) Existing plus addition compliance (Simulated Performance Alternative). Cost compliance verification shall demonstrate that the existing building plus the addition does not use more energy than the existing building did prior to the addition. This method requires the project to create cost compliance verification at three stages:

1. A baseline cost compliance of the existing structure prior to construction.
2. Projected cost compliance of the existing building plus the addition based on the proposed design for the building in its entirety.
3. Confirmed cost compliance to verify whole building performance. ~~Where *unconditioned space* is changed to *conditioned space*, the *addition* shall comply where the annual energy cost or energy use of the *addition* and the existing *building*, and any *alterations* that are part of the project, is less than or equal to the annual energy cost of the existing *building* when modeled in accordance with Section R405. The *addition* and any *alterations* that are part of the project shall comply with Section R405 in its entirety.~~

Add new text as follows:

R502.1.2.1 (IRC N1108.1.2.1) Reporting. Both the baseline and the projected cost compliance reports that include documentation of the proposed design shall be submitted with the construction documents. A confirmed cost compliance report shall be submitted prior to final inspection.

R502.1.3 (IRC N1108.1.3) Existing plus addition compliance (Energy Rating Index Alternative). An energy rating index score shall demonstrate that the existing building plus the addition does not use more energy than the existing *building* did prior to the addition. This method requires the project to obtain an ERI score at three stages:

1. A baseline ERI of the existing structure prior to construction.

2. A projected ERI of the existing building plus the addition based on the proposed design for the building in its entirety.
3. A confirmed ERI to verify whole building performance.

R502.1.3.1 (IRC N1108.1.3.1) Reporting. Both the baseline and the projected ERI compliance reports that include documentation for the proposed design shall be submitted with the construction documents. A confirmed ERI report shall be submitted prior to final inspection.

R502.1.4 (IRC N1108.1.4) Existing plus addition compliance (Prescriptive). The existing building plus the addition shall demonstrate that the structure in its entirety does not use more energy than the existing *building* did prior to adding the addition. All prescriptive measures shall be installed in the addition in accordance Section R402.1. A blower door test shall be performed to establish a baseline air leakage rate for the existing building prior to construction. Prior to final building inspection, a blower door test shall be conducted on the existing building plus addition to demonstrate an air leakage rate equal to or less than the baseline measurement.

R502.1.4.1 (IRC N1108.1.4.1) Reporting. A baseline blower door testing report for the existing building prior to construction shall be submitted with the construction documents. A confirmed blower door testing report shall be submitted after construction is complete and prior to final inspection.

Reason: The current existing buildings chapter 5 of the IECC has always struggled with clearly executing the energy code provisions on additions to an existing building. A building science approach teaches us that the house is a system. Therefore, if an addition is added to an existing building then the system's configuration has changed and assessing compliance on a portion of the system becomes a problem. In reality, it is not possible to assess a portion of the system separated from its entirety for energy code compliance. However, the code has established a method, but not a clear means for trying to do so.

In one form or another the IECC has always stated that an addition shall be deemed to comply where the building with the addition does not use more energy than the existing building did without the addition. The proposal for this section leverages this language (or method) and the existing paths (the means) in the code to offer better compliance mechanisms. The proposed Section R502.1.4 Existing plus addition compliance (Prescriptive), for example, uses a baseline pre-blower door test compared to a final confirmed blower door test to demonstrate if the final product is better than or equal to the existing benchmarked building. The assumption is that the prescriptive R-values, U-values, and installation requirements for the specification installed in the addition will be better than what has been installed in the existing portions of the building. Since it is not practical and, in most cases, possible to perform a blower door on just the addition the requirement changes in order to use the blower door as a compliance mechanism.

A Simulated Performance and Energy Rating Index path have been added as alternative compliance mechanisms in this section of the code for three reasons. First, the blower door is moved back to an assessment of energy performance rather than used as a compliance mechanism. Second, it is our experience that existing portions of a building are almost always touched during the creation of an addition on a building. Therefore, these compliance paths look at the entirety of the building rather than just the addition. Third, design flexibility is achieved when one is not required to use every portion of the prescriptive specification outlined in the code. The clear ability to use tradeoffs in existing buildings fits better with the reality of construction in this arena. Fourth, these two pathways enable and encourage pre-planning as well as offer a very clear matrix of compliance. The software analysis to generate the proposed design for the existing building plus the addition clearly projects if the new building in its entirety, will be better than or equal to the existing benchmarked building. The projection enables the designer to forecast what in the existing building must be addressed which helps create better building budgets and expectations. In addition, a variety of options can be presented to pick what in the existing and new sections of the building makes the most sense to address.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Demonstration of compliance with this code is required regardless, so adding additional options for demonstrating compliance would not add to the cost. It is not a certainty, but added flexibility could reduce the cost of construction as well as jurisdictional time spent on enforcement.

Proposal # 4747

RE212-19

RE213-19

IECC: R503.1.1 (IRC N1109.1.1)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com); Shaunna Mozingo (sdmozingo@shaunnamozingo.com)

2018 International Energy Conservation Code

Revise as follows:

SECTION R503 (IRC N1109) ALTERATIONS

R503.1 (IRC N1109.1) General. *Alterations* to any building or structure shall comply with the requirements of the code for new construction. *Alterations* shall be such that the existing building or structure is not less conforming to the provisions of this code than the existing *building* or structure was prior to the *alteration*.

Alterations to an existing *building*, *building* system or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portions of the existing *building* or *building* system to comply with this code. *Alterations* shall not create an unsafe or hazardous condition or overload *existing* building systems. *Alterations* shall be such that the existing *building* or structure does not use more energy than the existing building or structure prior to the *alteration*. *Alterations* to existing *buildings* shall comply with Sections R503.1.1 through R503.2.

R503.1.1 (IRC N1109.1.1) Building envelope. Building envelope assemblies that are part of the alteration shall comply with Section R402.1.2 or R402.1.4, Sections R402.2.1 through R402.2.13, R402.3.1, R402.3.2, R402.4.3 and R402.4.5. A pre and post blower door test shall be completed when building thermal envelope alterations are performed. If the alteration results in a post blower door CFM50 measurement that is less than the building airflow standard as set forth in Section R402.4.1.2, then combustion safety testing shall be performed and mechanical ventilation shall be recommended.

Exception: The following alterations shall not be required to comply with the requirements for new construction provided that the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.
2. Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation.
3. Construction where the existing roof, wall or floor cavity is not exposed.
4. Roof re-cover.
5. Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing.
6. Surface-applied window film installed on existing single pane fenestration assemblies to reduce solar heat gain provided that the code does not require the glazing or fenestration assembly to be replaced.

Reason: Alterations to the buildings thermal envelope inevitably impact the air tightness of the building and therefore the combustion safety of the building. This section of the code is in existing buildings which is an indication that the majority of the structures have atmospherically vented appliances. Specifically, atmospherically vented water heaters, which are the most likely appliance to back draft, are susceptible to pressure changes in existing homes. Replacing windows, adding insulation, installing air tight IC rated can lights, or any individual building thermal envelope upgrade, changes the dynamic in the building significantly to warrant preventative combustion safety testing and possibly mechanical ventilation. The proposed language continues to demonstrate the importance of energy codes relationship to health safety and durability as well as efficiency as described in the code's intent Section R101.3.

Cost Impact: The code change proposal will increase the cost of construction. Cost would be impacted as the health and safety of the building to better ensure that the occupant was not poisoned by carbon monoxide would have to be tested. This test cost approximately \$200-400 if conducted as a stand-alone test. Many energy retrofit specialists and building envelope specialists include this test as part of their service which brings down the cost.

Proposal # 4749

RE213-19

RE214-19

IECC: R502.1.1.1 (IRC N1108.1.1.1)

Proponent: Shaunna Mozingo, City of Westminster, representing Colorado Chapter of ICC Energy Code Development Committee (smozingo@cityofwestminster.us)

2018 International Energy Conservation Code

Revise as follows:

R502.1.1.1 (IRC N1108.1.1.1) Building envelope. New *building* envelope assemblies that are part of the *addition* shall comply with Sections R402.1, R402.2, R402.3.1 through R402.3.5, and R402.4.

~~**Exception:** Where *unconditioned space* is changed to *conditioned space*, the *building envelope* of the *addition* shall comply where the Total UA, as determined in Section R402.1.5, of the existing building and the *addition*, and any *alterations* that are part of the project, is less than or equal to the Total UA generated for the existing *building*.~~

Reason: This section of the code is talking about additions, which is new construction. The exception is talking about a change in space conditioning, which takes place as an alteration not as new construction. It does not make sense to have this exception for additions.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The exception wasn't addressing additions to begin with, so there should be no cost to remove it.

Proposal # 5320

RE214-19

RE215-19

IECC: R503.1 (IRC N1109.1)

Proponent: Shaunna Mozingo, City of Westminster, representing Colorado Chapter of ICC Energy Code Development Committee (smozingo@cityofwestminster.us)

2018 International Energy Conservation Code

Revise as follows:

R503.1 (IRC N1109.1) General. *Alterations* to any building or structure shall comply with the requirements of the code for new construction without requiring the unaltered portions of the existing *building* or *building system* to comply with this code. *Alterations* shall be such that the existing building or structure is not less conforming to the provisions of this code than the existing *building* or structure was prior to the *alteration*.

~~*Alterations to an existing building, building system or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portions of the existing building or building system to comply with this code.*~~

Alterations shall not create an unsafe or hazardous condition or overload *existing* building systems. *Alterations* shall be such that the existing *building* or structure does not use more energy than the existing building or structure prior to the *alteration*. *Alterations* to existing *buildings* shall comply with Sections R503.1.1 through R503.2.

Reason: Removing redundant language.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Removing redundant language.

Proposal # 5328

RE215-19

RE216-19

IECC: R503.1.1.1 (IRC N1109.1.1.1)

Proponent: Shaunna Mozingo, representing Self (smozingo@cityofwestminster.us)

2018 International Energy Conservation Code

Revise as follows:

R503.1.1.1 (IRC N1109.1.1.1) Replacement fenestration. Where some or all of an existing fenestration unit is replaced with a new fenestration product, including sash and glazing, the replacement fenestration unit shall meet the applicable requirements for *U*-factor and SHGC as specified Table R402.1.2. Where more than one replacement fenestration unit is to be installed, an area-weighted average of the *U*-factor, SHGC or both of all replacement fenestration units shall be an alternative that can be used to show compliance.

Where fenestration was previously used as a trade off in the building thermal envelope, the replacement fenestration shall have a U-Factor and SHGC equal to or less than the original fenestration U-Factor and SHGC.

Reason: If someone used good windows to get out of some insulation or to lower the insulation value and then they go to replace the windows but only used today's code value there is a chance that they are making the building thermal envelope less conforming than it was at the time of construction. Section 503.1 says that an alteration can never make a structure less conforming or use more energy.

This can be easily enforced if a jurisdiction requires the mandatory certificates that are called out in R401.3 that let us know what U-Factors and SHGC went in to the thermal envelope. These certificates become more and more important as we alter our buildings and as we provide trade offs such as window replacements.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

Because the energy code says that you can never make a building less conforming or use more energy, this new wording has always been implied but never written. Therefore, there should be no change in cost.

Proposal # 5331

RE216-19

RE217-19

IECC: R503.1.1 (IRC N1109.1.1)

Proponent: Darren Meyers, P.E., IECC_LLCC representing the National Roofing Contractors Association, representing the National Roofing Contractors Association (dmeyers@ieccode.com)

2018 International Energy Conservation Code

Revise as follows:

R503.1.1 (IRC N1109.1.1) Building envelope. Building envelope assemblies that are part of the alteration shall comply with Section R402.1.2 or R402.1.4, Sections R402.2.1 through R402.2.13, R402.3.1, R402.3.2, R402.4.3 and R402.4.5.

Exception: The following alterations shall not be required to comply with the requirements for new construction provided that the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.
2. Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation.
3. Construction where the existing roof, wall or floor cavity is not exposed.
4. Roof re-cover.
5. ~~Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing.~~ Roof replacement, where the required R-value of insulation entirely above the roof deck cannot be provided due to thickness limitations presented by existing rooftop conditions, including an HVAC system or refrigeration equipment, skylight curb(s), low door or glazing heights, weep holes, parapet or roof flashing heights, the maximum approved thickness of insulation compatible with the available space and existing uses shall be installed.
6. Surface-applied window film installed on existing single pane fenestration assemblies to reduce solar heat gain provided that the code does not require the glazing or fenestration assembly to be replaced.

Reason: This proposal is based on CE287-16, and resubmitted for flat-roof residential applications where the required R-value of insulation entirely above the roof deck cannot be provided due to thickness limitations. CE287-16 received a Committee recommendation of "Disapproval," a Public Comment recommendation of "As Modified by Public Comment" (AMPC), but ultimately did not receive the two-thirds necessary to prevail during the "Online Governmental Consensus Vote" (OGCV), leading to "Disapproval" as its Final Action.

Specifically, the newly proposed exception addresses the AMPC and the challenge of constructability when installing additional roof insulation in *reroofing* situations including *roof recover* and *roof replacement* where existing conditions do not allow for the full thickness of insulation required by Table R402.1.2 or Table R402.1.4. Consider the square footage of residential buildings with flat roofs (i.e., "two-flats" and "three-flats") constructed before an adoption of the 2009 IECC, that now require *reroofing*, without adequate "clear space" to accommodate up to 5+ inches (R-25-ish) or 6+ inches (R-30-ish) of insulation as the IECC evolved thru 2012 to 2015 and now the 2018 Editions. The building stock now considered 10 to 20 to 30+ years old, is far more likely to avail itself of skylight and structural curb heights, scupper and sump depths, door and window access thresholds that would turn into ponds, if five to six inches of insulation were "retroactively" foisted upon building ownership.

Moreover, if the IECC CDC were to consult the premise to Section R505.1, that "... [neither] an increase in demand for either fossil fuel [nor] electrical energy shall comply with this code," so long as the current level of insulation in the roof is replaced with an equivalent thickness/level/R-value of NEW! insulation product, you'd likely conclude that the newly proposed Exception 5 is a "do-no-harm" proposition.

Should the Committee agree with the newly proposed Exception 5, then the continuance of current Exception 5 is unnecessary, as both the current Exception 4 (*Roof re-cover*) and the New! Exception 5 (*Roof replacement*) address all circumstances defined as *Reroofing*.

We believe the proposal makes clear that the maximum thickness of insulation compatible within the technically-feasible limitations of "available space" and maintaining "positive drainage" is to be installed.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This change better positions the IECC to be clearer, more easily applied to *reroofing*, more competitive than the 90.1 Standard alternative on this issue; thereby no cost impact when compared with current provisions.

Proposal # 5271

RE217-19

RE218-19

IECC: R503.1.4

Proponent: Marilyn Williams, representing National Electrical Manufacturers Association (mar_williams@nema.org)

2018 International Energy Conservation Code

Revise as follows:

R503.1.4 (IRC N1109.1.4) Lighting. New lighting systems that are part of the *alteration* shall comply with Section R404.1.R404.1.

Exception: *Alterations* that replace less than ~~50~~ 10 percent of the luminaires in a space, provided that such *alterations* do not increase the installed interior lighting power.

Reason: Revising this language will:

1. Increase energy efficiency
2. Reduce inconsistency and application confusion in compliance
3. Resolve compliance with application, approval and inspection.

This revised language aligns the residential lighting alteration section with the commercial lighting systems Section C503.6. It changes the lighting alteration exception from when less than 50 percent of the luminaires in the space are replaced, to when less than 10 percent are replaced. This will make compliance and usability of the code easier as well as increase in the energy efficiency of alterations when 10 or less than 50 percent of the luminaires are replaced.

Cost Impact: The code change proposal will increase the cost of construction

This code change proposal will increase the cost of construction for residential alterations that replace between 10 and 50 percent of luminaires in a space.

Proposal # 4915

RE218-19

RE219-19

IECC: R503.1.1 (IRC N1109.1.1)

Proponent: Darren Meyers, P.E., IECC_LLCC representing the National Roofing Contractors Association, representing the National Roofing Contractors Association (dmeyers@ieccode.com)

2018 International Energy Conservation Code

Revise as follows:

R503.1.1 (IRC N1109.1.1) Building envelope. Building envelope assemblies that are part of the alteration shall comply with Section R402.1.2 or R402.1.4, Sections R402.2.1 through R402.2.13, R402.3.1, R402.3.2, R402.4.3 and R402.4.5.

Exception: The following alterations shall not be required to comply with the requirements for new construction provided that the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.
2. Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation.
3. Construction where the existing roof, wall or floor cavity is not exposed.
4. Roof re-cover.
5. Roofs without insulation ~~in the cavity~~ entirely above the roof deck and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing.
6. Surface-applied window film installed on existing single pane fenestration assemblies to reduce solar heat gain provided that the code does not require the glazing or fenestration assembly to be replaced.

Reason: It is unclear as to the intended application of current Exception 5 to Section 503.1.1. We believe the Exception was intended to apply to low-slope roof *reroofing*, as defined. However, with all *roof re-covers* addressed by current Exception 4, it is therefore likely current Exception 5 was intended to apply solely to flat *roof replacement* operations.

The overall outcome (i.e., fate) in applying Exception 5 to a low-slope roof replacement is seemingly to advise the roofing contractor to install replacement insulation, at whichever thickness and R-value (i.e., recall this is an exception), either above or below the rafter-line.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

There is no cost implication aligned with this proposal. Rather, it is an exercise steeped in clarification and consistency across the ICC Family of International Codes.

Proposal # 5269

RE219-19

RE220-19

IECC: R503.2 (N1109.2), R505.2 (IRC N1111.2)

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com); Shaunna Mozingo (sdmozingo@shaunnamozingo.com)

2018 International Energy Conservation Code

Revise as follows:

SECTION R503 (IRC N1109) ALTERATIONS

R503.2 (IRC N1109.2) Change in space conditioning. Any nonconditioned or low-energy space that is altered to become *conditioned space* shall be required to be brought into full compliance with this code.

~~**Exception:** Where the simulated performance option in Section R405 is used to comply with this section, the annual energy cost of the proposed design is permitted to be 110 percent of the annual energy cost otherwise allowed by Section R405.3. Spaces where compliance is demonstrated using the compliance mechanisms in accordance with Section R502.~~

SECTION R505 (IRC N1111) CHANGE OF OCCUPANCY OR USE

R505.2 (IRC N1111.2) General. Any space that is converted to a dwelling unit or portion thereof from another use or occupancy shall comply with this code.

~~**Exception:** Where the simulated performance option in Section R405 is used to comply with this section, the annual energy cost of the proposed design is permitted to be 110 percent of the annual energy cost allowed by Section R405.3. Spaces where compliance is demonstrated using the compliance mechanisms in accordance with Section R502.~~

Reason: This proposed change to Alteration and Change of Occupancy or Use in this existing buildings chapter offers a more flexible alternative compliance paths as outlined in the proposal for prescriptive, simulated performance, and energy rating index compliance paths in the Additions section of Section R505 Existing Buildings Performance Compliance Alternative. If the proposal is not accepted this proposal will be removed from consideration.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Demonstration of compliance with this code is required regardless, so adding additional options for demonstrating compliance would not add to the cost. It is not a certainty, but added flexibility could reduce the cost of construction as well as jurisdictional time spent on enforcement.

Proposal # 4751

RE220-19

RE221-19

IECC: R505.1 (IRC N1107.1), R505.2 (IRC N1111.2)

Proponent: Shaunna Mozingo, representing Self (smozingo@cityofwestminster.us)

2018 International Energy Conservation Code

Revise as follows:

R505.1 (IRC N1107.1) General. Spaces undergoing a change in occupancy that would result in an increase in demand for either fossil fuel or electrical energy shall comply with ~~this code: R501.1.1.~~

R505.2 (IRC N1111.2) General. Any space that is converted to a dwelling unit or portion thereof from another use or occupancy shall comply with ~~this code: Section 501.1.1.~~

Exception: Where the simulated performance option in Section R405 is used to comply with this section, the annual energy cost of the *proposed design* is permitted to be 110 percent of the annual energy cost allowed by Section R405.3.

Reason: Sections R502.1 and R503.1 reference complying with the code for new construction without requiring unaltered portions of the building to "comply with this code". Section R503.2 requires the space to be brought in to "full compliance with this code". Section 505.1 and 505.2 say a space has to "comply with this code". What is all that saying?

Many building departments read all of them to say the same thing that you have to be brought in to full compliance with the code. But if you look at the scope of both of these sections, they all have a different intent. It's pretty clear that when dealing with additions and alterations you only have to fix what you touch. And it stands to reason in 503.2 that if you go from a building that didn't use energy to a building that does use energy you need to comply with the entire code. But when you get to a change of occupancy or use, the intent becomes less clear. It says you have to comply with the code but does that mean "full code" like stated in 503.2 or "this code" like stated in 502 and 503?

Because 505 is dealing with a space that has already been conditioned (or you would be in 503.2) and its dealing with a change, we feel that the intent is truly that these spaces must comply with the code as it relates to existing buildings. Therefore, we have removed the confusing language and inserted the section that tells you which sections of the code your existing building must comply with.

For those who interpreted this existing section to require all changes of occupancy or use to be brought in to full compliance they are not going to like allowing unaltered portions to not be brought in to full compliance. But, we would say it never had to be or the wording in 503.2 would have been carried over to 505. It is our intent that when changing an occupancy or use that increases the demand for either fossil fuel or electrical energy you only have to change what the appropriate sections require you to change.

Changes in space conditioning are so different than changes of use. There's a big difference between a building that never complied versus a building that complied when it was built and is now changing its use. If you require every change of use to be brought in to 100% compliance you are discouraging the re-use of existing buildings. It becomes cheaper to move in to a new building than to get the best we can out of an existing building and move on.

Cost Impact: The code change proposal will decrease the cost of construction

Complying with only specific sections referenced in Chapter 5 instead of the entire code will likely decrease the cost of construction.

Proposal # 5332

RE221-19

RE222-19

IECC: RA103.1 (IRC AT103.1), RA103.5 (IRC AT103.5) (New), RA103.6 (IRC AT103.6)(New)

Proponent: Shaunna Mazingo, City of Westminster, representing Colorado Chapter of ICC Energy Code Development Committee (smozingo@cityofwestminster.us)

2018 International Energy Conservation Code

Revise as follows:

RA103.1 (IRC AT103.1) General. New detached one- and two-family dwellings, and townhouses with not less than 600 square feet (55.74 m²) of roof area oriented between 110 degrees and 270 degrees of true north shall comply with Sections RA103.2 through RA103.8.

Exceptions:

1. New residential buildings with a permanently installed on-site renewable energy system.
2. A building with a solar-ready zone that is shaded where all areas of the roof that would otherwise meet the requirements of Section RA103 are in full or partial shade for more than 70 percent of daylight hours annually.

RA103.4 (IRC AT103.4) Obstructions. Solar-ready zones shall be free from obstructions, including but not limited to vents, chimneys, and roof-mounted equipment.

Add new text as follows:

RA103.5 (IRC AT103.5) Shading The solar-ready zone shall be set back from any existing or new, permanently affixed object on the building or site that is located south, east or west of the solar zone a distance not less than 2 times the object's height above the nearest point on the roof surface. Such objects include, but are not limited to, taller portions of the building itself, parapets, chimneys, antennas, signage, roof top equipment, trees and roof plantings.

RA103.6 (IRC AT103.6) Capped Roof Penetration Sleeve A capped roof penetration sleeve shall be provided adjacent to a solar-ready zone located on a roof slope of not greater than 1 unit vertical in 12 units horizontal (8-percent slope). The capped roof penetration sleeve shall be sized to accommodate the future photovoltaic system conduit, but shall have an inside diameter of not less than 1 1/4 inches (32 mm).

Reason: The solar ready appendix in the IRC was changed last cycle but the changes were not incorporated in the solar ready appendix of IECC residential provisions. It was our understanding that anything dealing with residential provisions of the energy code would automatically match what was in the IRC, but apparently this does not apply to the appendix chapters. There is absolutely no reason that these two appendix chapters should differ.

Cost Impact: The code change proposal will increase the cost of construction

The cost of a roof penetration sleeve would be incurred if you were building to the IECC and had not been using the IRC. This would perhaps happen for multi family buildings less than 3 stories in height or for jurisdictions who use the IECC residential provisions and not the IRC.

Proposal # 5338

RE222-19

RE223-19

IECC: Appendix RB (IRC Appendix Q) (New)

Proponent: Eric Makela, New Buildings Institute, representing New Buildings Institute (ericM@newbuildings.org); Lauren Urbanek, Natural Resources Defense Council, representing Natural Resources Defense Council (lurbanek@nrdc.org)

2018 International Energy Conservation Code

Add new text as follows:

Appendix RB (IRC Appendix Q) **ZERO ENERGY RESIDENTIAL BUILDING PROVISIONS**

RB102 (IRC AQ 102) COMPLIANCE *(Note: language to replace R401.2 Compliance)*

Existing residential buildings shall comply with Chapter 5. New residential buildings shall comply with Section RB103.

RB103 (IRC AQ 103) **ZERO ENERGY RESIDENTIAL BUILDINGS**

RB103.1 (IRC AQ103.1) General. New residential buildings shall comply with Section RB103.

RB103.2 (IRC AQ103.2) Energy Rating Index Zero Energy Score. Compliance with this section requires that the *rated design* be shown to have a score less than or equal to the values in Table RB103.2 when compared to the *ERI reference design* determined in accordance with RESNET/ICC 301 for each of the following:

1. ERI value not including net onsite power production calculated in accordance with RESNET/ICC 301, and
2. ERI value including net onsite power production calculated in accordance with RESNET/ICC 301

TABLE RB103.2 (IRC AQ103.2)
MAXIMUM ENERGY RATING INDEX^a

<u>CLIMATE ZONE</u>	<u>ENERGY RATING INDEX not including onsite power</u>	<u>ENERGY RATING INDEX including onsite power (as proposed)</u>
<u>1</u>	<u>43</u>	<u>0</u>
<u>2</u>	<u>45</u>	<u>0</u>
<u>3</u>	<u>47</u>	<u>0</u>
<u>4</u>	<u>47</u>	<u>0</u>
<u>5</u>	<u>47</u>	<u>0</u>
<u>6</u>	<u>46</u>	<u>0</u>
<u>7</u>	<u>46</u>	<u>0</u>
<u>8</u>	<u>45</u>	<u>0</u>

a. The building shall meet the mandatory requirements of Section R406.2, and the building thermal envelope shall be greater than or equal to the levels of efficiency and SHGC in Table R402.1.2 or Table R402.1.4. of the 2015 *International Energy Conservation Code*.

Reason: This proposal provides cities and states an appendix to the residential section of the 2021 IECC that would result in a residential building that has zero energy consumption over the course of a year. Jurisdictions would have the prerogative to adopt the appendix in support of policy goals related to energy efficiency and renewable energy.

The provisions contained in this appendix are not mandatory unless specified as such in the jurisdiction’s adopting ordinance.

Why is this needed?

States and cities across the country are pursuing policies to reduce the energy consumption of buildings. More than 270 cities and counties and 10 states are signatories to the “We Are Still In” commitment supporting climate action to meet the goals of the Paris climate accord. Thus far, seventy cities have committed to to being powered by 100% renewable energy and more are joining all the time. The building energy code is an important policy tool for jurisdictions as they pursue these types of policy goals.

Many of these energy and climate-related goals have a target year of 2030, so the time is ripe to provide this option in the model energy code. While jurisdictions already can modify the model code to meet their needs, many do not have the in-house expertise to develop and vet this type of code language. Integrating a zero energy building pathway into the 2021 IECC as a jurisdictional option will make the model energy code a more robust policy tool. Use of appendices in the IECC have proven successful with the solar provisions in the 2018 IECC appendices.

Including a zero energy building appendix in the model energy code can smooth the transition to zero energy for builders. Rather than jurisdictions going alone— leading to a patchwork of zero energy residential code approaches—a single IECC appendix would provide consistent national language across the residential industry for manufacturers, builders and trades. Builders can standardize their construction practices across jurisdictions and states to meet these requirements. This makes education, incentive programs, and implementation significantly more straightforward and cost-effective.

How the Zero Energy appendix works

While there are a number of definitions of “zero energy buildings” (also referred to as “zero net energy,” “net zero energy,” or simply, “net zero”), the Appendix is based on the Energy Rating Index (ERI) compliance path found in section R406 of the 2018 IECC. In principle, the proposal works as follows:

1. Required ERI values are based on a highly efficient energy use performance level before considering on-site power generation.
2. The remaining energy use, on an annual level, is satisfied with on-site power generation.

The Energy Rating Index scores are set for a highly efficient level of energy consumption, which importantly, is still cost effective for the homeowner. These scores, which range from 42 to 48 based on climate zone, were calculated based on a thorough analysis of HERS scores nationwide, a survey of HERS scores for model high-performance home, modeling done for ASHRAE 90.2, and the U.S. DOE Zero Energy Ready Home program.

On-site renewable energy capacity is then required to meet the remaining energy use, resulting in an Energy Rating Index score of zero. Software required in the RESNET 301 standard can easily generate an ERI score of the home before and after the inclusion of renewable energy (known as Onsite Power Production in HERS). All renewable energy is required to be on-site. The minimum envelope backstops required in section R406 are also required in this appendix. Homes may use any fuel in accordance with RESNET 301 to comply with the Appendix.

Bibliography: Presentation: 90.2 Compliance Requirements. Results from EnergyGauge 5.0 Simulations and Economic Analysis SSPC 90.2 Orlando Meetings January 25-26, 2016. P. Fairey. Florida Solar Energy Center.
ASHRAE Standard 90.2018. Energy Efficient Design of Low-Rise Residential Buildings

Cost Impact: The code change proposal will increase the cost of construction

If adopted by the state or jurisdiction, complying with this appendix will increase the first cost of construction but the Energy Rating Index values, before the addition of onsite power production, that have been selected were found to be cost effective based on information presented to the ASHRAE Standard 90.2 committee. All of the ERI scores without onsite power production have been found to have Savings/Investment Ratios (SIR) of greater than 1.0.

Proposal # 5205

RE223-19

RE224-19 Part I

PART I — IECC: APPENDIX RB (New)

PART II — IRC: APPENDIX U (New)

Proponent: Theresa Weston, representing DuPont Performance Building Solutions (theresa.a.weston@dupont.com)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PARTS I AND II WILL BE HEARD BY IECC-RE COMMITTEE. PLEASE SEE THE TENTATIVE HEARING ORDERS FOR THIS COMMITTEE.

2018 International Energy Conservation Code

Add new text as follows:

Appendix RB STRETCH ENERGY CODE PROVISIONS

SECTION RB101 GENERAL

RB101.1 Scope. The provisions of this appendix shall be applicable for new construction or portions of existing residential buildings undergoing renovation or addition where increased levels of energy efficiency are required.

SECTION RB102 REQUIREMENTS

RB102.1 Requirements. Residential buildings or portions of residential buildings shall meet the requirements of ASHRAE/IES Standard 90.2.

SECTION RB103 REFERENCE STANDARDS

Add new standard(s) as follows:

ASHRAE

ASHRAE
1791 Tullie Circle NE
Atlanta GA 30329
US

90.2-2018: Energy-Efficient Design of Low-Rise Residential Buildings

Proposal # 5284

RE224-19 Part I

RE224-19 Part II

IRC: APPENDIX U (New)

Proponent: Theresa Weston, representing DuPont Performance Building Solutions (theresa.a.weston@dupont.com)

2018 International Residential Code

Add new text as follows:

Appendix U STRETCH ENERGY CODE PROVISIONS

SECTION AU101 GENERAL

AU101.1 Scope. The provisions of this appendix shall be applicable for new construction or portions of existing residential buildings undergoing renovation or addition where increased levels of energy efficiency are required.

Revise as follows:

SECTION AU102 REQUIREMENTS

AU102.1 Requirements. Residential buildings or portions of residential buildings shall meet the requirements of ASHRAE/IES Standard 90.2.

SECTION AU103 REFERENCE STANDARDS

Add new standard(s) as follows:

ASHRAE

ASHRAE
1791 Tullie Circle NE
Atlanta GA 30329
US

90.2-2018: Energy-Efficient Design of Low-Rise Residential Buildings

Reason: Some jurisdictions are interested in adopting stretch energy codes. Providing a stretch code through the reference of ANSI/ASHRAE/IES Standard 90.2-2018 allows for a stretch code that is based on an ERI methodology that is compatible with the ERI pathway within the base IECC. The ERI levels specified within 90.2-2018 have been specified as Tier 3 within the CEE New Residential Construction Specification, while the IECC 2018 ERI path is specified as Tier 1. (<https://library.cee1.org/content/cee-residential-new-construction-specification/>)

Cost Impact: The code change proposal will increase the cost of construction

The cost of construction will increase in the jurisdictions which adopt the stretch code appendix, but Standard 90.2 has been analyzed to be cost effective. The cost effectiveness analysis is reported in **FSEC-RR-584-15 Maximum Energy Efficiency Cost Effectiveness in New Home Construction**, dated May 20, 2015 (available at <http://www.fsec.ucf.edu/en/publications/pdf/FSEC-RR-584-15.pdf>).

Staff Analysis: A review of the standard proposed for inclusion in the code, ASHRAE 90.2-2018, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 5810

RE224-19 Part II

RE225-19

IECC: R403.2 (IRC N1103.2)

Proponent: Donald Sivigny, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Energy Conservation Code

R403.2 (IRC N1103.2) Hot water boiler outdoor temperature setback. Hot water boilers that supply heat to the *building* through one- or two-pipe heating systems shall have an outdoor setback control that decreases the boiler water temperature based on the outdoor temperature.

Exception: Boiler systems also used for domestic water heating.

Reason: This proposal is a correlation to the IECC-C code proposal to provides clarity to the requirements.

Why is the proposed code change a reasonable solution? It clarifies an exception.

Cost Impact: The code change proposal will decrease the cost of construction

This code change exempts domestic water heating from adding these setback controls which costs money to install (and maintain). By not installing them on the domestic water heating system it will save on costs of equipment.

-

Proposal # 5113

RE225-19

2019 GROUP B – PROPOSED CHANGES TO THE INTERNATIONAL GREEN CONSTRUCTION CODE

INTERNATIONAL GREEN CONSTRUCTION CODE COMMITTEE

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TENTATIVE ORDER OF DISCUSSION 2019 PROPOSED CHANGES TO THE INTERNATIONAL GREEN CONSTRUCTION CODE

The following is the tentative order in which the proposed changes to the code will be discussed at the public hearings. Proposed changes which impact the same subject have been grouped to permit consideration in consecutive changes.

Proposed change numbers that are indented are those which are being heard out of numerical order. Indentation does not necessarily indicate that one change is related to another. Proposed changes may be grouped for purposes of discussion at the hearing at the discretion of the chair. Note that some GG code change proposals may not be included on this list, as they are being heard by another committee.

GG1-19

GG2-19

GG3-19

GG4-19

ADM16-19 Part III

GG5-19

ADM33-19 Part IV

ADM40-19 Part V

GG1-19

IGCC@: SECTION 101, 101.1, 101.3.3 (2.3), 101.2.2 (1.2), 101.3 (New), 101.3.1 (2.1), 101.3.2 (2.2), 101.2.1 (1.1), 101.4.1(4.1)

Proponent: David Collins, representing SEHPCAC (SEHPCAC@iccsafe.org)

2018 International Green Construction Code

SECTION 101 GENERAL

101.1 Title. These regulations shall be known as the Green Construction Code of [NAME OF JURISDICTION] hereinafter referred to as “this code.”

Revise as follows:

~~101.3.3-101.2 (2.3) General.~~ This code is intended to provide minimum requirements to be used in conjunction with the other codes and standards adopted by the jurisdiction. The requirements in this code shall not be used to circumvent any applicable safety, health, or environmental requirements.

Delete without substitution:

~~101.2.2 (1.2)~~ This code is intended to provide the technical basis of mandatory building codes and regulations for *high-performance green buildings* that are broadly adoptable by national and local jurisdictions.

Add new text as follows:

101.3 Scope. The provisions of this code shall apply to the design, construction, addition, alteration, change of occupancy, relocation, replacement, equipment, removal and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures and to the building site on which the building is located. Occupancy classifications shall be determined in accordance with the *International Building Code*.

Delete without substitution:

~~101.3.1 (2.1)~~ This code contains requirements that address *site sustainability, water use efficiency, energy efficiency, indoor environmental quality (IEQ), materials and resources, and construction and plans for operation.* This code applies only to the following *building projects*:

- ~~1- New buildings and their systems.~~
- ~~2- New portions of buildings and their systems.~~
- ~~3- New systems and equipment in existing buildings.~~
- ~~4- Relocated existing buildings and temporary structures where specified in this code.~~

Revise as follows:

~~101.3.2-101.3.1 (2.2)~~ The provisions of this code do not apply to the following:

1. Single-family dwellings.
2. Multifamily dwellings of three stories or fewer above grade.
3. Manufactured houses (mobile homes).
4. Manufactured houses (modular).
5. *Building projects* that use none of the following:
 1. Electricity.
 2. Fossil fuels.
 3. Water.

~~(Informative note Exception:~~ The provisions in Appendix J for residential and multifamily construction apply where adopted by the authority having jurisdiction.)

~~101.2.1-101.4 (1.1) Intent.~~ The purpose-intent of this code is to provide minimum requirements for the siting, design, construction, and plans for operation of *high-performance green buildings* to: reduce emissions from buildings and building systems; enhance building occupant health and comfort; conserve water resources; protect local biodiversity and ecosystem services; promote sustainable and regenerative materials cycles; enhance building quality; enhance resilience to natural, technological, and human-caused hazards; and support the goal of development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

~~101.4.1(4.1)-101.5 General. Compliance.~~ *Building projects* shall comply with this code. Within each of Chapters 5 through 11. Within each of these chapters 11, *building projects* shall comply with all mandatory provisions (x.3) and, where offered, either the:

1. Prescriptive Option (x.4) or
2. Performance Option (x.5).

Reason: This proposal correlates the standard ICC Chapter 1 language with the administration language contained in ASHRAE Standard 189.1. New Section 101.2 (General) is a standard ICC section. In the 2018 IgCC it was covered, in essence, by Sections 101.2.2 and 101.3.3.

New Section 101.3 (Scope) is standard ICC scoping language.

2018 IgCC Section 101.3.2 is renumbered (no change to text) as Section 101.3.1 and is retained as a list of what are essentially exceptions to the scope.

2018 IgCC Sections 101.2.1 and 101.3.1 (Purpose and Scope) are now more appropriately combined and retitled as Section 101.4, Intent.

"Informative Notes" are typical in ASHRAE standards; in this proposal the informative note is clearly indicated as what it actually is: an exception.

The provisions of 2018 IgCC Sections 101.2 and 101.2.1 (Purpose) and 101.3.1 (Scope) are more appropriately relocated and retitled as Section 101.3, Intent.

The title of new Section 101.5 has been changed from "Application/General" to "Compliance" to differentiate it from the Section 102, Applicability.

This proposal is submitted by the ICC Sustainability, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors in July of 2011 to pursue opportunities to improve and enhance the IECC, the IgCC and the energy provisions of the IRC. The SEHPCAC held 4 open meetings in 2018. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as interested parties, to discuss and debate the proposed changes. Related documentation and reports are posted on the SEHPCAC website at: <https://www.iccsafe.org-tech-support/codes/code-development-process/sustainability-energy-and-high-performance-code-action-committee-sehpcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This proposal reorganizes and clarifies the code. It does not create any technical changes that would affect construction costs.

Proposal # 5164

GG1-19

GG2-19

IGCC@: 101.4 (New), Table 101.4 (New)

Proponent: jim edelson, representing New Buildings Institute (jim@newbuildings.org)

2018 International Green Construction Code

Add new text as follows:

101.4 Mandatory Chapters. Building projects shall comply with Chapters 5 through 11, except for those Chapter(s) determined not to be mandatory where selected by the jurisdiction in Table 101.4.

Table 101.4
Mandatory Compliance Chapters Determined By the Jurisdiction

Chapter	Mandatory Compliance
<u>5</u>	No <input type="checkbox"/>
<u>6</u>	No <input type="checkbox"/>
<u>7</u>	No <input type="checkbox"/>
<u>8</u>	No <input type="checkbox"/>
<u>9</u>	No <input type="checkbox"/>
<u>10</u>	No <input type="checkbox"/>

Reason: Many jurisdictions that consider adopting IgCC first face the question of which areas of scope (chapters) will be applied, and how they will be administered within the jurisdiction - or even if they fall within their governing authority. It is most likely a combination of policy intentions, statutory authority, and cross-agency administration that is considered as the decision is made to select which IgCC chapters should be pursued for adoption.

The proposal adds a clear mandatory chapter selection table to the administrative provisions of Chapter 1 where it can easily be indicated which chapters of the IgCC will not be mandatory for compliance with the code.

Cost Impact: The code change proposal will not increase or decrease the cost of construction

This code change provides a mechanism for jurisdictions to limit the scope of the IgCC, and does not in itself impact construction.

Proposal # 4938

GG2-19

GG3-19

IGCC@: 101.4.1(4.1), Table 101.4.1 (New)

Proponent: David Collins, representing SEHPCAC (SEHPCAC@iccsafe.org)

2018 International Green Construction Code

Revise as follows:

101.4.1(4.1) General. *Building projects* shall comply with Chapters 5 through ~~4+~~ 11. Within each of these chapters, *building projects* shall comply with all mandatory provisions (x.3) and, where offered, either the:

1. Prescriptive Option (x.4) or
2. Performance Option (x.5).

Exceptions:

1. Compliance shall not be required with Sections that are listed in Table 101.4.1 where the jurisdiction has opted out by checking "No" in the corresponding cell in the jurisdictional requirement column.
2. Where the jurisdiction has indicated a diversion percentage for Section 5.3.8.1 in Table 101.4.1, that percentage shall replace the diversion percentage indicated in Section 5.3.8.1.

Add new text as follows:

Table 101.4.1
REQUIREMENTS DETERMINED BY THE JURISDICTION

<u>Section</u>	<u>Section Title</u>	<u>Jurisdictional Requirement</u>
	<u>Chapter 5 - Site Sustainability</u>	
<u>5.3.3.2</u>	<u>Greenfield Sites</u>	<u>No</u>
<u>5.3.5.2</u>	<u>Mitigation of Heat Island Effect - Walls</u>	<u>No</u>
<u>5.3.6</u>	<u>Reduction of Light Pollution</u>	<u>No</u>
<u>5.3.7.1.1.1</u>	<u>Public Frontage Walkway</u>	<u>No</u>
<u>5.3.7.1.2</u>	<u>Bicycle Paths</u>	<u>No</u>
<u>5.3.7.2</u>	<u>Bicycle Parking</u>	<u>No</u>
<u>5.3.7.3</u>	<u>Preferred Parking</u>	<u>No</u>
<u>5.3.8.1</u>	<u>Building Site Waste Management - Diversion Percentage</u>	<u>90%</u> <u>75%</u> <u>50%</u>
	<u>Chapter 6 - Water Use Efficiency</u>	
<u>6.3.1.2</u>	<u>Irrigation</u>	<u>No</u>
<u>6.3.3</u>	<u>Special Water Heater Features</u>	<u>No</u>
<u>6.3.4.2</u>	<u>Consumption Data Collection</u>	<u>No</u>
<u>6.3.4.3</u>	<u>Data Storage and Retrieval</u>	<u>No</u>
<u>6.3.8</u>	<u>Dual Water Supply Plumbing</u>	<u>No</u>
	<u>Chapter 7 - Energy Efficiency</u>	
<u>7.3.4</u>	<u>Automated Demand Response</u>	<u>No</u>
<u>7.4.2.1</u>	<u>Building Envelope Requirements</u>	<u>No</u>
<u>7.4.2.2</u>	<u>Single Rafter Roof Insulation</u>	<u>No</u>
<u>7.4.2.3</u>	<u>High Speed Doors</u>	<u>No</u>
<u>7.4.2.4</u>	<u>Air Curtains</u>	<u>No</u>
<u>7.4.2.6</u>	<u>Permanent Projections</u>	<u>No</u>

7.4.2.9	<u>Orientation</u>	<u>No</u>
7.4.3.2	<u>Ventilation Controls for Densely Occupied Spaces</u>	<u>No</u>
7.4.3.4	<u>Economizers</u>	<u>No</u>
7.4.3.5	<u>Zone Controls</u>	<u>No</u>
7.4.3.6	<u>Fan System Power and Efficiency</u>	<u>No</u>
7.4.3.7	<u>Exhaust Air Energy Recovery</u>	<u>No</u>
7.4.3.8	<u>Kitchen Exhaust Systems</u>	<u>No</u>
7.4.3.10	<u>Automatic Control of HVAC and lights in Hotel/Motel Guest Rooms</u>	<u>No</u>
7.4.4.2	<u>Insulation for Spa Pools</u>	<u>No</u>
7.4.6.2	<u>Occupancy Sensor Controls with Multilevel Switching or Dimming</u>	<u>No</u>
7.4.6.3	<u>Automatic Controls for Egress and Security Lighting</u>	<u>No</u>
7.4.6.4	<u>Controls for Exterior Sign Lighting</u>	<u>No</u>
7.4.6.5	<u>Parking and Outdoor Sales Lighting</u>	<u>No</u>
7.4.7.2	<u>Supermarket Heat Recovery</u>	<u>No</u>
7.4.7.3.1	<u>ENERGY STAR Requirements for Equipment not Covered by Federal Appliance Efficiency Regulations (All Building Projects)</u>	<u>No</u>
7.4.7.4	<u>Programmable Thermostats</u>	<u>No</u>
7.4.7.5	<u>Refrigerated Display Cases</u>	<u>No</u>
	Chapter 8 - Indoor Environmental Quality	
8.3.1.3.(b)	<u>Ozone</u>	<u>No</u>
8.3.1.4	<u>Building Pressure</u>	<u>No</u>
8.3.1.5.1	<u>Vented Combustion</u>	<u>No</u>
8.3.1.9	<u>Guest Room Preoccupancy Outdoor Air Purge Cycle</u>	<u>No</u>
8.3.1.10	<u>Preoccupancy Ventilation Control</u>	<u>No</u>
8.3.2	<u>Thermal Environmental Conditions for Human Occupancy</u>	<u>No</u>
8.3.3.4	<u>Interior Sound Reverberation</u>	<u>No</u>
8.4.1.3	<u>Shading for Offices</u>	<u>No</u>
	Chapter 9 - Materials and Resources	
9.3.1.3	<u>Construction Waste</u>	<u>No</u>
	Chapter 10 - Construction and Plans for Operation	
10.3.1.5.b	<u>IAQ Construction management (Flush-out)</u>	<u>No</u>
10.3.1.8	<u>Construction Activity Pollution Prevention: Protection of Occupied Areas</u>	<u>No</u>
10.3.1.9	<u>Soil-Gas Control</u>	<u>No</u>
10.3.2.1.1	<u>Site Sustainability</u>	<u>No</u>
10.3.2.1.2.2	<u>Track and Access Water Use</u>	<u>No</u>
10.3.2.1.2.3	<u>Documentation of Water Use</u>	<u>No</u>
10.3.2.1.3	<u>Energy Efficiency</u>	<u>No</u>
10.3.2.1.4	<u>IAQ</u>	<u>No</u>
10.3.2.4.2	<u>Transportation Management Plan, Owner Occupied Building Projects or Portions of Building Projects</u>	<u>No</u>
10.3.2.4.3	<u>Transportation Management Plan, Building Tenant</u>	<u>No</u>

Reason: This proposal is intended to increase adoptions of the IgCC by allowing jurisdictions to customize the code so that it may be more acceptable to more of the parties affected. The proposal generally simplifies the code for owners, designers, manufacturers, code officials and elected officials by identifying provisions that may not be suitable in all locations and allowing jurisdictions to opt out of them. All other code sections are considered to be core requirements, suitable for all jurisdictions and critically important in order to be considered a green or sustainable building. The user of Chapter 7 is required to comply with ASHRAE 90.1-2016 which saves more energy than the requirements that many jurisdictions now require. Many of the requirements listed in Table 101.4 for Chapter 7 are beyond those in ASHRAE 90.1 for the same topic.

This proposal is submitted by the ICC Sustainability, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance the IECC, the IgCC and the energy provisions of the IRC. The SEHPCAC held 4 open meetings in 2018. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as interested parties, to discuss and debate the proposed changes. Related documentation and reports are posted on the SEHPCAC website at: <https://www.iccsafe.org-tech-support/codes/code-development-process/sustainability-energy-and-high-performance-code-action-committee-sehpcac>.

Cost Impact: The code change proposal will decrease the cost of construction
Where jurisdictions opt-out of requiring compliance with code sections, construction costs decrease.

Proposal # 5179

GG3-19

GG4-19

IGCC@: 101.4.2 (4.1.1), 101.4.3 (4.1.2), 101.4.4 (4.1.3), 101.4.5 (4.1.4), 102.4, 102.4.1, 102.4.2

Proponent: David Collins, representing SEHPCAC (SEHPCAC@iccsafe.org)

2018 International Green Construction Code

Delete without substitution:

~~101.4.2 (4.1.1) Referenced Standards. The standards referenced in this code and listed in Chapter 11 shall be considered to be part of the requirements of this code to the prescribed extent of such reference. Where differences exist between provisions of this code and a referenced standard, the provisions of this code shall apply. Informative references in Informative Appendix G are cited to acknowledge sources and are not part of this code.~~

~~101.4.3 (4.1.2) Normative Appendices. The normative appendices to this code are considered to be integral parts of the mandatory requirements of this code, which for reasons of convenience are placed apart from all other normative elements.~~

Revise as follows:

~~101.4.4 (4.1.3) Informative Appendices. The informative appendices to this code, and informative notes located within this code, contain additional information and are not mandatory or part of this code.~~

Exceptions:

1. Prescriptive Energy Compliance Option. Where the jurisdiction adopts the International Energy Conservation Code (IECC) based provisions of Appendix H for prescriptive energy compliance and that option is utilized on the building project, compliance with ANSI/ASHRAE/IES Standard 90.1 shall not be required.
2. Residential Compliance Option. Where the jurisdiction adopts the ICC 700 based provisions of Appendix J for residential compliance and that option is utilized on the building project, compliance with other provisions of this code shall not be required.

~~101.4.5 (4.1.4) Referenced Standard Reproduction Annexes. The referenced standard reproduction annexes contain material that is cited in this code but that is contained in another standard. The reference standard reproduction annexes are not part of this code but are included in its publication to facilitate its use.~~

~~102.4 Referenced codes and standards. Where adopted by the authority having jurisdiction, the following codes shall be considered to be part of the requirements of this code: International Building Code, International Code Council Performance Code, International Energy Conservation Code, International Existing Building Code, International Fire Code, International Fuel Gas Code, International Mechanical Code, International Plumbing Code, International Property Maintenance Code, and International Residential Code .~~

~~102.4.1 Conflicting provisions. Where the extent of the reference to a referenced code or standard includes subject matter that is within the scope of this code or the International Codes as adopted by the authority having jurisdiction listed in Section 102.4, the provisions of this code or the International Codes listed in Section 102.4, as applicable, shall take precedence over the provisions in the referenced code or standard.~~

~~102.4.2 Application of referenced standards. The standards referenced in this code and listed in Chapter 11 shall be considered to be part of the requirements of this code to the prescribed extent of such reference. Where differences exist between the provisions of this code and a referenced standard, the provisions of this code shall apply. Informative references in Informative Appendix G are cited to acknowledge sources and are not part of this code.~~

~~Reason: All but the last sentence of Section 101.4.2 was redundant with Section 102.4.2. Therefore, Section 101.4.2 was deleted except that the last sentence of Section 101.4.2 was added to Section 102.4.2.~~

~~Excptions were added to Section 101.4.4 to address the fact that Appendices H (IECC based prescriptive energy compliance) and J (ICC 700 National Green Building Standard based residential compliance), unlike all other informative appendices, are adoptable and are only enforceable where they are adopted, as indicated at the top of the page of each of these appendices. Thus, these informative appendices become part of the code where they are adopted, which is contrary to the charging sentence in Section 101.4.4.~~

This proposal is submitted by the ICC Sustainability, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors in July of 2011 to pursue opportunities to improve and enhance the IECC, the IgCC and the energy provisions of the IRC. The SEHPCAC held 4 open meetings in 2018. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee, as well as interested parties, to discuss and debate the proposed changes. Related documentation and reports are posted on the SEHPCAC website at: <https://www.iccsafe.org-tech-support/codes/code-development-process/sustainability-energy-and-high-performance-code-action-committee-sehpcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This change is administrative/procedural in nature and, therefore, does not affect the cost of construction.

GG5-19

IGCC@: SECTION 106, 106.1

Proponent: David Collins, representing SEHPCAC (SEHPCAC@iccsafe.org)

2018 International Green Construction Code

SECTION 106 PERMITS

Revise as follows:

106.1 Required. Any owner or owner's authorized agent who intends to construct, enlarge, alter, repair, move, demolish, or change the occupancy of a building or structure, or to erect, install, enlarge, alter, repair, remove, convert or replace any energy, electrical, gas, mechanical or plumbing system, the installation of which is regulated by this code, or to cause any such work to be done, shall first make application to the authority having jurisdiction and obtain the required permit under the applicable adopted code (~~Informative Note: e.g., International Building Code~~) or regulation relevant to the intended work. ~~Separate permits shall not be issued under this code.~~ Exemptions from permit requirements shall not be deemed to grant authorization for any work to be done in any manner in violation of the provisions of this code or any other applicable laws, codes or ordinances of this jurisdiction.

Reason: Jurisdictions decide for themselves what type of permits are required and this differs widely from jurisdiction to jurisdiction. There is no reason that the IgCC should be treated differently than any other code in this respect.

This proposal is submitted by the ICC Sustainability, Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance the IECC, the IgCC and the energy provisions of the IRC. The SEHPCAC held 4 open meetings in 2018. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as interested parties, to discuss and debate the proposed changes. Related documentation and reports are posted on the SEHPCAC website at: <https://www.iccsafe.org-tech-support/codes/code-development-process/sustainability-energy-and-high-performance-code-action-committee-sehpcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This change is administrative/procedural in nature and, therefore, does not affect the cost of construction.

Proposal # 5162

GG5-19

IPC Code Change Proposal

The following code change proposals are labeled as Plumbing code change proposals because they are proposals for changes to sections in chapters of the International Plumbing Code that are designated as the responsibility of the IPC Development Committee (see page x of the Introductory pages of this monograph). However the changes included in this Group B code development cycle are to sections of the code that have been prefaced with a [CE], meaning that they are the responsibility of a different IECC Code Development Committee—IECC-Commercial Committee [CE].

The committee assigned for each code change proposal is indicated in a banner statement near the beginning of the proposal.

P1-19

IPC@: [E] 607.5 (New)

Proponent: Craig Dipetrillo, representing self (cjd@dipetrilloproperties.com)

THIS PROPOSAL WILL BE HEARD BY THE IECC RE COMMITTEE. PLEASE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2018 International Plumbing Code

Revise as follows:

[E] 607.5 Insulation of piping. For other than Group R2, R3 and R4 occupancies that are three stories or less in height above grade plane, piping to the inlet of a water heater and piping conveying water heated by a water heater shall be insulated in accordance with Section C404.4 of the International Energy Conservation Code. For Group R2, R3 and R4 occupancies that are three stories or less in height above grade plane, piping to the inlet of a water heater and piping conveying water heated by a water heater shall be insulated in accordance with Section R403.5.3 of the International Energy Conservation Code. Pipe insulation shall be continuous except where the piping passes through a framing member.

Reason: The intent of the proposal is to have consistency where the code requires insulation of water piping "to be continuous" as currently written in C404.5

Testimony:

SUBMITTAL FOR CONTINUOUS INSULATION

For the past 25 years I have been a Commissioner on the Rhode Island Building Code Standards Committee as both a member and chairman. During those years I have been the chairman or member of the Energy, Mechanical and Plumbing Subcommittees. I have been very pleased with the progress of the energy conservation in mechanical and plumbing systems especially relating to insulation of piping. The ICC has clearly recognized the importance of pipe insulation used for hot water conveyance. Over the years ICC has established requirements of insulation of piping and how to install the insulation to achieve maximum energy savings. Specifically, the requirement of continuous insulation through the hangers/supports as addressed in section C404.4 of the IECC. Upon discussions established by Craig DiPetrillo in regards to his findings of inconsistency, and during my research I have noticed that the IMC and IPC have not clearly delineated the continuous insulation (C404.4) requirement. I have asked Craig DiPetrillo to introduce an amendment to Section 607.5 to address this installation methodology.

Sincerely yours,

Gordon W. Preiss P. E., LEED AP

Rhode Island Building Code Standard Committee Commissioner

Westerly R. I. 02891

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The intent of the proposal is only for clarification and consistency of requirements. As such, there is no change in materials or labor to install for where the code currently requires insulation of water piping "to be continuous".

Proposal # 1381

P1-19

2019 GROUP B – PROPOSED CHANGES TO THE INTERNATIONAL RESIDENTIAL CODE - BUILDING

INTERNATIONAL RESIDENTIAL CODE COMMITTEE - BUILDING

David Perry Tyree, PE, CBO, Chair

Regional Manager
American Wood Council
Colorado Springs, CO

Sean DeCrane, Vice Chair

Manager, Industry Relations
Underwriters Laboratories
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Anne M. Anderson, PE, SE

Rep: National Association of Home Builders
Owner, Principal
Green Mountain Structural Engineering
Camas, WA

Paul Armstrong, PE, CBO

Building Official, Palos Verdes Estates CA
HR Green Pacific, Inc.
Corona, CA

Rudolph M. Beuc III, RA, CBO

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Rep: NAHB
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Key Homes LLC
Buckner, KY

Sean P. Farrell, CBO, CZA

Development Project Engineer
Prince William County
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Robert (Bob) Gardner

Building Inspection Supervisor
City of Thornton
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Cole Graveen, PE, SE

Senior Engineer
Raths, Raths & Johnson, Inc.
Willowbrook, IL

Henry J. Kelly, Jr.

Rep: National Association of Home Builders
President/CEO
The Kelly Group Inc.
Island Heights, NJ

Kevin T. McOsker, PE, CBO

Director/Building Official
City of Las Vegas
Las Vegas, NV

Jonathan Sukonik

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Sukonik Building Companies
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Staff Secretariats:

Allan Bilka, RA

Senior Staff Architect
International Code Council
Central Regional Office
Country Club Hills, IL

Kimberly Paarlberg, RA

Senior Staff Architect
Codes and Standards Development
ICC Indiana Field Office
Indiana

TENTATIVE ORDER OF DISCUSSION 2019 PROPOSED CHANGES TO THE INTERNATIONAL RESIDENTIAL CODE –BUILDING

The following is the tentative order in which the proposed changes to the code will be discussed at the public hearings. Proposed changes which impact the same subject have been grouped to permit consideration in consecutive changes.

Proposed change numbers that are indented are those which are being heard out of numerical order. Indentation does not necessarily indicate that one change is related to another. Proposed changes may be grouped for purposes of discussion at the hearing at the discretion of the chair. Note that some RB code change proposals may not be included on this list, as they are being heard by another committee.

ADM9-19 Part IV	RB25-19	RB63-19	EB63-19 Part II
ADM10-19 Part II	G12-19 Part II	RB64-19	EB101-19 Part II
CE17-19 Part II	RB26-19	RB65-19	RB102-19
ADM16-19 Part II	RB27-19	RB66-19	RB103-19
RB1-19	RB28-19	RB67-19	RB104-19
RB2-19	RB29-19	RB68-19	RB105-19
ADM24-19 Part II	RB30-19	RB69-19	RB106-19
ADM46-19 Part II	RB31-19	RB70-19	RB107-19
ADM32-19 Part II	RB32-19	RB71-19	RB108-19
ADM37-19 Part II	RB33-19	RB72-19	RB109-19
ADM38-19 Part II	RB34-19	RB73-19	RB110-19
ADM39-19 Part II	RB35-19	RB74-19	RB111-19
ADM40-19 Part II	RB36-19	RB75-19	RB112-19
ADM41-19 Part II	RB37-19	RB76-19	RB113-19
RB3-19	RB38-19	RB77-19	RB114-19
RB4-19	RB39-19	RB78-19	RB115-19
RB5-19	RB40-19	RB79-19	RB116-19
RB6-19	RB41-19	RB80-19	RB117-19
RB7-19	RB42-19	RB81-19	RB118-19
RB8-19	RB43-19	RB82-19	RB119-19
RB9-19	RB44-19	RB83-19	RB120-19
RB10-19	RB45-19	RB84-19	RB121-19
RB11-19	RB46-19	RB85-19	RB122-19
RB12-19	RB47-19	RB86-19	RB123-19
RB13-19	RB48-19	RB87-19	RB124-19
RB14-19	RB49-19	RB88-19	RB125-19
G4-19 Part II	RB50-19	RB89-19	RB126-19
RB15-19	RB51-19	RB90-19	RB127-19
RB16-19	RB52-19	RB91-19	RB128-19
RB17-19	RB53-19	RB92-19	RB129-19
RB18-19	RB54-19	RB93-19	RB130-19
RB19-19	RB55-19	RB94-19	RB131-19
RB20-19	RB56-19	RB95-19	RB132-19
RB21-19	RB57-19	RB96-19	RB133-19
RE9-19 Part II	RB58-19	RB97-19	RB134-19
RB22-19	RB59-19	RB98-19	RB135-19
ADM5-19 Part II	RB60-19	RB99-19	RB136-19
RB23-19	RB61-19	RB100-19	RB137-19
RB24-19	RB62-19	RB101-19	RB138-19

RB139-19	RB193-19	RB246-19	RB298-19
RB140-19	RB194-19	RB247-19	RB299-19
RB141-19	RB195-19	RB248-19	RB300-19
RB142-19	RB196-19	RB249-19	RB301-19
RB143-19	RB197-19	RB250-19	RB302-19
RB144-19	RB198-19	RB251-19	
RB145-19	S183-19 Part II	RB252-19	
RB146-19	S184-19	RB253-19	
RB147-19	RB199-19	RB254-19	
RB148-19	RB200-19	RB255-19	
S34-19 Part II	RB201-19	RB256-19	
RB149-19	RB202-19	RB257-19	
RB150-19	RB203-19	RB258-19	
RB151-19	RB204-19	RB259-19	
RB152-19	RB205-19	RB260-19	
RB153-19	RB206-19	RB261-19	
RB154-19	RB207-19	RB262-19	
RB155-19	RB208-19	RB263-19	
RB156-19	RB209-19	RB264-19	
RB157-19	RB210-19	RB265-19	
RB158-19	RB211-19	RB266-19	
RB159-19	RB212-19 Part I	RB267-19	
RB160-19	RB213-19	RB268-19	
RB161-19	RB214-19	RB269-19	
RB162-19	RB215-19	RB270-19	
RB163-19	RB216-19	S33-19 Part II	
RB164-19	RB217-19	RB271-19	
RB165-19	RB218-19	RB272-19	
RB166-19	RB219-19	RB273-19	
RB167-19	RB220-19	RB274-19	
RB168-19	RB221-19	RB275-19	
RB169-19	RB222-19	RB276-19	
RB170-19	RB223-19	RB277-19	
RB171-19	RB224-19	RB278-19	
RB172-19	RB225-19	RB279-19	
RB173-19	RB226-19	RB280-19	
RB174-19	RB227-19	RB281-19	
RB175-19	RB228-19	RB282-19	
RB176-19	RB229-19	S34-19 Part II	
RB177-19	RB230-19	RB283-19	
RB178-19	RB231-19	RB284-19	
RB179-19	RB232-19	ADM43-19 Part II	
RB180-19	RB233-19	RB285-19	
RB181-19	RB234-19	RB286-19	
RB182-19	RB235-19	RB287-19	
RB183-19	RB236-19	RB288-19	
RB184-19	RB237-19	RB289-19	
RB185-19	RB238-19	RB290-19	
RB186-19	RB239-19	RB291-19	
RB187-19	RB240-19	RB292-19	
RB188-19	RB241-19	RB293-19	
RB189-19	RB242-19	RB294-19	
RB190-19	RB243-19	RB295-19	
RB191-19	RB244-19	RB296-19	
RB192-19	RB245-19	RB297-19	

RB1-19

IRC®: R104.11, R104.11.1 (New), R104.11.1.1 (New), R104.11.1, R106.3.1.1 (New), 202 (New)

Proponent: Michael Savage, representing Compliance Code Action Committee (CCAC) (ccac@iccsafe.org)

2018 International Residential Code

R104.11 Alternative materials, design and methods of construction and equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code. The *building official* shall have the authority to approve an alternative material, design or method of construction upon application of the owner or the owner's authorized agent. The *building official* shall first find that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety. Compliance with the specific performance-based provisions of the International Codes shall be an alternative to the specific requirements of this code. Where the alternative material, design or method of construction is not *approved*, the *building official* shall respond in writing, stating the reasons why the alternative was not *approved*.

Add new text as follows:

R104.11.1 Research reports. Supporting data, where necessary to assist in the approval of materials or assemblies not specifically provided for in this code, shall consist of valid research reports from *approved sources*.

R104.11.1.1 Approved sources. Agencies conducting product certification or product evaluation shall be accredited by an accreditation body. The scope of accreditation shall include the acceptance criteria referenced in the research report, for the research report to be accepted for product approval.

Revise as follows:

~~R104.11.1~~ R104.11.2 Tests. Where there is insufficient evidence of compliance with the provisions of this code, or evidence that a material or method does not conform to the requirements of this code, or in order to substantiate claims for alternative materials or methods, the *building official* shall have the authority to require tests as evidence of compliance to be made at no expense to the *jurisdiction*. Test methods shall be as specified in this code or by other recognized test standards. In the absence of recognized and accepted test methods, the *building official* shall approve the testing procedures. Tests shall be performed by an *approved* agency. Reports of such tests shall be retained by the *building official* for the period required for retention of public records.

Add new text as follows:

R106.3.1.1 Third-party certification. Products and materials required by the code to be in compliance with a referenced standard shall be *certified* by a *third-party certification agency* as complying with the referenced standards. Products and materials shall bear the identification of the manufacturer and any markings required by the applicable referenced standards.

Add new definition as follows:

ACCREDITATION BODY. An approved, third-party organization that is independent of the grading, product certification and inspection agencies that initially accredit and subsequently monitors agencies conducting

building product certification or evaluation schemes on a continuing basis, including the competency and performance of a grading or inspection agency related to carrying out specific tasks.

Reason: The standard practice in building products conformity assessment involves accreditation of the agencies by an accreditation body such as ISO. Third party testing, manufacturing inspections and product certification or product evaluation provide a higher level of quality assurance on these activities for the building official. Approved sources that issue research reports must be accredited to the specific acceptance criteria referenced in the research report. This ensures that the approved sources have the requisite technical expertise and experience to conduct such activities on behalf of the building official. Harmonized language is proposed for inclusion a new Section R106.3.1.1 regarding third-party certification, and in Chapter 2 with a definition for accreditation body. A definition for Third-Party Certification Agency already exists in the IRC and remains unchanged. The language in the new Section R106.3.1.1 is identical to language in the International Plumbing Code Section 303.4. The added definition is the same as that proposed for inclusion in the International Building Code. These additions will improve the consistency and intent of the I-codes.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal coordinates the codes.

Proposal # 4997

RB1-19

RB2-19

IRC®: R105.2

Proponent: Lee Schwartz, representing Self (lee@hbaofmichigan.com)

2018 International Residential Code

Revise as follows:

R105.2 Work exempt from permit. Exemption from *permit* requirements of this code shall not be deemed to grant authorization for any work to be done in any manner in violation of the provisions of this code or any other laws or ordinances of this *jurisdiction*. *Permits* shall not be required for the following:

Building:

1. One-story detached *accessory structures*, provided that the floor area does not exceed 200 square feet (18.58 m²).
2. Fences ~~not over 7 feet (2134 mm) high~~.
3. Retaining walls that are not over 4 feet (1219 mm) in height measured from the bottom of the footing to the top of the wall, unless supporting a surcharge.
4. Water tanks supported directly upon *grade* if the capacity does not exceed 5,000 gallons (18 927 L) and the ratio of height to diameter or width does not exceed 2 to 1.
5. Sidewalks and driveways.
6. Painting, papering, tiling, carpeting, cabinets, counter tops and similar finish work.
7. Prefabricated swimming pools that are less than 24 inches (610 mm) deep.
8. Swings and other playground equipment.
9. Window awnings supported by an exterior wall that do not project more than 54 inches (1372 mm) from the exterior wall and do not require additional support.
10. Decks not exceeding 200 square feet (18.58 m²) in area, that are not more than 30 inches (762 mm) above *grade* at any point, are not attached to a dwelling and do not serve the exit door required by Section R311.4.

Electrical:

1. *Listed* cord-and-plug connected temporary decorative lighting.
2. Reinstallation of attachment plug receptacles but not the outlets therefor.
3. Replacement of branch circuit overcurrent devices of the required capacity in the same location.
4. Electrical wiring, devices, *appliances*, apparatus or *equipment* operating at less than 25 volts and not capable of supplying more than 50 watts of energy.
5. Minor repair work, including the replacement of lamps or the connection of *approved* portable electrical *equipment* to *approved* permanently installed receptacles.

Gas:

1. Portable heating, cooking or clothes drying *appliances*.
2. Replacement of any minor part that does not alter approval of *equipment* or make such *equipment* unsafe.
3. Portable-fuel-cell *appliances* that are not connected to a fixed piping system and are not interconnected to a power grid.

Mechanical:

1. Portable heating *appliances*.
2. Portable ventilation *appliances*.
3. Portable cooling units.
4. Steam, hot- or chilled-water piping within any heating or cooling *equipment* regulated by this code.
5. Replacement of any minor part that does not alter approval of *equipment* or make such *equipment* unsafe.
6. Portable evaporative coolers.
7. Self-contained refrigeration systems containing 10 pounds (4.54 kg) or less of refrigerant or that are actuated by motors of 1 horsepower (746 W) or less.
8. Portable-fuel-cell *appliances* that are not connected to a fixed piping system and are not interconnected to a power grid.

Plumbing:

1. The stopping of leaks in drains, water, soil, waste or vent pipe; provided, however, that if any concealed trap, drainpipe, water, soil, waste or vent pipe becomes defective and it becomes necessary to remove and replace the same with new material, such work shall be considered as new work and a *permit* shall be obtained and inspection made as provided in this code.
2. The clearing of stoppages or the repairing of leaks in pipes, valves or fixtures, and the removal and reinstallation of water closets, provided such repairs do not involve or require the replacement or rearrangement of valves, pipes or fixtures.

Reason: The International Residential Code contains no definition of “fence”, no listing of “fence” in the index and no sections or subsections specifically governing the material, design or method of construction for a fence. In short there are no specific code requirements for fences found in the International Residential Code. This leaves permit applicants to searching in vain thorough the entire IRC to find requirements for the construction of a fence when none exist. It also places inspectors in the unenivable position of having to inspect fences for which a permit was pulled without any criteria for approving the fence construction. How can a building official write a violation notice when there are no pertinent requirements to base the notice on?

While the IRC does contain an exemption for fences not over 7 feet high. This is an arbitrary number chosen for convenience and without without any data to back it up. Is a fence that is 7 feet two inches inherently more dangerous to the publis health, safety and general welfare than a fence that is 6 feet 11 1/2 inches?

The purpose of the code is to establish minimum requirements to safeguard the public safety, health and general welfare. Mandating the issuance of a construction permit for fences when no minimum requirements are specifically present in the code book does not safeguard the public safety, health and general welfare.

Requiring a permit for a fence, even with the under seven feet exeption, simply because the code states you must have a permit aqnd without any standards is exactly the type of overreach which leads to people not pulling permits on other, more critical, construction.

In most jurisdictions, requirements for fences have been treated as a zoning issue with zoning ordinances controlling the size, type, materials and manner of construction for a fence. The requirment for a fence permit should be totally removed from the IRC and left to local zoning.

Cost Impact: The code change proposal will decrease the cost of construction

by eliminating an unnecessary permit and the fee for that permit.

Proposal # 4677

RB2-19

RB3-19

IRC@: [RB] 202

Proponent: Donald Sivigny, representing State of MN and Association of Minnesota Building Officials
(don.sivigny@state.mn.us)

2018 International Residential Code

Revise as follows:

[RB] APPROVED AGENCY. An established and recognized agency that is regularly engaged in conducting tests, furnishing inspection services or furnishing product certification, and has been *approved* by the building official. ~~For the definition applicable in Chapter 11, see Section N1101.6.~~

Reason: This change removes the language that sends the user to chapter 11 and section 1101.6 of the document to find the definition of *Approved Agency* because, Section N1101.6 does not include the definition of *Approved Agency*. Also there is no need to add or repeat the definition in chapter 11 of the IRC as long as it is defined in Chapter 2 of the same IRC. This will save on printing costs as well as save energy.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The code change proposal will not increase the cost of construction.

Proposal # 5378

RB3-19

RB4-19

IRC@: [RB] 202

Proponent: Donald Sivigny, representing State of MN and Association of Minnesota Building Officials
(don.sivigny@state.mn.us)

2018 International Residential Code

Revise as follows:

[RB] BUILDING. ~~Any one- or two-family dwelling or portion thereof, including townhouses, structure used or intended to be used for human habitation, for living, sleeping, cooking or eating purposes, or any combination thereof, or any accessory structure. For the definition applicable in Chapter 11, see Section N1101.6. for supporting or sheltering any use or occupancy, including any mechanical HVAC systems, service water heating systems and electric power and lighting systems located on the building site and supporting the building.~~

Reason: The definition provided for “Building” is currently the definition used for “Dwelling” and “Dwelling Unit” in the IRC. The proposed language is the same used in the IRC Chapter 11 definitions and in the IECC Residential and Commercial codes IECC Energy Code definitions, and is in line with other ICC code documents including the IMC and IFGC. It is important to maintain a consistent definition of “Building” throughout the codes. There is no need to repeat the definition in the IRC, Chapter 11 since Chapter 2 definitions apply to the entire IRC

Cost Impact: The code change proposal will not increase or decrease the cost of construction
There will be no cost impact with this change

Proposal # 5384

RB4-19

RB5-19

IRC®: 202 (New)

Proponent: Steven Mickley, representing American Institute of Building Design (steve.mickley@aibd.org)

2018 International Residential Code

Add new definition as follows:

BUILDING DESIGNER. The owner of the building or the person that contracts with the owner for the design of the building structural system or who is responsible for the preparation of the construction documents. Where required by the statutes of the jurisdiction in which the project is to be constructed, the building designer shall be a registered design professional.

Reason: The title "building designer" is currently used twice within the IRC, in Section R502.11.4 and Section R802.10.1. In each of the two sections, "building designer" refers to a person who is qualified and responsible for designing the size, connections, and anchorage of the permanent continuous lateral bracing. Therefore, a definition of the title providing the qualifications of the individual is necessary.

Furthermore, nearly every State allows for individuals other than "registered design professionals" to prepare construction drawings for those buildings covered under the scope of the IRC. Therefore, it is essential to the correct interpretation of the code that the title "building designer" is clarified by definition to avoid potential confusion and misinterpretation of the actual qualifications and prerequisites required of those individuals given the responsibility to design one- and two-family dwellings and townhouses.

Standard ANSI/TPI 1 includes a definition of "building designer" and this proposal largely mirrors the ANSI/TPI 1 definition with a small deviation to remain consistent with verbiage in Section R106.1.

Standard ANSI/TPI 1 is a nationally developed consensus standard referenced by the IRC. Therefore, it makes logical sense to include the currently accepted definition of "building designer" for clarity, for consistency, and to avoid referencing two separate documents for the same information.

References:

"ANSI/TPI 1, 2.2 Definitions:

***Building Designer:** The owner of the building or the Person that contracts with the Owner for the design of the Building Structural System and/or who is responsible for the preparation of the Construction Documents. When mandated by the Legal Requirements, the Building Designer shall be a Registered Design Professional."*

"Section R106.1 Submittal Documents

...The construction documents shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed..."

"R502.11.4 Truss design drawings.

*11. Maximum axial compression forces in the truss members to enable the **building designer** to design the size, connections and anchorage of the permanent continuous lateral bracing. Forces shall be shown on the truss drawing or on supplemental documents."*

"R802.10.1 Truss design drawings.

*11. Maximum axial compression forces in the truss members to enable the **building designer** to design the size, connections and anchorage of the permanent continuous lateral bracing. Forces shall be shown on the truss design drawing or on supplemental documents."*

Bibliography: ANSI/TPI 1 - 2014, August 27, 2014, Truss Plate Institute, Alexandria, VA

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal does not change the current practice of building design, or who is qualified to perform the task.

Proposal # 5223

RB5-19

RB6-19

IRC@: [RB] 202

Proponent: Donald Sivigny, representing State of MN and Association of Minnesota Building Officials
(don.sivigny@state.mn.us)

2018 International Residential Code

Revise as follows:

[RB] BUILDING CODE OFFICIAL. The officer or other designated authority charged with the administration and enforcement of this code, or a duly authorized representative. ~~For the definition applicable in Chapter 11, see Section N1101.6.~~

Reason: Using the term “Building Official”, implies the code official is responsible for enforcement of only the building, does not include the building site, associated systems, and equipment. The term “Code Official” used in the IMC, IFGC, IECC Residential and Commercial codes, rather than “Building Official”; will create greater consistency with the IRC. *This will also remove the language that sends one to chapter 11 and section N1101.6.*

Cost Impact: The code change proposal will not increase or decrease the cost of construction
No Cost will be added with this change

Proposal # 5383

RB6-19

RB7-19

IRC@: [RB] 202

Proponent: Lucas Pump, representing Self (l.pump@cedar-rapids.org)

2018 International Residential Code

Revise as follows:

[RB] CRAWL SPACE. An unfinished underfloor space that is not a basement.

Reason: The current definition for "crawl space" is too broad. According to the current definition, I could walk into the main level of a 2-story house, and stand in the living room, and I could call that area a "crawl space". I would be under the floor of the second floor, and not in a basement, but I believe that we could all agree that this 1st floor is not a "crawl space". So, adding this additional language helps define the space better.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is just clarification of the definition, and should not have a cost impact.

Proposal # 4712

RB7-19

RB8-19

IRC®: [RB] 202 (New); IEBC®: 202

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

[RB] EMERGENCY ESCAPE AND RESCUE OPENING. An operable exterior window, door or other similar device that provides for a means of escape and access for rescue in the event of an emergency. (See also ~~“Grade-“Grade floor opening.” opening.”~~)

2018 International Existing Building Code

Add new definition as follows:

EMERGENCY ESCAPE AND RESCUE OPENING. An operable exterior window, door or other similar device that provides for a means of escape and access for rescue in the event of an emergency.

Reason: The intent of this proposal is to coordinate the definitions for emergency escape and rescue openings between IBC, IRC, IEBC, IPMC, IFC. This change was approved as part of Group A for IBC, IFC, IPMC as G5-18 Part 1 and 2(AS/AM).

This is a series of proposal to coordinate the requirements for emergency escape and rescue openings in the IBC and IRC. While independent issues, if all the proposals are approved, the IRC section would appear as indicated below. Other related changes will refer back to the definition for this information.

This is what the EERO requirements would look like if all of the proposals are approved.

SECTION R310

EMERGENCY ESCAPE AND RESCUE OPENINGS

R310.1 General. Emergency escape and rescue openings shall comply with the requirements of this section.

R310.2 Where required. *Basements, habitable attics* and ~~every~~ sleeping rooms shall have no fewer than one emergency escape and rescue opening in accordance with this section. Where *basements* contain one or more sleeping rooms, an emergency escape and rescue opening shall be required in each sleeping room, but shall not be required in adjoining areas of the *basement*. Such openings shall open directly into a public way, or to a *yard* or court that opens to a public way.

Exceptions:

1. *Basements* with a ceiling height of less than 80 inches (2032 mm) shall not be required to have *emergency escape and rescue openings*.
2. Emergency escape and rescue openings are not required from basements or sleeping rooms that have an

exit door or exit access door that opens directly into a public way or to a yard, court or exterior egress balcony that opens to a public way.

3. Basements used only to house mechanical equipment and not exceeding a total floor area of 200 square feet (18.58 m²) shall not be required to have emergency escape and rescue openings.

4. Storm shelters are not required to comply with this section where the shelter is constructed in accordance with ICC 500.

5. Where the *dwelling* or *townhouse* is equipped with an automatic sprinkler system installed in accordance with Section P2904, sleeping rooms in *basements* shall not be required to have emergency escape and rescue openings provided that the *basement* has one of the following:

5.1. One means of egress complying with Section R311 and one emergency escape and rescue opening.

5.2. Two means of egress complying with Section R311.

R310.2.1 Operational constraints and opening control devices. Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys or tools. Window opening control devices and fall prevention devices complying with ASTM F2090 shall be permitted for use on windows serving as a required emergency escape and rescue opening.

R310.3 Emergency escape and rescue openings. Emergency escape and rescue openings shall have minimum dimensions in accordance with Section R310.3.1 through R310.3.3.

R310.3.1 Minimum size. Emergency and escape rescue openings shall have a net clear opening of not less than 5.7 square feet (0.530 m²).

Exception: The minimum net clear opening for grade-floor emergency escape and rescue openings shall be 5 square feet (0.465 m²).

R310.3.2 Minimum dimensions. The minimum net clear opening height dimension shall be 24 inches (610 mm). The minimum net clear opening width dimension shall be 20 inches (508 mm). The net clear opening dimensions shall be the result of normal operation of the opening.

R310.3.3 Maximum height from floor. Emergency escape and rescue openings, it shall have the bottom of the clear opening not greater than 44 inches (1118 mm) above the floor.

R310.4 Emergency escape and rescue doors. Where a door is provided as the required emergency escape and rescue opening, it shall be a swinging door or a sliding door.

R310.5 Area wells. An emergency escape and rescue opening with the bottom of the clear opening below the adjacent grade shall be provided with an area well in accordance with Sections R310.5.1 through R310.5.4.

R310.5.1 Minimum size. The horizontal area of the area well shall be not less than 9 square feet (0.9 m²), with a horizontal projection and width of not less than 36 inches (914 mm). The area well shall allow the emergency escape and rescue opening to be fully opened.

Exception: The ladder or steps required by Section R310.5.2.1 shall be permitted to encroach not more than 6 inches (152 mm) into the required dimensions of the area well.

R310.5.2 Ladder and steps. Area wells with a vertical depth greater than 44 inches (1118 mm) shall be equipped with an approved permanently affixed ladder or steps. The ladder or steps shall not be obstructed by the emergency escape and rescue opening when the window or door is in the open position. Ladders or steps required by this section shall not be required to comply with Section R311.7.

R310.5.2.1 Ladders. Ladders or rungs shall have an inside width of at least 12 inches (305 mm), shall project at least 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center (o.c.) vertically for the full height of the area well.

R310.5.2.2 Steps. Steps shall have an inside width of at least 12 inches (305 mm), shall have minimum treads depth of 5 inches (127 mm) and a maximum riser height of 18 inches (457 mm) for the full height of the area well.

R310.5.3 Drainage. Area wells shall be designed for proper drainage by connecting to the building's foundation drainage system required by Section R405.1.

Exception: A drainage system for area wells is not required where the foundation is on well-drained soil or sand gravel mixture soils in accordance with the United Soil Classification System, Group I Soils, as detailed in Table R405.1.

R310.5.4 Bars, grilles, covers and screens. Where bars, grilles, covers, screens or similar devices are placed over emergency escape and rescue openings, bulkhead enclosures, or area wells that serve such openings, the minimum net clear opening size shall comply with Sections R310.2 through R310.2.2 and R310.4.1. Such devices shall be releasable or removable from the inside without the use of a key or tool or force greater than that required for the normal operation of the escape and rescue opening.

R310.6 Emergency escape and rescue openings under decks and porches. Emergency escape and rescue openings installed under decks and porches shall be fully operable and provide a path not less than 36 inches (914 mm) in height to a yard or court.

R310.7 Replacement windows for emergency escape and rescue openings. Replacement windows installed in buildings meeting the scope of this code shall be exempt from Section R310.2 and R310.4, provided that the replacement window meets the following conditions:

1. The replacement window is the manufacturer's largest standard size window that will fit within the existing frame or existing rough opening. The replacement window is of the same operating style as the existing window or a style that provides for an equal or greater window opening area than the existing window.

2. Where the replacement window is not part of a change of occupancy.

R310.8 Dwelling additions. Where *dwelling additions* contain sleeping rooms, an emergency escape and rescue opening shall be provided in each new sleeping room. Where *dwelling additions* have *basements*, an emergency escape and rescue opening shall be provided in the new *basement*.

Exceptions:

1. An emergency escape and rescue opening is not required in a new *basement* that contains a sleeping room with an emergency escape and rescue opening.

2. An emergency escape and rescue opening is not required in a new *basement* where there is an emergency escape and rescue opening in an existing *basement* that is *accessed* from the new *basement*.

3. An operable window complying with Section 310.9.1 shall be acceptable as an emergency escape and rescue opening.

R310.9 Alterations or repairs of existing basements. New sleeping rooms created in an existing *basement* shall be provided with emergency escape and rescue openings in accordance with Section R310.1. Other than new sleeping rooms, where existing *basements* undergo alterations or repairs an emergency escape and rescue opening is not required.

Exception: An operable window complying with Section 310.9.1 shall be acceptable as an emergency escape and rescue opening.

R310.9.1 Existing Emergency escape and rescue openings. Where a change of occupancy would require emergency escape and rescue opening in accordance with Section R310.1, operable windows serving as the emergency escape and rescue opening shall comply with the following:

1. An existing operable window shall provide a minimum net clear opening of 4 square feet (0.38 m²) with a minimum net clear opening height of 22 inches (559 mm) and a minimum net clear opening width of 20 inches (508 mm).

2. A replacement window where such window complies with both of the following:

2.1 The replacement window meets the size requirements in Item 1.

2.2 The replacement window is the manufacturer's largest standard size window that will fit within the existing frame or existing rough opening. The replacement window shall be permitted to be of the same operating style as the existing window or a style that provides for an equal or greater window opening area than the existing window.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal is editorial.

Proposal # 4141

RB8-19

RB9-19

IRC®: [RB] 202

Proponent: Marcelo M Hirschler, GBH International, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Revise as follows:

[RB] FIRE-RETARDANT-TREATED WOOD. ~~Pressure-treated lumber and plywood that~~ Wood products that, when impregnated with chemicals by a pressure process or other means during manufacture, exhibit reduced surface burning characteristics and resist propagation of fire.

Reason: The definition of fire retardant treated wood is being copied from the IBC, for consistency within ICC codes. Also, the existing definition states that fire retardant treated wood (FRTW) is pressure treated but the sub definitions (and the section on FRTW in chapter 8) point out that it can be made by pressure treatment or other means during manufacture.

The sub definitions of "other means during manufacture" and "pressure process" are being slightly revised for two reasons: to clarify that impregnation with a fire retardant formulation is the essential issue and to make them parallel to each other.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This corrects the definition and makes it consistent with the IBC.

Proposal # 4352

RB9-19

RB10-19

IRC@: [RB] 202

Proponent: Thomas Meyers, representing Self (codeconsultant@gmail.com)

2018 International Residential Code

Revise as follows:

[RB] FIRE SEPARATION DISTANCE. The distance measured from the building face to one of the following:

1. To the closest interior *lot line*.
2. To the centerline of a street, an alley or public way.
3. ~~To an imaginary line between two buildings on the lot.~~

The distance shall be measured at a right angle from the face of the wall.

Reason: The definition for fire separation distance is identical to that in the IBC. Unlike the IBC, the IRC does not have a requirement to use an “imaginary line” for fire separation distance assessment. It’s retention in the definition creates confusion and should therefore be eliminated.

Cost Impact: The code change proposal will decrease the cost of construction. Elimination of unnecessary and confusing language may result in cost reductions where the imaginary line was erroneously applied.

Proposal # 5643

RB10-19

RB11-19

IRC®: (New)

Proponent: Donald Sivigny, representing State of MN and Association of Minnesota Building Officials
(don.sivigny@state.mn.us)

2018 International Residential Code

Add new definition as follows:

[RB] Flashing. A non-corrosive, water-resistant material, installed to resist water entry, and direct water away from or out of the building assembly.

Reason: There is a need to prevent water from seeping in and causing damage to the home's walls, ceilings and other assemblies. This water is causing structural damage to the home, or creating moisture and mold problems throughout the home. This form of protection is a necessary construction practice, and it's widely applied to commercial, residential and industrial structures within the industry. Therefore, there is a need to define flashing

Cost Impact: The code change proposal will not increase or decrease the cost of construction
There is no Cost Impact with this Change

Proposal # 5386

RB11-19

RB12-19

IRC®: (New)

Proponent: Donald Sivigny, representing State of MN and Association of Minnesota Building Officials
(don.sivigny@state.mn.us)

2018 International Residential Code

Add new definition as follows:

[RB] FLOOR AREA. The calculated square footage of the floor within the inside perimeter of the exterior walls of the building under construction, without deduction for hallways, stairways, closets, the thickness of interior walls, columns or other features

Reason: The definition for “floor area” is added because that term is not defined by the 2018 IRC and it is necessary to establish uniform application of the Building Code. The proposed definition of “floor area” will be consistent with the definition of “floor area” as used in the 2018 IBC. It is therefore reasonable to add the definition of “floor area” to the proposed code to encourage uniform enforcement of the code.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
There is no Cost Impact with this change

Proposal # 5387

RB12-19

RB13-19

IRC@: [RB] 202

Proponent: Donald Sivigny, representing State of MN and Association of Minnesota Building Officials
(don.sivigny@state.mn.us)

2018 International Residential Code

Revise as follows:

[RB] GRADE FLOOR OPENING. A window or other opening located such that the ~~sill height~~ bottom of the clear opening is not more than 44 inches (1118 mm) above or below the finished ground level adjacent to the opening. (See also “Emergency escape and rescue opening.”)

Reason: The rationale for the code change stems from the inconsistent interpretation of the word “sill” in the industry, and also to give a clearer more uniform benchmark for where the height requirements in Sections R310 and R312 are measured to

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The code change proposal will not increase the cost of construction as it is simply creating a clearer definition of what the terminology "Grade Floor Opening" means. In fact it may decrease cost of construction from delays that are created when a code corection is written that slows down or stops construction. Time is money on a jobsite, and the delay of one day typically changes the construction Schedule which costs the builder Money.

Proposal # 5370

RB13-19

RB14-19

IRC@: [RB] 202 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

[RB] GRADE FLOOR EMERGENCY ESCAPE AND RESCUE OPENING. ~~A window or other~~ An emergency and escape and rescue opening located such that the ~~sill~~ height of the bottom of the clear opening is not more than 44 inches (1118 mm) above or below the finished ground level adjacent to the opening. (See also “Emergency escape and rescue opening.”)

Reason: This definition is used only in Section IRC R310.2.1. The change to the definition is so it matches how it will be used in the technical criteria. What is a ‘sill’ is not clear – the modification is for consistency with technical criteria. It is important to indicate that this is to the bottom of the opening (otherwise a below grade window could be very deep). See also revisions to IRC R310.2.1. There was a similar proposal approved for Group A for IBC - G4-18(AS).

This is one of a series of proposals to coordinate the requirements for emergency escape and rescue openings in the IBC and IRC. While independent issues, if all the proposals are approved, the IRC section would appear as indicated in the reason for the proposal to revise the definition – emergency escape and rescue openings.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is a coordination item for requirements for EEROs already permitted between the codes.

Proposal # 4142

RB14-19

RB15-19

IRC®: [RB]

Proponent: Marcelo Hirschler, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Revise as follows:

[RB] INSULATING SHEATHING. ~~An insulating board~~ A rigid panel or board insulation material having a thermal resistance of not less than R-2 of the core material with properties suitable for use on walls, floors, roofs, or foundations.

For the definition applicable in Chapter 11, see Section N1101.6.

Reason: This change simply applies to the definition of insulating sheathing. The recent IBC G proposal G6 accepted as submitted the IBC definition, with the revised wording proposed here and consistency within ICC definitions is important.

Proposed definition will read:

A rigid panel or board insulation material having a thermal resistance of not less than R-2 of the core material with properties suitable for use on walls, floors, roofs, or foundations.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Change in definition only.

Proposal # 5786

RB15-19

RB16-19

IRC: R202

Proponent: John Woestman, representing Extruded Polystyrene Foam Association
(jwoestman@kellencompany.com)

2018 International Residential Code

SECTION R202 DEFINITIONS

Revise as follows:

[RB] INSULATING SHEATHING. ~~An insulating board~~ A rigid panel or board insulation material having a thermal resistance of not less than R-2 of the core material with properties suitable for use on walls, floors, roofs, or foundations.

Reason: This proposal for the IRC coordinates with G6-18 approved "As Submitted" during the 2018 ICC code development cycle for the 2021 IBC. This proposes the same definition for Insulating Sheathing for the IRC. Within the IRC, the term "insulating sheathing" is only in Chapter 7.

The proposal improves the definition to better fit context of use of this term and material in the IRC (and IBC). For example, the term "rigid panel" is added to recognize composite assemblies that are not homogenous. The clarification of use in walls, floors, roofs, and foundations reflects common use of foam plastic insulating sheathing materials.

Although the first printing of the IRC had this term in Chapter 11, ICC Staff has indicated that the presence of term in Section N1106.2 and in the IEEC-RE Chapter 2 is errata. The term is not used in the code language and therefore should have been removed editorially before publication.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposed definition revision adds adds clarity to the meaning of the code and as such, is only editorial in nature.

Proposal # 5186

RB16-19

RB17-19

IRC@: [RB] 202

Proponent: Samuel Steele, representing Seattle Department of Construction and Inspection (SDCI)
(samuel.steele@seattle.gov)

2018 International Residential Code

Revise as follows:

[RB] LOT. A measured portion or parcel of land considered as a unit having fixed boundaries.

[RB] LOT LINE. ~~A line dividing one lot from another, or from a street or any public place.~~ The line that bounds a plot of ground described as a lot in the title to the property.

Reason: The current definitions lack information on what distinguishes a lot or parcel as a unit. A lot or parcel must be measured, have fixed boundaries, and be tied to the title of the property. Code enforcement officials work with these definitions on every project. Therefore, the definition of them needs to be clear and consistent for identifying lots and parcels of land.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is simply a clarification of current definitions to assist with enforcement in the field. It will not have a cost impact.

Proposal # 4345

RB17-19

RB18-19

IRC@: [RB]

Proponent: Marcelo Hirschler, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

[RB] NONCOMBUSTIBLE MATERIAL. ~~Materials~~ Material that ~~pass~~ passes the test procedure for defining noncombustibility of elementary requirements for noncombustible materials set forth in ASTM E136.

Reason: This proposal simply addresses the definition of noncombustible materials. The recent set of proposals in the IBC (FS2 and FS3) made it clear that ASTM E136 (and the code) applies to materials that are noncombustible materials and are not elementary materials (since elementary materials are only those contained in the periodic table of elements). For example, neither steel nor cement are elementary materials but they are noncombustible materials. Thus, any material that passes the criteria set forth in ASTM E136 is considered a noncombustible material. ASTM E136 does not apply to laminated or coated materials. The proposed definition will read:

[RB] NONCOMBUSTIBLE MATERIAL. Material that passes the requirements for noncombustible materials set forth in ASTM E136.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This simply changes an incorrect definition.

Proposal # 5815

RB18-19

RB19-19

IRC@: [RB] 202

Proponent: Tim Earl, representing GBH International (tearl@gbhinternational.com)

2018 International Residential Code

Revise as follows:

[RB] NONCOMBUSTIBLE MATERIAL. ~~Materials that pass the test procedure for defining noncombustibility of elementary materials set forth in~~ A material that passes ASTM E136.

Reason: The current definition is incorrect in two ways:

The term "elementary materials" is misused here and was removed from ASTM E136 in 1973, and from the IBC during the 2018 Group A revision process.

There is no "test procedure for defining noncombustibility" in E136. Materials are simply reported as having passed E136. It is the codes which declare materials that pass E136 to be noncombustible.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This change simply corrects a definition which contains some technical flaws, so it will have no effect on construction costs.

Proposal # 4032

RB19-19

RB20-19

IRC®: (New)

Proponent: Donald Sivigny, State of Minnesota, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Residential Code

Add new definition as follows:

PORCH. An open, screened, or glazed, one story portion of a building that is separated by a thermal envelope, and has a space conditioning system exceeding 3.4 Btus or 1 watt of energy use at peak operation, or that is capable of being shut off without shutting off the space conditioning system to other areas of the building.

Reason: *There is no industry standard language as to what a porch is defined as. Many times a deck becomes a porch and then actually becomes conditioned space. The code does define decks and conditioned spaces but not a porch. Therefor there is a need for a definition of what a porch actually is. This language is very similar to the same language used to define a sunroom, in the code with some modifications*

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The code change proposal will not increase the cost of construction and may actually decrease the costs because it creates a consistent definition of what a porch is, no longer do the code official and builder need to guess how it is going to be permitted, defined and built or what are the code requirements that need to be met.

Proposal # 5372

RB20-19

RB21-19

IRC@: [RB]

Proponent: Marcelo Hirschler, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

[RB] ROOF ASSEMBLY. A system designed to provide weather protection and resistance to design loads. The system consists of a roof covering and roof deck or a single component serving as both the roof covering and the roof deck. A roof assembly ~~includes the roof deck, underlayment and roof covering, and can also include a~~ can include an underlayment, thermal barrier, ignition barrier, insulation or a vapor retarder. For the definition applicable in Chapter 11, see Section N1101.6.

Reason: This proposal simply revises the definition of roof assembly. The recent action on WUI proposal WUIC 1 added into the IWUIC a definition based on the IBC definition of roof assembly and it is being proposed here as a revision, for consistency among ICC definitions. Furthermore this definition is more accurate since not all roof assemblies will include an underlayment and the sentence already states that it does include a roof deck and, therefore, stating that it "can include a roof deck" is not correct. The proposed definition reads as follows:

[RB] ROOF ASSEMBLY. A system designed to provide weather protection and resistance to design loads. The system consists of a roof covering and roof deck or a single component serving as both the roof covering and the roof deck. A roof assembly includes the roof deck, underlayment and roof covering, and can also include a can include an underlayment, thermal barrier, ignition barrier, insulation or a vapor retarder. For the definition applicable in Chapter 11, see Section N1101.6.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Definition change only.

Proposal # 5814

RB21-19

RB22-19

IRC@: [RB] 202

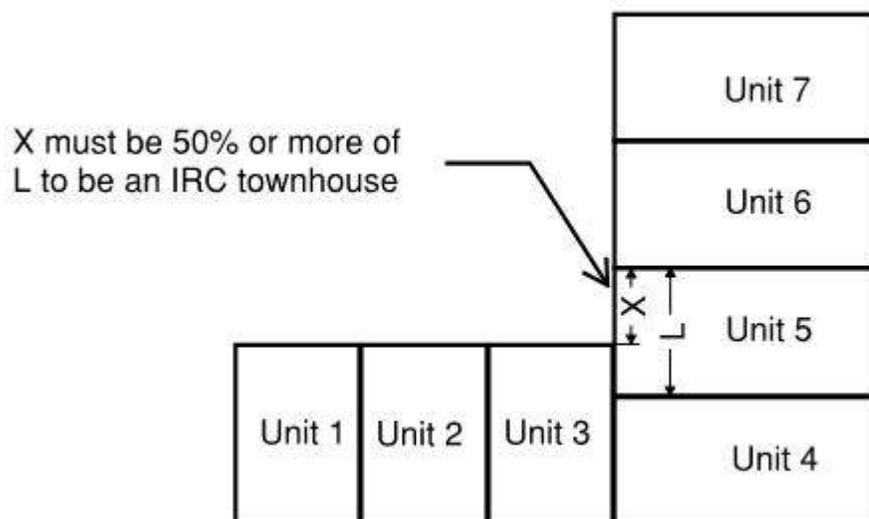
Proponent: David Renn, PE, SE, City and County of Denver, representing Code Change Committee of Colorado Chapter of ICC (david.renn@denvergov.org)

2018 International Residential Code

Revise as follows:

[RB] TOWNHOUSE. A single-family dwelling unit constructed in a group of three or more attached units in which each unit extends from foundation to roof and ~~with~~ has a yard or public way on not less than two sides that extends at least 50 percent of the length of each of these two sides.

Reason: The definition of "townhouse" requires a yard or public way on not less than two sides, which is intended to provide some degree of independence from the other townhouse units in a building; however, the definition does not dictate the length required for the yard or public way. This proposal requires a minimum of 50% of the length of a side to have a yard or public way, which is a reasonable amount to provide the degree of independence intended and to provide fire department access. There is a need for this requirement as configurations of townhouses can create situations with a side that has a relatively small proportion of the wall length that has a yard or public way; for example, townhouses that are configured around the corner of a townhouse building per the drawing below.



Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal provides a clarification to the current code requirements so it should not increase or decrease the cost of construction.

Proposal # 4158

RB22-19

RB23-19

IRC@: [RB] 202

Proponent: Craig Conner, representing self (craig.conner@mac.com); Joseph Lstiburek, representing self (joe@buildingsscience.com)

2018 International Residential Code

Revise as follows:

[RB] VAPOR DIFFUSION PORT. ~~A passageway for conveying~~ An assembly constructed or installed within a roof assembly at an opening in the roof deck to convey water vapor from an unvented *attic* to the outside atmosphere.

Reason: Objective: Provide consistency with IBC and improve clarity
This code change provides consistency with the IBC and improves clarity.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This provides consistency with the IBC and provides an improved definition. It does not change costs.

Proposal # 5432

RB23-19

RB24-19

IRC@: [RB] 202

Proponent: Craig Conner, representing self (craig.conner@mac.com); Joseph Lstiburek, representing self (joe@building-science.com)

2018 International Residential Code

Revise as follows:

[RB] VAPOR PERMEABLE. The property of having a moisture vapor permeance rating of 5 perms (2.9×10^{-10} kg/Pa • s • m²) or greater, where tested in accordance with ~~the desiccant method using Procedure A or Procedure B~~ of ASTM E96. A vapor permeable material permits the passage of moisture vapor.

Reason: Objective: Define vapor permeable as 5 perms or greater using Procedure A or B

Action: Amend IRC in Cycle B with same language submitter in Cycle A for IBC

Relying on only Procedure A is inaccurate and misleading. The existing code language limits the use of newer materials and systems such as "smart" materials that can be "tuned" to address moisture control issues in different climate zones. The existing definition applied to asphalt felts and Type D coated papers and dates back over a half a century. For Type D papers the original Federal Specification UUP-147 was issued in 1948. The technical rationale for this change can be found in the following link:

<https://building-science.com/documents/building-science-insights/bsi-099-its-all-relative>

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This adds a test procedure that is more appropriate for some products.

Proposal # 5404

RB24-19

RB25-19

IRC®: (New)

Proponent: Donald Sivigny, representing State of MN and Association of Minnesota Building Officials
(don.sivigny@state.mn.us)

2018 International Residential Code

Add new definition as follows:

WATERPROOFING. Treatment of a surface or structure that bridges nonstructural cracks, and is designed to resist the passage of water under hydrostatic pressure or through capillary action, which may penetrate the building assembly.

Reason: Damproofing in Section R406.1 is no longer commonly used in the code knowledgeable industry, as it is not an effective way to keep the buildings below grade foundation system, dry, durable and free from moisture and mold issues affecting homes and homeowners today. The typical damproofing, system will require additional steps such as parging, or other materials be applied to the foundation wall prior to the application of the damproofing product. This adds additional costs in materials and labor for the builder. This cost is passed along to the consumer. Knowledgeable builders of today understand the benefits of waterproofing and the overall cost savings in initial costs, and the reduction in costs associated with call backs and repairs of wet foundation systems. Therefore it is necessary to define waterproofing

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code change proposal will not increase the cost of construction as it is simply correcting the definition for clarity reasons. In fact this clarity may even reduce the costs of the code from delays that happen when code corrections are written for a specific job or building by more clearly defining what the code means by, Waterproofing . These delays caused by code corrections costs the builders money.

Proposal # 5392

RB25-19

RB26-19

IRC@: 202 (New), (New)

Proponent: Donald Sivigny, representing State of MN and Association of Minnesota Building Officials
(don.sivigny@state.mn.us)

2018 International Residential Code

Add new definition as follows:

202 Definitions. Window Clear Opening Height: The lowest part of the window opening of an operable window measured from the interior floor below.

WINDOW CLEAR OPENING HEIGHT. The lowest part of the window opening of an operable window measured from the interior floor below.

Reason: There is a need to define what window clear opening height is and where it is measured as referenced in the IRC Sections on Emergency Escape and Rescue and Window Fall Protection. This definition is necessary to clarify confusion about where the sill height is measured. The incorporation of this definition into the code is necessary to provide uniformity of construction, inspection and enforcement of the requirements within the code

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The code change proposal will not increase the cost of construction as it is simply correcting the definition for clarity reasons. In fact this clarity may even reduce the costs of the code from delays that happen when code corrections are written for a specific job or building by more clearly defining what the code means by, Window Clear Opening . These delays caused by code corrections costs the builders money.

Proposal # 5393

RB26-19

RB27-19

IRC®: (New), R301.1.1, 44 ASABE (New), ASABE (New)

Proponent: Andy Williams, Association Management Center (afwilliams@Connect2amc.com)

2018 International Residential Code

Add new definition as follows:

POST FRAME BUILDING SYSTEM. A building system characterized by primary structural frames of wood posts as columns to support floors and trusses or rafters as roof framing. Roof framing is attached to the posts, either directly or indirectly through girders. Posts are embedded in the soil and supported on isolated footings, or are attached to the top of piers, concrete or masonry walls, or slabs-on-grade. Secondary framing members, purlins in the roof and girts in the walls, are attached to the primary members to provide lateral support and to transfer sheathing loads, both in-plane and out-of-plane, to the posts and roof framing.

R301.1.1 Alternative provisions. As an alternative to the requirements in Section R301.1, the following standards are permitted subject to the limitations of this code and the limitations therein. Where engineered design is used in conjunction with these standards, the design shall comply with the International Building Code

1. *AWC Wood Frame Construction Manual (WFCM).*
2. *AISI Standard for Cold-Formed Steel Framing—Prescriptive Method for One- and Two-Family Dwellings (AISI S230).*
3. *ICC Standard on the Design and Construction of Log Structures (ICC 400).*
4. *For post frame building systems : AWC National Design Specification for Wood Construction (NDS), ASABE Diaphragm Design of Metal-clad, Wood-frame Rectangular Buildings (EP 484.3), ASABE Shallow-post and Pier aFoundation Design (EP 486.2) and ASABE Design Requirements and Bending Properties for Mechanically Laminated Wood Assemblies (EP 559.2), as applicable.*

Add new standard(s) as follows:

ASABE

American Society of Agricultural
and Biological Engineers
2950 Niles Road
St. Joseph MI 49085
US

ASABE

American Society of Agricultural
and Biological Engineers
2950 Niles Road
St. Joseph MI 49085
US

EP 484.3 MON2016:: Daiphragm Design of Metal-clad, Wood-frame Rectangular Buildings.....R301.1.1

Revise as follows:

EP 486.2 OCT 2012ED:: Shallow-post and Pier Foundation Design.....R301.1.1

EP 559.2MON2016:: Design Requirements and Bending Properties for Mechanically Laminated Wood Assemblies.....R301.1.1

Reason: Post frame design and construction has been recognized in the IBC and IRC as a popular building construction option for many years. The material and labor advantages are more often now being recognized in residential construction. Post frame is an engineered construction method that often requires significant design in the areas of isolated foundations; nail lamination of wood elements to create columns and headers; and diaphragm design for the transfer wind load throughout the structure. This definition specifically identifies to the reader that there are code recognized standards to be followed to ensure proper design.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Addition of this definition will not change the requirements of the code but will further educate the code user.

Staff Analysis: The referenced standards, ASABE EP 484.3, ASABE EP 486.2 and ASABE EP 559.2, are currently referenced in other 2018 I-codes.

Proposal # 4214

RB27-19

RB28-19

IRC®: 202 (New), R301.1.1, UL Chapter 44 (New)

Proponent: Jonathan Roberts, UL LLC, representing UL LLC (jonathan.roberts@ul.com)

2018 International Residential Code

Add new definition as follows:

[RB] 3D PRINTED BUILDING CONSTRUCTION. A process for fabricating buildings and structures from 3D model data using automated equipment that deposits construction material in a layer upon layer fashion.

Revise as follows:

R301.1.1 Alternative provisions. As an alternative to the requirements in Section R301.1, the following standards are permitted subject to the limitations of this code and the limitations therein. Where engineered design is used in conjunction with these standards, the design shall comply with the International Building Code .

1. *AWC Wood Frame Construction Manual (WFCM).*
2. *AISI Standard for Cold-Formed Steel Framing—Prescriptive Method for One- and Two-Family Dwellings (AISI S230).*
3. *ICC Standard on the Design and Construction of Log Structures (ICC 400).*
4. *UL 3401 Outline of Investigation for 3D Printed Building Construction .*

Add new standard(s) as follows:

UL

UL LLC
333 Pfingsten Road
Northbrook IL 60062

UL 3401 -19: Outline of Investigation for 3D Printed Building Construction

Reason: 3D building construction has moved from a conceptual stage to reality, and projects are being proposed in an increasing number of jurisdictions. Unfortunately the prescriptive design and construction requirements in the IRC are not applicable to 3D printed fabrication techniques, so code officials have to approve this construction based on limited equivalency evaluations that may not take into account variations in material properties introduced by the 3D printing process, or variances in the physical characteristics of the construction materials used.

The UL 3401 Outline of Investigation for 3D Printed Building Construction was developed to evaluate critical aspects of this construction process, and level the playing field so that 3D printed building techniques comply with an equivalent level of safety and performance as legacy construction techniques currently in the code.

This proposal introduces a definition for 3D Printed Building Construction and revises the alternate design methods in R301.1.1 to permit UL 3401 to be used to evaluate this construction. Note that a companion proposal introduces an Annex U covering this in more detail, which may be adopted by jurisdictions to use. These two proposals will work together, but each also stands on its own.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is a new construction technique that simply provides an alternative to traditional construction methods and may possibly reduce the cost of construction.

Staff Analysis: A review of the standard proposed for inclusion in the code, UL 3401, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 4834

RB28-19

RB29-19

IRC@: R301.1.3

Proponent: Stephanie Young, representing National Council of Structural Engineers Associations
(stephanie@mattsonmacdonald.com)

2018 International Residential Code

Revise as follows:

R301.1.3 Engineered design. Where a building of otherwise conventional construction contains structural elements exceeding the limits of Section R301 or otherwise not conforming to this code, these elements shall be designed in accordance with accepted engineering practice. The extent of such design need only demonstrate compliance of nonconventional elements with other applicable provisions and shall be compatible with the performance of the conventional framed system. The owner or owner's authorized agent shall confirm that the design is performed to the extent necessary to comply with the provisions of Section R301.1. Engineered design in accordance with the International Building Code is permitted for buildings and structures, and parts thereof, included in the scope of this code.

Reason: The IRC allows for specific, selected portions of a structure to be designed per the requirements of the IBC or other accepted standard, while the remaining portion of the structure remains governed by the prescriptive design methods contained in the IRC. When providing such an engineered design for a selected element in a system, it should be noted that the design of additional elements, outside the original specific scope, may be required in order to insure a continuous load path as directed by Section R301.1.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The modified language is intended to clarify the requirements of engineered designs which fall outside the conditional limits of the IRC.

Proposal # 4597

RB29-19

RB30-19

IRC®: SECTION R202, 202, R301.1.4 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

SECTION R202 DEFINITIONS

Add new text as follows:

INTERMODAL SHIPPING CONTAINER. A six-sided steel unit originally constructed as a general cargo container used for the transport of goods and materials.

R301.1.4 Intermodal shipping containers. Intermodal shipping containers shall be designed in accordance with the structural provisions in Section 3114 of the International Building Code.

Reason: This code change purpose is to introduce intermodal shipping containers into the International Residential Code based on requests by code officials in the U.S. Prior to this proposal, several jurisdictions had created their own individual regulations or ordinances, or had administered additional requirements beyond the code (e.g. Section R104.11 “Alternative Materials, design and methods of construction and equipment”) so as to be comfortable to ensure a safe structure. This code change proposal is in response to those requests to develop a provision in order to establish a consistent set of provisions which cover the minimum safety requirements, but which do not duplicate existing code provisions.

The proposed definition is consistent with the successful code change proposal to the International Building Code, new Section 3114. For consistency, we are introducing that same definition here.

The reference to the International Building Code has been modeled after Sections R301.1.1 through R301.1.3. The BCAC Shipping Container Working Group chose not to duplicate the newly accepted shipping container structural design language in the International Building Code. This proposal is making a simple reference the new section in the IBC where the provisions for shipping container structural safety are contained. As Section R301.1 applies to structural design only, the other non-structural provisions of the International Residential Code would apply as required (e.g. energy, plumbing, mechanical, electrical, etc.). Also, because Section R301.1.1 deals with primarily alternative sources of structural design (e.g. independent reference standard structural design resources outside the codes), the BCAC shipping container Working Group determined it to be more appropriate to separate this reference to the IBC for clarity.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/building-code-action-committee-bcac/>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code change proposal will decrease the cost of construction. This new code section will provide clarity on how to consistently design with, permit, and field inspect shipping containers that are repurposed for residential

building construction. Current use of repurposed intermodal shipping containers requires the owner or builder to submit through the alternative means and methods administrative provisions.

Proposal # 4133

RB30-19

RB31-19

IRC®: FIGURE R301.2(2) - continued (New), FIGURE R301.2(3) - continued (New)

Proponent: Kelly Cobeen, Wiss Janney Elstner Associates, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (KCobeen@wje.com); Michael Mahoney, representing Federal Emergency Management Agency (mike.mahoney@fema.dhs.gov)

2018 International Residential Code

Revise as follows:

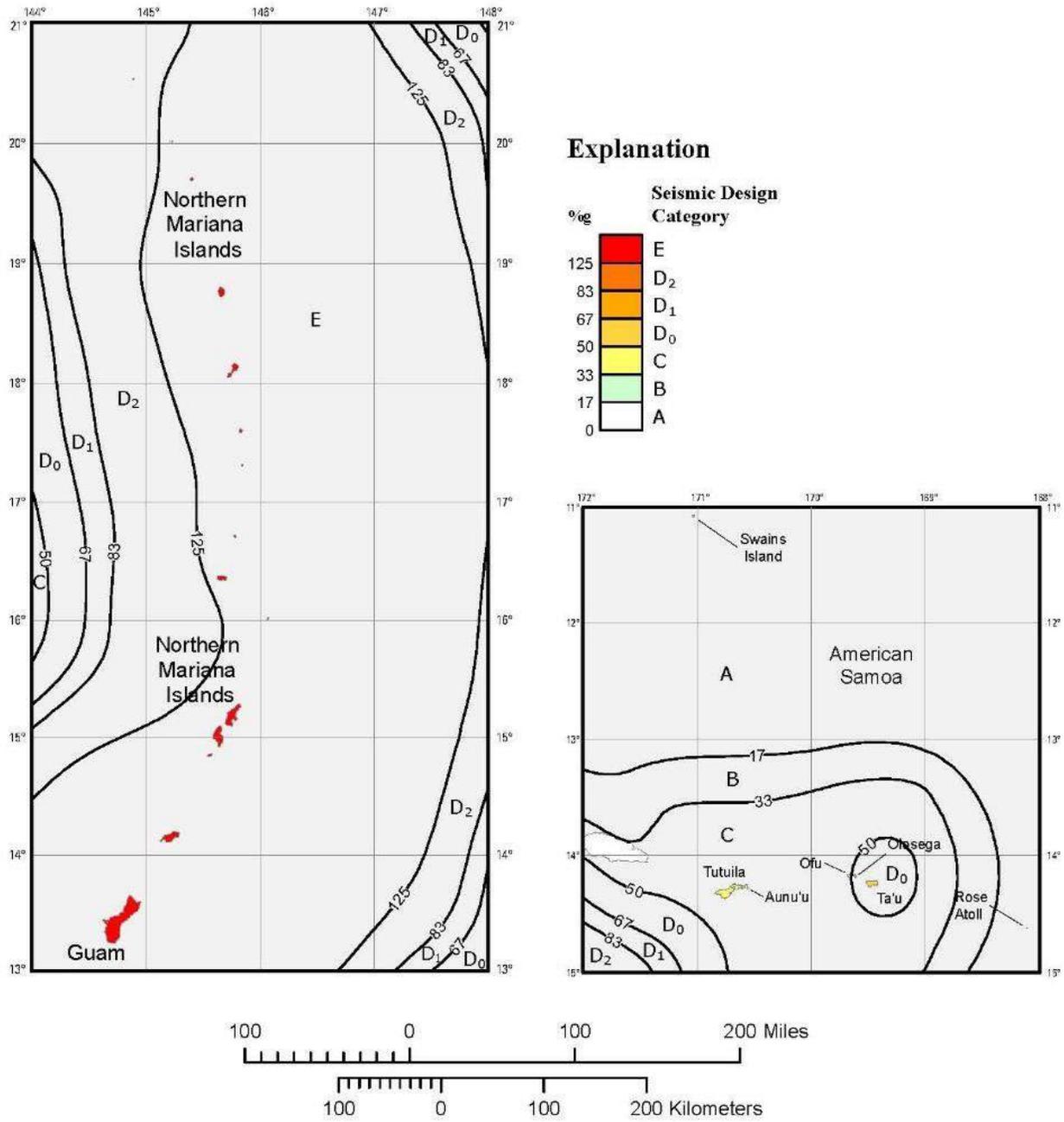


FIGURE R301.2(2) - continued
SEISMIC DESIGN CATEGORIES

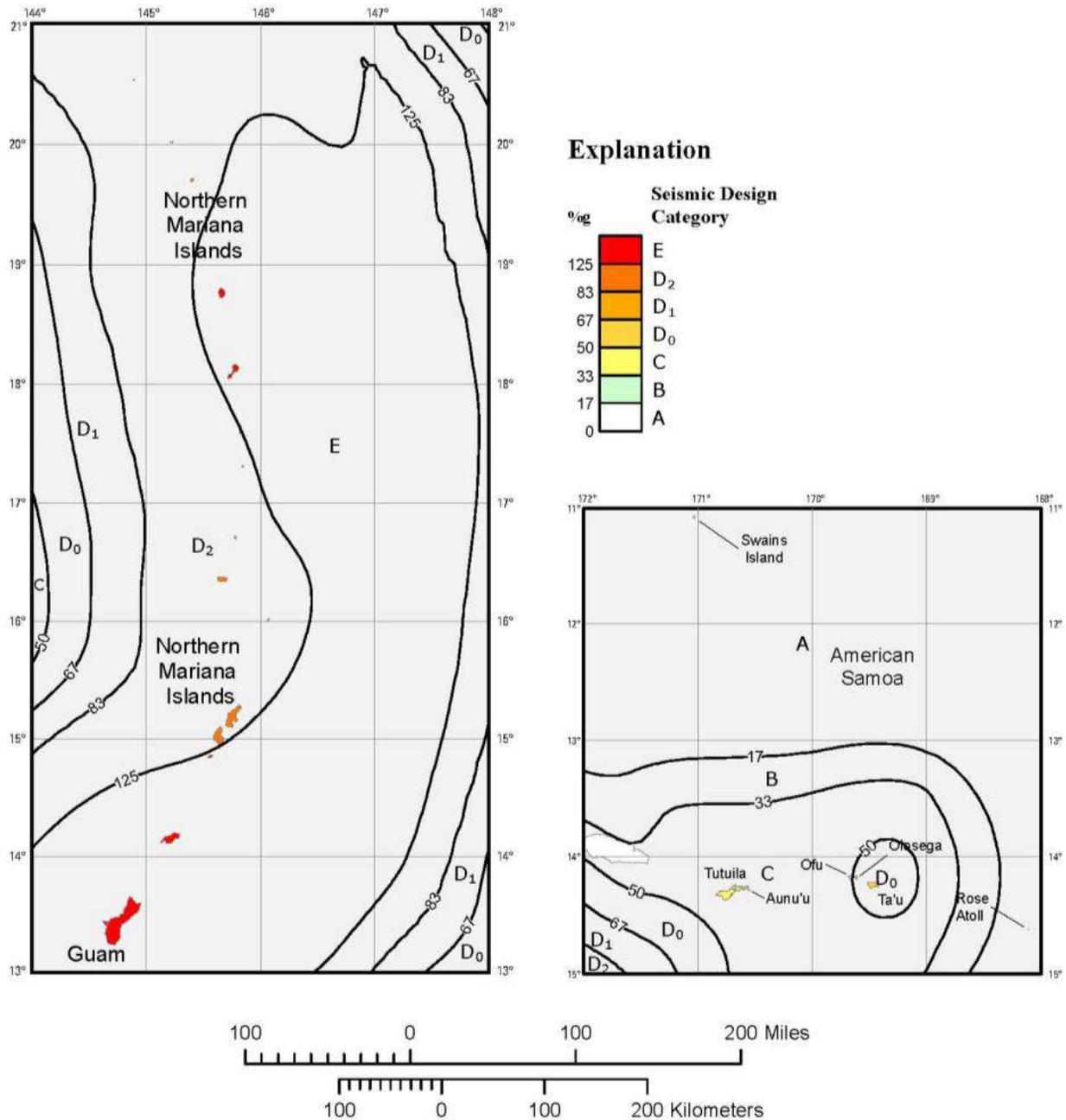


FIGURE R301.2(3) - continued
ALTERNATE SEISMIC CATEGORIES

Reason: This proposal adds new maps addressing Seismic Design Categories for Guam, the Northern Mariana Islands, and American Samoa. This new information is provided in two new figures added to the existing map sets, one added to Figure R301.2(2) Seismic Design Category map set, and one to the Figure R301.2(3) Alternate Seismic Design Category map set. This change will make Seismic Design Category information more readily available and will make the geographic areas addressed by seismic hazard maps consistent between the IRC and the IBC..

Cost Impact: The code change proposal will not increase or decrease the cost of construction. There is no cost impact.

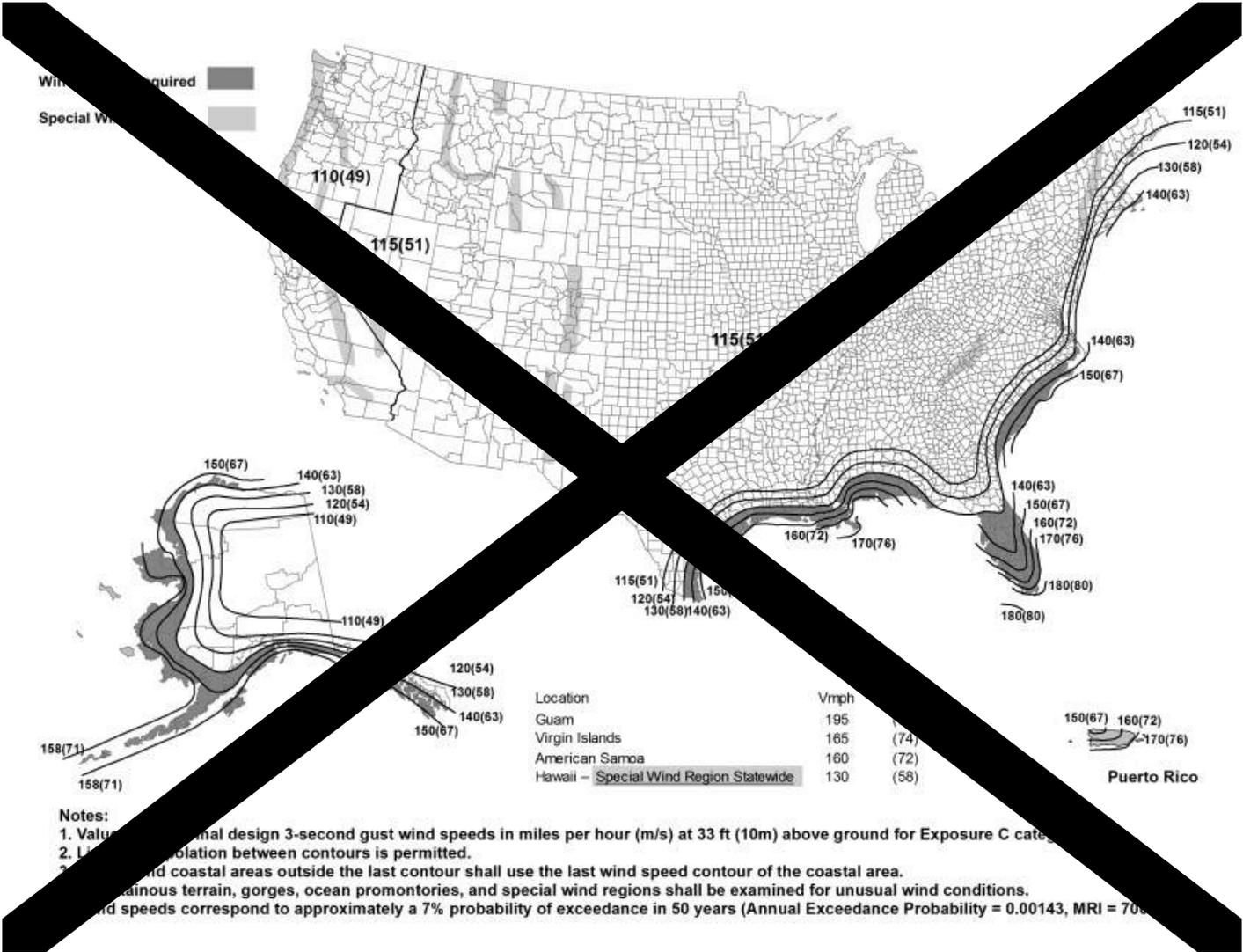
RB32-19

IRC@: FIGURE R301.2(5)B

Proponent: T. Eric Stafford, representing Insurance Institute for Business and Home Safety
(testafford@charter.net)

2018 International Residential Code

Revise as follows:



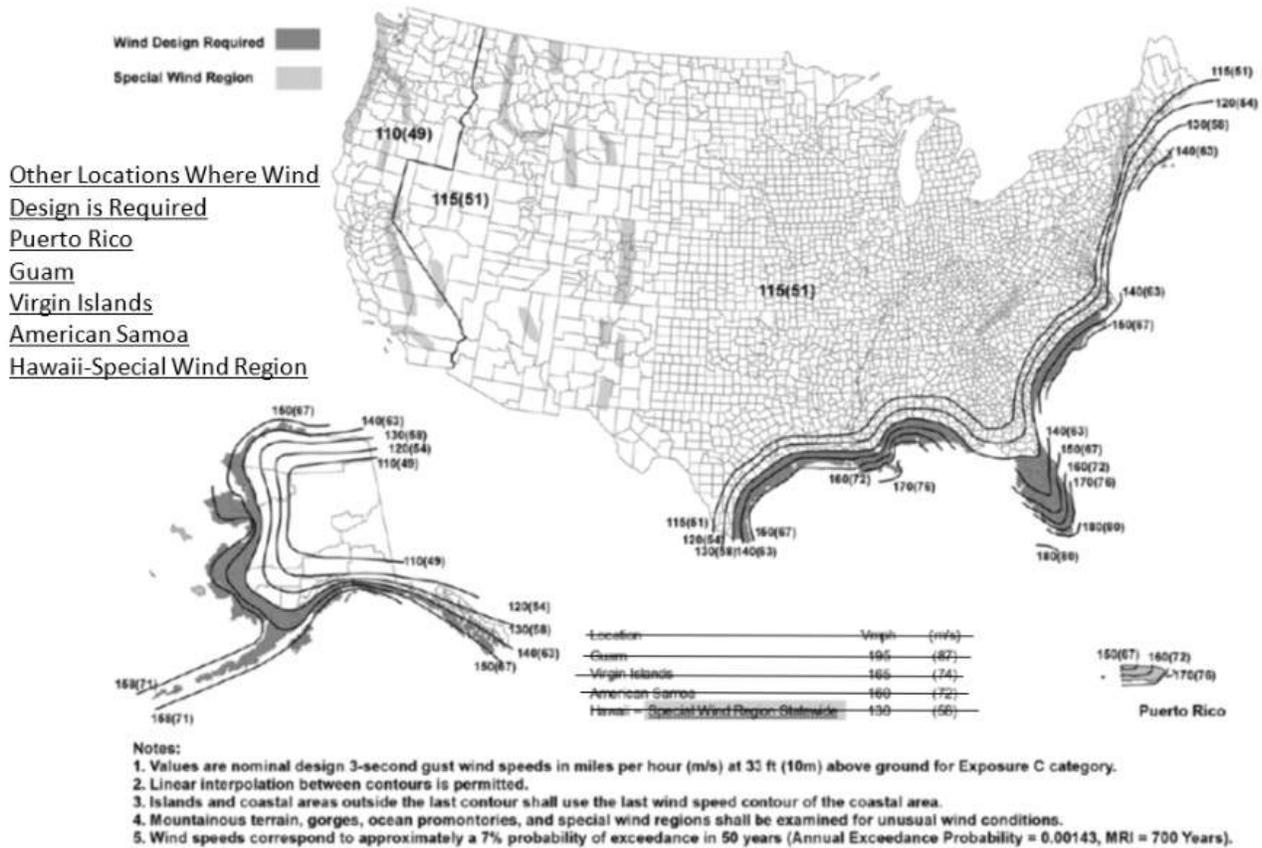


FIGURE R301.2(5)B
REGIONS WHERE WIND DESIGN IS REQUIRED

Reason: This proposal corrects an error in the 2015 and 2018 IRC that became evident as result of the 2017 hurricanes that impacted the Caribbean and Southern United States. Puerto, Rico, Guam, Virgin Island, American Samoa, and Hawaii have been considered areas requiring wind design since the first edition of the IRC. When the Wind Design Required was introduced to the 2012 IRC, a note was provided on the figure indicating that Puerto Rico, Guam, Virgin Islands, American Samoa and Hawaii were other regions requiring wind design. The wind speed map and the wind design required map in the 2015 IRC were updated for consistency with ASCE 7-10. However, the note regarding Puerto Rico, Guam, Virgin Islands, American Samoa and Hawaii included on the 2012 wind design required map was inadvertently not included. The proposal simply restores that note.

Cost Impact: The code change proposal will not increase or decrease the cost of construction Will not impact cost as these locations have historically required wind design by all versions of the IRC prior to the 2015 Edition.

Proposal # 4366

RB32-19

RB33-19

IRC®: TABLE R301.2(1)

Proponent: Gil Rossmiller, representing Colorado Chapter ICC (gilrossmiller@coloradocode.net)

2018 International Residential Code

TABLE R301.2(1)
CLIMATIC AND GEOGRAPHIC DESIGN CRITERIA

GROUND SNOW	WIND DESIGN				SEISMIC DESIGN CATEGORY ^f	SUBJECT TO DAMAGE FROM			WINTER DESIGN TEMP ^g	ICE BARRIER UNDERLAYMENT REQUIRED ^h	FLOOD HAZARDS ^g	AIR FREEZING INDEX ⁱ	MEAN ANNUAL TEMP ⁱ
	LOAD ^a	Speed ^d (mph)	Topographic effects ^a	Special wind region ^f		Wind-borne debris zone ^m	Weathering ^a	Frost line depth ^b					
—	—	—	—	—	—	—	—	—	—	—	—	—	—
MANUAL J DESIGN CRITERIA ^a													
Elevation			Latitude	Winter heating	Summer cooling	Altitude correction factor ^g		Indoor design temperature	Design temperature cooling		Heating temperature difference		
—			—	—	—	—		—	—		—		
Cooling temperature difference			Wind velocity heating	Wind velocity cooling	Coincident wet bulb	Daily range		Winter humidity	Summer humidity		—		
—			—	—	—	—		—	—		—		

For SI: 1 pound per square foot = 0.0479 kPa, 1 mile per hour = 0.447 m/s.

- a. Where weathering requires a higher strength concrete or grade of masonry than necessary to satisfy the structural requirements of this code, the frost line depth strength required for weathering shall govern. The weathering column shall be filled in with the weathering index, "negligible," "moderate" or "severe" for concrete as determined from Figure R301.2(4). The grade of masonry un
- b. Where the frost line depth requires deeper footings than indicated in Figure R403.1(1), the frost line depth strength required for weathering shall govern. The jurisdiction shall fill in the frost line depth column with the minimum depth of footing below finish grade.
- c. The jurisdiction shall fill in this part of the table to indicate the need for protection depending on whether there has been a history of local subterranean termite damage.
- d. The jurisdiction shall fill in this part of the table with the wind speed from the basic wind speed map [Figure R301.2(5)A]. Wind exposure category shall be determined on a site-specific basis in accordance with Section R301.2.1.4.

- e. ~~The outdoor design dry-bulb temperature shall be selected from the columns of 97 1/2-percent values for winter from Appendix D of the International Plumbing Code. Deviations from the Appendix D temperatures shall be permitted to reflect local climates or local weather experience as determined by the building official. [Also see Figure R301.2(1)]~~
- f. The jurisdiction shall fill in this part of the table with the seismic design category determined from Section R301.2.2.1.
- g. The jurisdiction shall fill in this part of the table with (a) the date of the jurisdiction's entry into the National Flood Insurance Program (date of adoption of the first code or ordinance for management of flood hazard areas), (b) the date(s) of the Flood Insurance Study and (c) the panel numbers and dates of the currently effective FIRMs and FBFMs or other flood hazard map adopted by the authority having jurisdiction, as amended.
- h. In accordance with Sections R905.1.2, R905.4.3.1, R905.5.3.1, R905.6.3.1, R905.7.3.1 and R905.8.3.1, where there has been a history of local damage from the effects of ice damming, the jurisdiction shall fill in this part of the table with "YES." Otherwise, the jurisdiction shall fill in this part of the table with "NO."
- i. The jurisdiction shall fill in this part of the table with the 100-year return period air freezing index (BF-days) from Figure R403.3(2) or from the 100-year (99 percent) value on the National Climatic Data Center data table "Air Freezing Index-USA Method (Base 32 °F)."
- j. The jurisdiction shall fill in this part of the table with the mean annual temperature from the National Climatic Data Center data table "Air Freezing Index-USA Method (Base 32 °F)."
- k. In accordance with Section R301.2.1.5, where there is local historical data documenting structural damage to buildings due to topographic wind speed-up effects, the jurisdiction shall fill in this part of the table with "YES." Otherwise, the jurisdiction shall indicate "NO" in this part of the table.
- l. In accordance with Figure R301.2(5)A, where there is local historical data documenting unusual wind conditions, the jurisdiction shall fill in this part of the table with "YES" and identify any specific requirements. Otherwise, the jurisdiction shall indicate "NO" in this part of the table.
- m. In accordance with Section R301.2.1.2 the jurisdiction shall indicate the wind-borne debris wind zone(s). Otherwise, the jurisdiction shall indicate "NO" in this part of the table.
- n. The jurisdiction shall fill in these sections of the table to establish the design criteria using Table 1a or 1b from ACCA Manual J or established criteria determined by the jurisdiction.
- o. The jurisdiction shall fill in this section of the table using the Ground Snow Loads in Figure R301.2(6).
- p. The jurisdiction shall fill in this section of the table to establish the design criteria using Table 10A from ACCA Manual J or established criteria as determined by the jurisdiction.

Reason: The overall change will help jurisdictions complete the manual J portion of the table and help plans examiners in completing reviews.

The upper portion of the table remains unchanged, except for the removal of the “WINTER DESIGN TEMP^e” column and footnote e. This currently creates a conflict within the table itself. Footnote e states the winter design temperature shall be selected from appendix D of the International Plumbing Code using the 97 ½ percent value. The Manual J portion states that the winter design come from table 1A which uses the 99 percent value. Removing the “WINTER DESIGN TEMP^e” column and footnote e eliminates this conflict.

The Manual J portion has been reformatted to clarify the design parameters and removed default values. We will take each cell and explain:

Wind Velocity Heating: Deleted from table

This value is not found in table 1A or 1B of Manual J. The default value in Manual J is 7.5mph. This is also the default value used in all Manual J software. For those who have a Manual J (version two) the explanation is on page 177 and is reprinted here for all to review:

“The default values for wind velocity are 15 MPH for heating and 7 ½ MPH for cooling. These velocities do not represent the most severe wind conditions that will be experienced when the outdoor temperature is at the winter or summer design temperature, but they do represent values that are compatible with normal weather patterns. If a location has a reputation for wind velocities that consistently exceed these defaults during non-

storm conditions, an appropriate set of velocity values may be substituted for the default values.”

Wind Velocity Cooling: Deleted from table See reason above

Elevation: Unchanged

Altitude Correction Factor ^o: Added new footnote

Provides direction to the correct table in Manual J. This is the only value in the Manual J section that does not appear in table 1A or 1B

o. The jurisdiction shall fill in this section of the table to establish the design criteria using Table 10A from ACCA Manual J or established criteria determined by the jurisdiction.

Summer design grains: New

This was added to help the plans examiner during plan review. This is a critical design perimeter as this the one of the values used to calculate the latent load (moisture) for cooling. This is the value that designers will change to increase (artificially) the latent load for cooling and therefore the need for larger equipment. This value is plainly seen in Manual J reports. We have provided two examples below and a portion of Manual J table 1A.

Indoor winter design relative humidity: Modified

Was labeled ‘Winter humidity’ and was assumed that this was indoor design relative humidity. This change makes it clear.

Indoor winter design temperature: Modified

Was labeled ‘Indoor design temperature’ and was assumed to be the winter design as it was under the “WINTER DESIGN TEMP^o” column. With the above coulomb removed this change makes it clear the value should be the indoor winter design temperature.

Outdoor winter design temperature: Modified

Was labeled ‘Winter heating’ and was assumed that this was outdoor design temperature. This change makes it clear.

Heating temperature difference: Unchanged.

Latitude: Unchanged

Daily range: Unchanged

Coincident wet bulb: Unchanged

Indoor summer design relative humidity: Modified

Was labeled ‘Summer humidity’ and was assumed that this was the indoor design relative humidity. This change makes it clear.

Indoor summer design temperature: Modified

This was labeled as 'Design temperature cooling' and was assumed to be the indoor summer design temperature. This change makes it clear.

Cooling temperature difference: Unchanged

FOOTNOTES: The language of the footnotes remains unchanged. They were renumbered do to the removal of footnote e and a new footnote o.

Examples of a completed Manual J Table:

FOR DENVER, COLORADO

TABLE R301.2(1)
CLIMATIC AND GEOGRAPHIC DESIGN CRITERIA

GROUND SNOW LOAD^o	WIND DESIGN				SEISMIC DESIGN CATEGORY^o	SUBJECT TO DAMAGE FROM			ICE BARRIER UNDERLAYMENT REQUIRED^o	FLOOD HAZARDS^l	AIR FREEZING INDEX^o
	Speed^d (mph)	Topographic Effects^l	Special wind Region^o	Windborne debris zone^o		Weathering^o	Frost line depth^o	Termite^o			
—	—	—	—	—	—	—	—	—	—	—	—
MANUAL J DESIGN CRITERIA^o											
Elevation	Altitude correction factor ^o		Summer design grains	Indoor winter design relative humidity	Indoor winter design temperature	Outdoor winter design temperature	Heating temp differen				
5283	0.84		-33 to -48	30%	70°	-3°	73°				
Latitude	Daily range		Coincident wet bulb	Indoor summer design relative humidity	Indoor summer design temperature	Outdoor summer design temperature	Coolin temperature d				
39	H		59°	50%	75°	90°	15°				

FOR St. AUGUSTINE, FLORIDA

TABLE R301.2(1)
CLIMATIC AND GEOGRAPHIC DESIGN CRITERIA

GROUND SNOW LOAD^o	WIND DESIGN				SEISMIC DESIGN CATEGORY^o	SUBJECT TO DAMAGE FROM			ICE BARRIER UNDERLAYMENT REQUIRED^o	FLOOD HAZARDS^l	AIR FREEZING INDEX^o
	Speed^d (mph)	Topographic Effects^l	Special wind Region^o	Windborne debris zone^o		Weathering^o	Frost line depth^o	Termite^o			
—	—	—	—	—	—	—	—	—	—	—	—
MANUAL J DESIGN CRITERIA^o											
Elevation	Altitude correction factor ^o		Summer design grains	Indoor winter design relative humidity	Indoor winter design temperature	Outdoor winter design temperature	Heating temp differen				
10	1.00		59 to 72	30%	70°	35°	35				
Latitude	Daily range		Coincident wet bulb	Indoor summer design relative humidity	Indoor summer design temperature	Outdoor summer design temperature	Cool temperature				
29	M		78°	50%	75°	89°	15				

Table 1A
Outdoor Design Conditions for the United States

Location	Elevation Feet	Latitude Degrees North	Winter		Summer		
			Heating 99% Dry Bulb	Cooling 1% Dry Bulb	Coincident Wet Bulb	Design Grains 55% RH	Design Grains 50% RH
St. Augustine	10	29	35	89	78	59	66
St. Petersburg	11	28	47	93	79	59	66

As you can see from the tables above there is a large difference in the design grains from a dry climate like Denver, Colorado and humid climate like St. Augustine, Florida. You can also see from table 1A that depending on your indoor relative humidity design the design grains change. The key for reviewers is not to get stuck on an exact number, but to know that dry climates will always have a negative number and humid climates will have a positive number.

PARTIAL MANUAL J REPORT FROM WRIGHTSOFT SOFTWARE

Design Conditions			
Location: Denver, CO, US Elevation: 5331 ft Latitude: 40°N			Indoor: Indoor temperature (°F) 70 Design TD (°F) 73 Relative humidity (%) 30 Moisture difference (gr/lb) 35.0
Outdoor: Drybulb (°F) -3 Daily range (°F) - Wet bulb (°F) - Wind speed (mph) 15.0	Heating	Cooling	Infiltration: Method Simplified Construction quality Average Fireplaces 0
		90 27 (H) 59 7.5	

PARTIAL MANUAL J REPORT FROM ELITE SOFTWARE

Design Data

Reference City:	Denver, Colorado
Building Orientation:	Front door faces Southeast
Daily Temperature Range:	High
Latitude:	39 Degrees
Elevation:	5830 ft.
Altitude Factor:	0.807
Elevation Sensible Adj. Factor:	1.000
Elevation Total Adj. Factor:	1.000
Elevation Heating Adj. Factor:	1.000
Elevation Heating Adj. Factor:	1.000

	<u>Outdoor Dry Bulb</u>	<u>Outdoor Wet Bulb</u>	<u>Outdoor Rel.Hum</u>	<u>Indoor Rel.Hum</u>	<u>Indoor Dry Bulb</u>	<u>G Differ</u>
Winter:	-3	-3.7	80%	30%	70	3
Summer:	90	59	17%	50%	75	

The two reports above are both for Denver, Colorado and both are correct and yet you see the Grains Difference are not the same. This value will vary slightly depending on the weather data within the software. Again, small differences will not change the calculation significantly.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The revised table will not increase the heating or cooling loads. It may help for more accurate load calculations, therefore smaller equipment and possible reduced costs.

Proposal # 5232

RB33-19

RB34-19

IRC@: TABLE R301.2(1)

Proponent: Gregory Wilson, representing Federal Emergency Management Agency (gregory.wilson2@fema.dhs.gov); Rebecca Quinn, RCQuinn Consulting, on behalf of Federal Emergency Management Agency, representing Federal Emergency Management Agency (rcquinn@earthlink.net)

2018 International Residential Code

Revise as follows:

TABLE R301.2(1)
CLIMATIC AND GEOGRAPHIC DESIGN CRITERIA

GROUND SNOW	WIND DESIGN				SEISMIC DESIGN CATEGORY ^f	SUBJECT TO DAMAGE FROM			WINTER DESIGN TEMP ^g	ICE BARRIER UNDERLAYMENT REQUIRED ^h	FLOOD HAZARDS ^g	AIR FREEZING INDEX ⁱ	MEANANNUAL TEMP ⁱ
	LOAD ^a	Speed ^d (mph)	Topographic effects ^k	Special wind region ^l		Wind-borne debris zone ^m	Weathering ^a	Frost line depth ^b					
—	—	—	—	—	—	—	—	—	—	—	—	—	—
MANUAL J DESIGN CRITERIA ⁿ													
Elevation			Latitude	Winter heating	Summer cooling	Altitude correction factor		Indoor design temperature	Design temperature cooling		Heating temperature difference		
—			—	—	—	—		—	—		—		
Cooling temperature difference			Wind velocity heating	Wind velocity cooling	Coincident wet bulb	Daily range		Winter humidity	Summer humidity		—		
—			—	—	—	—		—	—		—		

For SI: 1 pound per square foot = 0.0479 kPa, 1 mile per hour = 0.447 m/s.

- a. Where weathering requires a higher strength concrete or grade of masonry than necessary to satisfy the structural requirements of this code, the frost line depth strength required for weathering shall govern. The weathering column shall be filled in with the weathering index, "negligible," "moderate" or "severe" for concrete as determined from Figure R301.2(4). The grade of masonry un
- b. Where the frost line depth requires deeper footings than indicated in Figure R403.1(1), the frost line depth strength required for weathering shall govern. The jurisdiction shall fill in the frost line depth column with the minimum depth of footing below finish grade.
- c. The jurisdiction shall fill in this part of the table to indicate the need for protection depending on whether there has been a history of local subterranean termite damage.
- d. The jurisdiction shall fill in this part of the table with the wind speed from the basic wind speed map [Figure R301.2(5)A]. Wind exposure category shall be determined on a site-specific basis in accordance with Section R301.2.1.4.

- e. The outdoor design dry-bulb temperature shall be selected from the columns of 97¹/₂-percent values for winter from Appendix D of the International Plumbing Code. Deviations from the Appendix D temperatures shall be permitted to reflect local climates or local weather experience as determined by the building official. [Also see Figure R301.2(1)]
- f. The jurisdiction shall fill in this part of the table with the seismic design category determined from Section R301.2.2.1.
- g. The jurisdiction shall fill in this part of the table with (a) the date of the jurisdiction's entry into the National Flood Insurance Program (date of adoption of the first code or ordinance for management of flood hazard areas); and (b) the title and date(s) of the currently effective Flood Insurance Study and ~~(c) the panel numbers and dates of the currently effective FIRMs and FBFMs~~ or other flood hazard map study and maps adopted by the authority having jurisdiction, as amended. In accordance with Sections R905.1.2, R905.4.3.1, R905.5.3.1, R905.6.3.1, R905.7.3.1 and R905.8.3.1, where there has been a history of local damage from the effects of ice damming, the jurisdiction shall fill in this part of the table with "YES." Otherwise, the jurisdiction shall fill in this part of the table with "NO."
- h. The jurisdiction shall fill in this part of the table with the 100-year return period air freezing index (BF-days) from Figure R403.3(2) or from the 100-year (99 percent) value on the National Climatic Data Center data table "Air Freezing Index-USA Method (Base 32 °F)."
- i. The jurisdiction shall fill in this part of the table with the mean annual temperature from the National Climatic Data Center data table "Air Freezing Index-USA Method (Base 32 °F)."
- j. In accordance with Section R301.2.1.5, where there is local historical data documenting structural damage to buildings due to topographic wind speed-up effects, the jurisdiction shall fill in this part of the table with "YES." Otherwise, the jurisdiction shall indicate "NO" in this part of the table.
- k. In accordance with Figure R301.2(5)A, where there is local historical data documenting unusual wind conditions, the jurisdiction shall fill in this part of the table with "YES" and identify any specific requirements. Otherwise, the jurisdiction shall indicate "NO" in this part of the table.
- l. In accordance with Section R301.2.1.2 the jurisdiction shall indicate the wind-borne debris wind zone(s). Otherwise, the jurisdiction shall indicate "NO" in this part of the table.
- m. The jurisdiction shall fill in these sections of the table to establish the design criteria using Table 1a or 1b from ACCA Manual J or established criteria determined by the jurisdiction.
- n. The jurisdiction shall fill in this section of the table using the Ground Snow Loads in Figure R301.2(6).

Reason: It is sufficient only to identify the title and date of the community's Flood Insurance Study. Flood Insurance Studies are official reports provided by the Federal Emergency Management Agency that include or contain the Flood Insurance Rate Maps (FIRM), the Flood Boundary and Floodway Map (FBFM), the water surface elevation of the *base flood* and supporting technical data.

The requirement to list the panel numbers and associated dates of all currently effective FIRMs and FBFMs is burdensome, especially in large jurisdictions with multiple panels. Additionally, some states permit communities to automatically adopt updated FISs and accompanying FIRMs. Requiring individual panel numbers and dates of newly updated FIRMs would require those communities to modify the list with issuance of each new FIRM and defeats the purpose of the auto-adopt mechanism.

This proposal brings the establishment of the flood hazard area in line with Section 1612.3 of the IBC, which requires only identification of the title and date of issuance of the FIS.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. No additional cost. The proposal eliminates an administrative burden on communities.

RB35-19

IRC®: TABLE R301.2(2), TABLE R301.2(2) (New), TABLE R301.2(3), FIGURE R301.2(8), FIGURE R301.2(5)A, FIGURE R301.2(5)B

Proponent: Jennifer Goupil, American Society of Civil Engineers (ASCE), representing American Society of Civil Engineers (ASCE) (jgoupil@asce.org); Don Scott, representing Representing National Council of Structural Engineers Association (dscott@pcs-structural.com); T. Eric Stafford, Insurance Institute for Business and Home Safety, representing Insurance Institute for Business and Home Safety (testafford@charter.net)

2018 International Residential Code

Delete without substitution:

TABLE R301.2(2)
COMPONENT AND CLADDING LOADS FOR A BUILDING WITH A MEAN ROOF HEIGHT OF 30
FEET LOCATED IN EXPOSURE B (ASD) (psf)^{a, b, c, d, e}

Delete table in its entirety.

Add new text as follows:

TABLE R301.2(2)
COMPONENT AND CLADDING LOADS FOR A BUILDING WITH A MEAN ROOF HEIGHT OF 30 FEET LOCATED IN EXPOSURE B
(ASD) (psf) a,b,c,d,e,f,g

	Zone	Effective Wind Areas (feet ²)	Ultimate Design Wind Speed, V _{ult}																											
			90		95		100		105		110		115		120		130		140		150		160		170		180			
			Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg		
Flat and Gable Roof 0 to 7 degrees	1	10	3.6	-13.9	4.0	-15.5	4.4	-17.2	4.8	-19.0	5.3	-20.8	5.8	-22.7	6.3	-24.8	7.4	-29.1	8.6	-33.7	9.9	-38.7	11.2	-44.0	12.7	-49.7	14.2	-55.7		
	1	20	3.3	-13.0	3.7	-14.5	4.1	-16.0	4.5	-17.7	5.0	-19.4	5.4	-21.2	5.9	-23.1	7.0	-27.1	8.1	-31.4	9.3	-36.1	10.5	-41.1	11.9	-46.4	13.3	-52.0		
	1	50	3.0	-11.8	3.4	-13.1	3.8	-14.5	4.1	-16.0	4.5	-17.6	5.0	-19.2	5.4	-20.9	6.3	-24.5	7.4	-28.4	8.4	-32.6	9.6	-37.1	10.8	-41.9	12.2	-47.0		
	1	100	2.8	-10.8	3.1	-12.1	3.5	-13.4	3.8	-14.7	4.2	-16.2	4.6	-17.7	5.0	-19.2	5.9	-22.6	6.8	-26.2	7.8	-30.0	8.9	-34.2	10.0	-38.6	11.3	-43.3		
	2	10	3.6	-18.4	4.0	-20.5	4.4	-22.7	4.8	-25.0	5.3	-27.4	5.8	-30.0	6.3	-32.7	7.4	-38.3	8.6	-44.5	9.9	-51.0	11.2	-58.1	12.7	-65.6	14.2	-73.5		
	2	20	3.3	-17.2	3.7	-19.2	4.1	-21.2	4.5	-23.4	5.0	-25.7	5.4	-28.1	5.9	-30.6	7.0	-35.9	8.1	-41.6	9.3	-47.8	10.5	-54.3	11.9	-61.4	13.3	-68.8		
	2	50	3.0	-15.6	3.4	-17.4	3.8	-19.3	4.1	-21.3	4.5	-23.3	5.0	-25.5	5.4	-27.8	6.3	-32.6	7.4	-37.8	8.4	-43.4	9.6	-49.4	10.8	-55.8	12.2	-62.5		
	2	100	2.8	-14.4	3.1	-16.1	3.5	-17.8	3.8	-19.7	4.2	-21.6	4.6	-23.6	5.0	-25.7	5.9	-30.1	6.8	-35.0	7.8	-40.1	8.9	-45.7	10.0	-51.5	11.3	-57.8		
	3	10	3.6	-25.0	4.0	-27.9	4.4	-30.9	4.8	-34.1	5.3	-37.4	5.8	-40.9	6.3	-44.5	7.4	-52.2	8.6	-60.6	9.9	-69.6	11.2	-79.1	12.7	-89.4	14.2	-100.2		
	3	20	3.3	-22.6	3.7	-25.2	4.1	-28.0	4.5	-30.8	5.0	-33.8	5.4	-37.0	5.9	-40.3	7.0	-47.2	8.1	-54.8	9.3	-62.9	10.5	-71.6	11.9	-80.8	13.3	-90.6		
	3	50	3.0	-19.4	3.4	-21.7	3.8	-24.0	4.1	-26.5	4.5	-29.0	5.0	-31.7	5.4	-34.6	6.3	-40.6	7.4	-47.0	8.4	-54.0	9.6	-61.4	10.8	-69.4	12.2	-77.8		
	3	100	2.8	-17.4	3.1	-19.0	3.5	-21.0	3.8	-23.2	4.2	-25.5	4.6	-27.8	5.0	-30.3	5.9	-35.6	6.8	-41.2	7.8	-47.3	8.9	-53.9	10.0	-60.8	11.3	-68.2		

Gable Roof >7 to 20 degrees	1. 2e	10	5.4	-16.2	6.0	18.0	6.7	19.9	7.4	22.0	8.1	24.1	8.8	26.4	9.6	28.7	11.3	33.7	13.1	39.1	15.0	44.9	17.1	51.0	19.3	57.6	21.6	-64.6
	1. 2e	20	4.9	-16.2	5.4	18.0	6.0	19.9	6.6	22.0	7.2	24.1	7.9	26.4	8.6	28.7	10.1	33.7	11.7	39.1	13.5	44.9	15.3	51.0	17.3	57.6	19.4	-64.6
	1. 2e	50	4.1	-9.9	4.6	11.0	5.1	12.2	5.6	13.4	6.1	14.7	6.7	16.1	7.3	17.5	8.6	20.6	10.0	23.8	11.4	27.4	13.0	31.1	14.7	35.2	16.4	-39.4
	1. 2e	100	3.6	-5.0	4.0	-5.6	4.4	-6.2	4.8	-6.9	5.3	-7.5	5.8	-8.2	6.3	-9.0	7.4	-10.5	8.6	-12.2	9.9	-14.0	11.2	-15.9	12.7	-18.0	14.2	-20.2
	2n. 2r. 3e	10	5.4	-23.6	6.0	26.3	6.7	29.1	7.4	32.1	8.1	35.2	8.8	38.5	9.6	41.9	11.3	49.2	13.1	57.0	15.0	65.4	17.1	74.5	19.3	84.1	21.6	-94.2
	2n. 2r. 3e	20	4.9	-20.3	5.4	22.7	6.0	25.1	6.6	27.7	7.2	30.4	7.9	33.2	8.6	36.2	10.1	42.4	11.7	49.2	13.9	56.5	15.3	64.3	17.3	72.6	19.4	-81.4
	2n. 2r. 3e	50	4.1	-16.0	4.6	17.9	5.1	19.8	5.6	21.8	6.1	24.0	6.7	26.2	7.3	28.5	8.6	33.5	10.0	38.8	11.4	44.6	13.0	50.7	14.7	57.2	16.4	-64.2
	2n. 2r. 3e	100	3.6	-12.8	4.0	14.3	4.4	15.8	4.8	17.4	5.3	19.1	5.8	20.9	6.3	22.8	7.4	26.7	8.6	31.0	9.9	35.6	11.2	40.5	12.7	45.7	14.2	-51.3
	3r	10	5.4	-28.0	6.0	30.2	6.7	34.6	7.4	38.1	8.1	41.8	8.8	45.7	9.6	49.8	11.3	58.4	13.1	67.8	15.0	77.8	17.1	88.5	19.3	99.9	21.6	-112.0
	3r	20	4.9	-24.0	5.4	26.7	6.0	29.6	6.6	32.7	7.2	35.9	7.9	39.2	8.6	42.7	10.1	50.1	11.7	58.1	13.5	66.7	15.3	75.9	17.3	85.6	19.4	-96.0
	3r	50	4.1	18.7	4.6	20.8	5.1	23.1	5.6	25.4	6.1	27.9	6.7	30.5	7.3	33.2	8.6	39.0	10.0	45.2	11.4	51.9	13.0	59.0	14.7	66.6	16.4	-74.7
	3r	100	3.6	-14.7	4.0	16.3	4.4	18.1	4.8	20.0	5.3	21.9	5.8	24.0	6.3	26.1	7.4	30.6	8.6	35.5	9.9	40.8	11.2	46.4	12.7	52.3	14.2	-58.7
Gable Roof >20 to 27 degrees	1. 2e	10	6.5	-12.4	7.3	13.9	8.0	15.4	8.9	16.9	9.7	18.6	10.6	20.3	11.6	22.1	13.6	26.0	15.8	30.1	18.1	34.6	20.6	39.3	23.3	44.4	26.1	-49.9
	1. 2e	20	5.6	-12.4	6.3	13.9	7.0	15.4	7.7	16.9	8.4	18.6	9.2	20.3	10.0	22.1	11.7	26.0	13.6	30.1	15.6	34.6	17.8	39.3	20.1	44.4	22.5	-49.8
	1. 2e	50	4.4	-10.6	5.0	11.8	5.5	13.1	6.1	14.4	6.6	15.8	7.3	17.3	7.9	18.8	9.3	22.1	10.8	25.6	12.3	29.4	14.0	33.5	15.9	37.8	17.8	-42.4
	1. 2e	100	3.6	-9.1	4.0	10.2	4.4	11.3	4.8	12.4	5.3	13.6	5.8	14.9	6.3	16.2	7.4	19.0	8.6	22.1	9.9	25.3	11.2	28.8	12.7	32.5	14.2	-36.5
	2n. 2r. 3e	10	6.5	-19.9	7.3	22.1	8.0	24.5	8.9	27.0	9.7	29.7	10.6	32.4	11.6	35.3	13.6	41.4	15.8	48.0	18.1	55.2	20.6	62.8	23.3	70.8	26.1	-79.4
	2n. 2r. 3e	20	5.6	-17.4	6.3	19.4	7.0	21.5	7.7	23.7	8.4	26.0	9.2	28.4	10.0	31.0	11.7	36.3	13.6	42.1	15.6	48.4	17.8	55.0	20.1	62.1	22.5	-69.6

	2n, 2r, 3e	50	4.4	-14.2	5.0	15.8	5.5	17.5	6.1	19.3	6.6	21.1	7.3	23.1	7.9	25.2	9.3	29.5	10.8	34.2	12.3	39.3	14.0	44.7	15.9	50.5	17.8	56.6
	2n, 2r, 3e	100	3.6	-11.7	4.0	13.0	4.4	14.5	4.8	15.9	5.3	17.5	5.8	19.1	6.3	20.8	7.4	24.4	8.6	28.3	9.9	32.5	11.2	37.0	12.7	41.8	14.2	46.8
	3r	10	6.5	-23.6	7.3	26.3	8.0	29.1	8.9	32.1	9.7	35.2	10.6	38.5	11.6	41.9	13.6	49.2	15.8	57.0	18.1	65.4	20.6	74.5	23.3	84.1	26.1	94.2
	3r	20	5.6	-19.9	6.3	22.1	7.0	24.5	7.7	27.0	8.4	29.7	9.2	32.4	10.0	35.3	11.7	41.4	13.6	48.0	15.6	55.2	17.8	62.8	20.1	70.8	22.5	79.4
	3r	50	4.4	-14.7	5.0	16.3	5.5	18.1	6.1	20.0	6.6	21.9	7.3	24.0	7.9	26.1	9.3	30.6	10.8	35.5	12.3	40.8	14.0	46.4	15.9	52.3	17.8	58.7
	3r	100	3.6	-14.7	4.0	16.3	4.4	18.1	4.8	20.0	5.3	21.9	5.8	24.0	6.3	26.1	7.4	30.6	8.6	35.5	9.9	40.8	11.2	46.4	12.7	52.3	14.2	58.7
Gable Roof >27 to 45 degrees	1, 2e, 2r	10	8.0	-14.7	8.9	16.3	9.9	18.1	10.9	20.0	12.0	21.9	13.1	24.0	14.2	26.1	16.7	30.6	19.4	35.5	22.2	40.8	25.3	30.0	21.1	33.8	32.0	58.7
	1, 2e, 2r	20	7.1	-12.4	7.9	13.9	8.8	15.4	9.7	16.9	10.6	18.6	11.6	20.3	12.6	22.1	14.8	26.0	17.2	30.1	19.8	34.6	22.5	39.3	25.4	44.4	28.5	49.8
	1, 2e, 2r	50	5.9	-9.5	6.6	10.6	7.3	11.7	8.1	12.9	8.9	14.2	9.7	15.5	10.5	16.9	12.4	19.8	14.3	22.9	16.5	26.3	18.7	30.0	21.1	33.8	23.7	37.9
	1, 2e, 2r	100	5.0	-7.3	5.6	8.1	6.2	9.0	6.9	9.9	7.5	10.8	8.2	11.9	9.0	12.9	10.5	15.1	12.2	17.6	14.0	20.2	15.9	22.9	18.0	25.9	20.2	29.0
	2n, 3r	10	8.0	-16.2	8.9	18.0	9.9	19.9	10.9	22.0	12.0	24.1	13.1	26.4	14.2	28.7	16.7	33.7	19.4	39.1	22.2	44.9	25.3	51.0	28.5	57.6	32.0	64.6
	2n, 3r	20	7.1	-14.4	7.9	16.1	8.8	17.8	9.7	19.7	10.6	21.6	11.6	23.6	12.6	25.7	14.8	30.1	17.2	34.9	19.8	40.1	22.5	45.6	25.4	51.5	28.5	57.8
	2n, 3r	50	5.9	-12.2	6.6	13.5	7.3	15.0	8.1	16.5	8.9	18.2	9.7	19.9	10.5	21.6	12.4	25.4	14.3	29.4	16.5	33.8	18.7	38.4	21.1	43.4	23.7	48.6
	2n, 3r	100	5.0	-10.4	5.6	11.6	6.2	12.9	6.9	14.2	7.5	15.6	8.2	17.1	9.0	18.6	10.5	21.8	12.2	25.3	14.0	29.0	15.9	33.0	18.0	37.3	20.0	41.8
	3e	10	8.0	-19.9	8.9	22.1	9.9	24.5	10.9	27.0	12.0	29.7	13.1	32.4	14.2	35.3	16.7	41.4	19.4	48.0	22.2	55.2	25.3	62.8	28.8	70.8	32.0	79.4
	3e	20	7.1	-17.6	7.9	19.6	8.8	21.8	9.7	24.0	10.6	26.3	11.6	28.8	12.6	31.3	14.8	36.8	17.2	42.7	19.8	49.0	22.5	55.7	25.4	62.9	28.5	70.5
	3e	50	5.9	-14.7	6.6	16.3	7.3	18.1	8.1	20.0	8.9	21.9	9.7	24.0	10.5	26.1	12.4	30.6	14.3	35.5	16.6	40.8	18.7	46.4	21.1	52.3	23.7	58.7
	3e	100	5.0	-12.4	5.6	13.9	6.2	15.4	6.9	16.9	7.5	18.6	8.2	20.3	9.0	22.1	10.5	26.0	12.2	30.1	14.0	34.6	15.9	39.3	18.0	44.4	20.2	49.8

Hipped Roof >7 to 20 degrees	1	10	6.5	-14.7	7.3	16.3	8.0	18.1	8.9	20.0	9.7	21.9	10.6	24.0	11.6	26.1	13.6	30.6	15.8	35.5	18.1	40.8	20.6	46.4	23.3	52.3	26.1	-58.7	
	1	20	5.6	-14.7	6.3	16.3	7.0	18.1	7.7	20.0	8.4	21.9	9.2	24.0	10.0	26.1	11.7	30.6	13.6	35.5	15.6	40.8	17.8	46.4	20.1	52.3	22.5	-58.7	
	1	50	4.4	-11.3	5.0	12.6	5.5	14.0	6.1	15.4	6.6	16.9	7.3	18.5	7.9	20.2	9.3	23.7	10.8	27.4	12.3	31.5	14.0	35.8	15.9	40.4	17.8	-45.3	
	1	100	3.6	-8.7	4.0	9.7	4.4	10.8	4.8	11.9	5.3	13.1	5.8	14.3	6.3	15.5	7.4	18.2	8.6	21.2	9.9	24.3	11.2	27.6	12.7	31.2	14.2	-35.0	
	2r	10	6.5	-19.1	7.3	21.3	8.0	23.6	8.9	26.0	9.7	28.6	10.6	31.2	11.6	34.0	13.6	39.9	15.8	46.3	18.1	53.1	20.6	60.4	23.3	68.2	26.1	-76.5	
	2r	20	5.6	-17.2	6.3	19.2	7.0	21.3	7.7	23.4	8.4	25.7	9.2	28.1	10.0	30.6	11.7	35.9	13.6	41.7	15.6	47.9	17.8	54.4	20.1	61.5	22.5	-68.9	
	2r	50	4.4	-14.7	5.0	16.4	5.5	18.2	6.1	20.0	6.6	22.0	7.3	24.0	7.9	26.1	9.3	30.7	10.8	35.6	12.3	40.9	14.0	46.5	15.9	52.5	17.8	-58.8	
	2r	100	3.6	-12.8	4.0	14.3	4.4	15.8	4.8	17.4	5.3	19.1	5.8	20.9	6.3	22.8	7.4	26.7	8.6	31.0	9.9	35.6	11.2	40.5	12.7	45.7	14.2	-51.3	
	2e. 3	10	6.5	-20.6	7.3	22.9	8.0	25.4	8.9	28.0	9.7	30.8	10.6	33.6	11.6	36.6	13.6	43.0	15.8	49.8	18.1	57.2	20.6	65.1	23.3	73.5	26.1	-82.4	
	2e. 3	20	5.6	-18.5	6.3	20.6	7.0	22.9	7.7	25.2	8.4	27.7	9.2	30.3	10.0	32.9	11.7	38.7	13.6	44.8	15.6	51.5	17.8	58.6	20.1	66.1	22.5	-74.1	
	2e. 3	50	4.4	-15.8	5.0	17.6	5.5	19.5	6.1	21.5	6.6	23.6	7.3	25.8	7.9	28.0	9.3	32.9	10.8	38.2	12.3	43.8	14.0	49.9	15.9	56.3	17.8	-63.1	
	2e. 3	100	3.6	-13.7	4.0	15.3	4.0	16.9	4.8	18.7	5.3	20.5	5.8	22.4	6.3	24.4	7.4	28.6	8.6	33.2	9.9	38.1	11.2	43.3	12.7	48.9	14.2	-54.8	
	Hipped Roof >20 to 27 degrees	1	10	6.5	-11.7	7.3	13.0	8.0	14.5	8.9	15.9	9.7	17.5	10.6	19.1	11.6	20.8	13.6	24.4	15.8	28.3	18.1	32.5	20.6	37.0	23.3	41.8	26.1	-46.8
		1	20	5.6	-10.4	6.3	11.6	7.0	12.8	7.7	14.1	8.4	15.5	9.2	16.9	10.0	18.4	11.7	21.6	13.6	25.1	15.6	28.8	17.8	32.8	20.1	37.0	22.5	-41.5
1		50	4.4	-8.6	5.0	9.6	5.5	10.6	6.1	11.7	6.6	12.8	7.3	14.0	7.9	15.3	9.3	17.9	10.8	20.8	12.3	23.9	14.0	27.2	15.9	30.7	17.8	-34.4	
1		100	3.6	-7.3	4.0	8.1	4.4	9.0	4.8	9.9	5.3	10.8	5.8	11.9	6.3	12.9	7.4	15.1	8.6	17.6	9.9	20.2	11.2	22.9	12.7	25.9	14.2	-29.0	
2e. 2r. 3		10	6.5	-16.2	7.3	18.0	8.0	19.9	8.9	22.0	9.7	24.1	10.6	26.4	11.6	28.7	13.6	33.7	15.8	39.1	18.1	44.9	20.6	51.0	23.3	57.6	26.1	-64.6	
2e. 2r. 3		20	5.6	-14.4	6.3	16.1	7.0	17.8	7.7	19.7	8.4	21.6	9.2	23.6	10.0	25.7	11.7	30.1	13.6	34.9	15.6	40.1	17.8	45.6	20.1	51.5	22.5	-57.8	

	2e, 2r, 3	50	4.4	-12.2	5.0	13.5	5.5	15.0	6.1	16.5	6.6	18.2	7.3	19.9	7.9	21.6	9.3	25.4	10.8	29.4	12.3	33.8	14.0	38.4	15.9	43.4	17.8	-48.6
	2e, 2r, 3	100	3.6	-10.4	4.0	11.6	4.4	12.9	4.8	14.2	5.3	15.6	5.8	17.1	6.3	18.6	7.4	21.8	8.6	25.3	9.9	29.0	11.2	33.0	12.7	37.3	14.2	-41.8
Hipped Roof >27 to 45 degrees	1	10	6.2	-12.4	6.9	13.9	7.7	15.4	8.5	16.9	9.3	18.6	10.2	20.3	11.1	22.1	13.0	26.0	15.1	30.1	17.3	34.6	19.7	39.3	22.2	44.4	24.9	-49.8
	1	20	5.4	-11.0	6.0	12.3	6.7	13.6	7.4	15.0	8.1	16.5	8.9	18.0	9.6	19.6	11.3	23.0	13.1	26.7	15.1	30.7	17.1	34.9	19.4	39.4	21.7	-44.2
	1	50	4.4	-9.2	4.9	10.2	5.4	11.3	5.9	12.5	6.5	13.7	7.1	15.0	7.7	16.3	9.1	19.2	10.5	22.2	12.1	25.5	13.8	29.0	15.5	32.8	17.4	-36.7
	1	100	3.6	-7.8	4.0	8.7	4.4	9.6	4.8	10.6	5.3	11.6	5.8	12.7	6.3	13.8	7.4	16.2	8.6	18.8	9.9	21.6	11.2	24.6	12.7	27.8	14.2	-31.1
	2e	10	6.2	-14.8	6.9	16.5	7.7	18.3	8.5	20.2	9.3	22.1	10.2	24.2	11.1	26.3	13.0	30.9	15.1	35.9	17.3	41.2	19.7	46.8	22.2	52.9	24.9	-59.3
	2e	20	5.4	-11.7	6.0	13.0	6.7	14.5	7.4	15.9	8.1	17.5	8.9	19.1	9.6	20.8	11.3	24.4	13.1	28.3	15.1	32.5	17.1	37.0	19.4	41.8	21.7	-46.8
	2e	50	4.4	-7.3	4.9	8.1	5.4	9.0	5.9	9.9	6.5	10.8	7.1	11.9	7.7	12.9	9.1	15.1	10.5	17.6	12.1	20.2	13.8	22.9	15.5	25.9	17.4	-29.0
	2e	100	3.6	-7.3	4.0	8.1	4.4	9.0	4.8	9.9	5.3	10.8	5.8	11.9	6.3	12.9	7.4	15.1	8.6	17.6	9.9	20.2	11.2	22.9	12.7	25.9	14.2	-29.0
	2r	10	6.2	-18.7	6.9	20.9	7.7	23.1	8.5	25.5	9.3	28.0	10.2	30.6	11.1	33.3	13.0	39.1	15.1	45.4	17.3	52.1	19.7	59.2	22.2	66.9	24.9	-75.0
	2r	20	5.4	-15.7	6.0	17.5	6.7	19.4	7.4	21.4	8.1	23.5	8.9	25.7	9.6	28.0	11.3	32.8	13.1	38.1	15.1	43.7	17.1	49.8	19.4	56.2	21.7	-63.0
	2r	50	4.4	-11.7	4.9	13.1	5.4	14.5	5.9	16.0	6.5	17.5	7.1	19.2	7.7	20.9	9.1	24.5	10.5	28.4	12.1	32.6	13.8	37.1	15.5	41.9	17.4	-47.0
	2r	100	3.6	-8.7	4.0	9.7	4.4	10.8	4.8	11.9	5.3	13.1	5.8	14.3	6.3	15.5	7.4	18.2	8.6	21.2	9.9	24.3	11.2	27.6	12.7	31.2	14.2	-35.0
	3	10	6.2	-20.0	6.9	22.3	7.7	24.7	8.5	27.2	9.3	29.9	10.2	32.7	11.1	35.6	13.0	41.7	15.1	48.4	17.3	55.6	19.7	63.2	22.2	71.4	24.9	-80.0
	3	20	5.4	-15.0	6.0	16.8	6.7	18.6	7.4	20.5	8.1	22.5	8.9	24.6	9.6	26.7	11.3	31.4	13.1	36.4	15.1	41.8	17.1	47.5	19.4	53.7	21.7	-60.2
	3	50	4.4	-8.7	4.9	9.7	5.4	10.8	5.9	11.9	6.5	13.1	7.1	14.3	7.7	15.5	9.1	18.2	10.5	21.2	12.1	24.3	13.8	27.6	15.5	31.2	17.4	-35.0
	3	100	3.6	-8.7	4.0	9.7	4.4	10.8	4.8	11.9	5.3	13.1	5.8	14.3	6.3	15.5	7.4	18.2	8.6	21.2	9.9	24.3	11.2	27.6	12.7	31.2	14.2	-35.0

Wall	4	10	8.7	-9.5	9.7	10.6	10.8	11.7	11.9	12.9	13.1	14.2	14.3	15.5	15.5	16.9	18.2	19.8	21.2	22.9	24.3	26.3	27.6	30.0	31.2	33.8	35.0	37.9
	4	20	8.3	-9.1	9.3	10.1	10.3	11.2	11.4	12.4	12.5	13.6	13.6	14.8	14.8	16.2	17.4	19.0	20.2	22.0	23.2	25.3	26.4	28.7	29.8	32.4	33.4	36.4
	4	50	7.8	-8.6	8.7	-9.5	9.7	10.6	10.7	11.7	11.7	12.8	12.8	14.0	13.9	15.2	16.3	17.9	18.9	20.7	21.7	23.8	24.7	27.1	27.9	30.6	31.3	34.3
	4	100	7.4	-8.2	8.3	-9.1	9.2	10.1	10.1	11.1	11.1	12.2	12.1	13.3	13.2	14.5	15.5	17.1	18.0	19.8	20.6	22.7	23.5	25.8	26.5	29.2	29.7	32.7
	4	500	6.5	-7.3	7.3	-8.1	8.0	-9.0	8.9	-9.9	9.7	10.8	10.6	11.9	11.6	12.9	13.5	15.1	15.8	17.6	18.1	20.2	20.6	22.9	23.3	25.9	26.1	29.0
	5	10	8.7	-11.7	9.7	13.0	10.8	14.5	11.9	15.9	13.1	17.5	14.3	19.1	15.5	20.8	18.2	24.4	21.2	28.3	24.3	32.5	27.6	37.0	31.2	41.8	35.0	46.8
	5	20	8.3	-10.9	9.3	12.2	10.3	13.5	11.4	14.9	12.5	16.3	13.6	17.8	14.8	19.4	17.4	22.8	20.2	26.4	23.2	30.3	26.4	34.5	29.8	39.0	33.4	43.7
	5	50	7.8	-9.9	8.7	11.0	9.7	12.2	10.7	13.4	11.7	14.7	12.8	16.1	13.9	17.5	16.3	20.6	18.9	23.9	21.7	27.4	24.7	31.2	27.9	35.2	31.3	39.5
	5	100	7.4	-9.1	8.3	10.1	9.2	11.2	10.1	12.4	11.1	13.6	12.1	14.8	13.2	16.1	15.5	19.0	18.0	22.0	20.6	25.2	23.5	28.7	26.5	32.4	29.7	36.3
	5	500	6.5	-7.3	7.3	-8.1	8.0	-9.0	8.9	-9.9	9.7	10.8	10.6	11.9	11.6	12.9	13.6	15.1	15.8	17.6	18.1	20.2	20.6	22.9	23.3	25.9	26.1	29.0

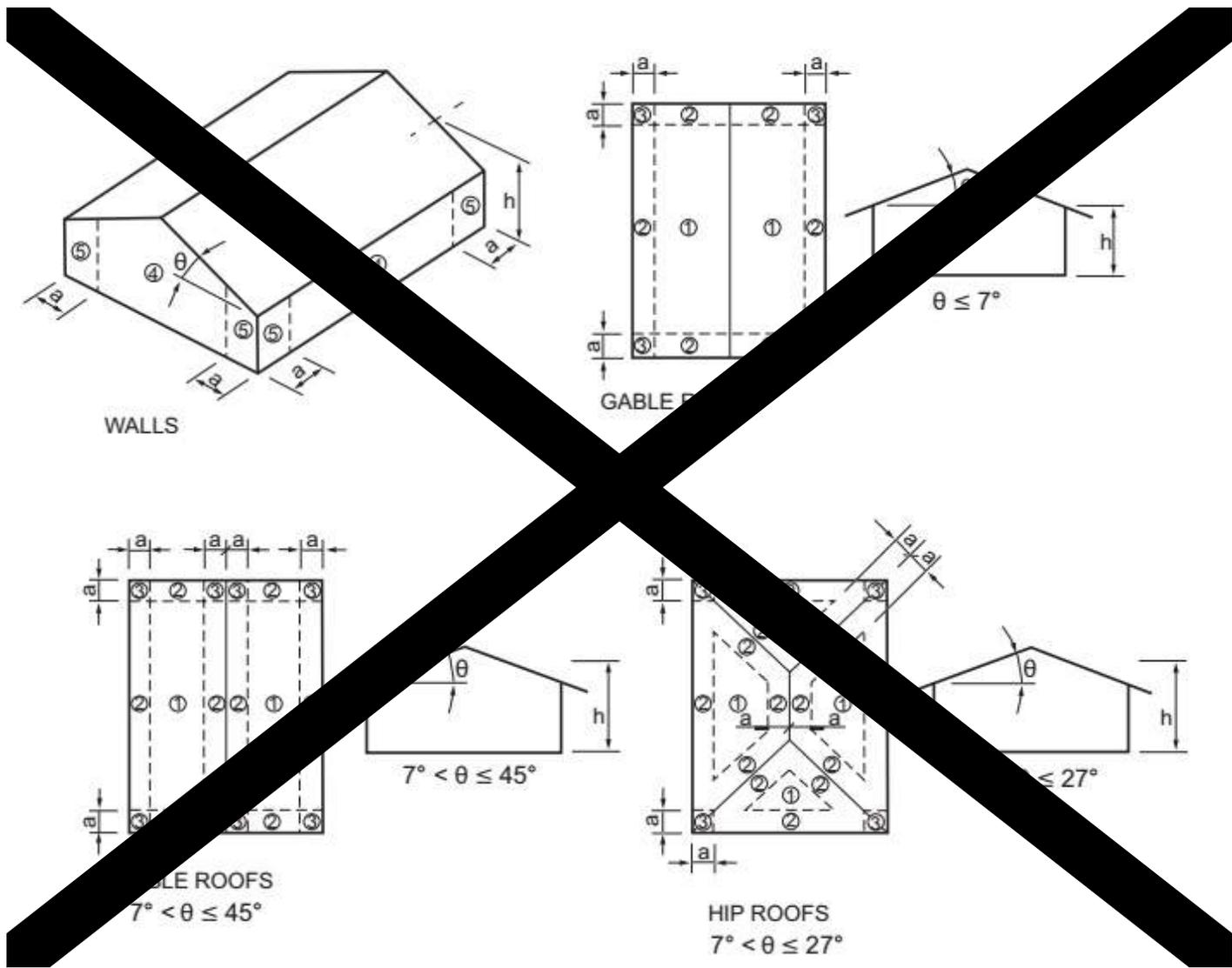
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Revise as follows:

**TABLE R301.2(3)
HEIGHT AND EXPOSURE ADJUSTMENT COEFFICIENTS FOR TABLE R301.2(2)**

MEAN ROOF HEIGHT	EXPOSURE		
	B	C	D
15	0.82 1.00	1.21	1.47
20	0.89 1.00	1.29	1.55
25	0.94 1.00	1.35	1.61
30	1.00	1.40	1.66
35	1.05	1.45	1.70
40	1.09	1.49	1.74
45	1.12	1.53	1.78
50	1.16	1.56	1.81
55	1.19	1.59	1.84
60	1.22	1.62	1.87

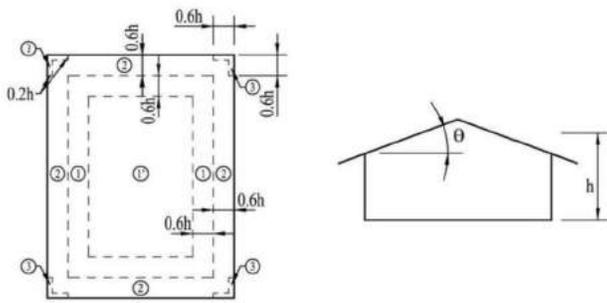
Delete and substitute as follows:



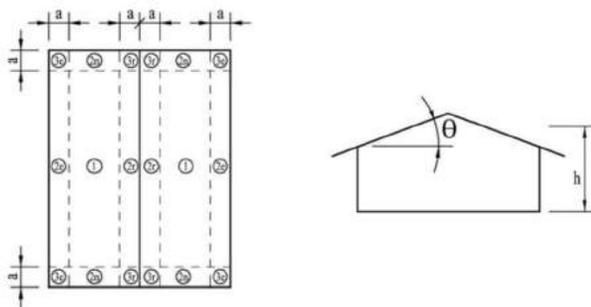
For SI: 1 foot = 304.8 mm, 1 degree = 0.0175 rad.

Note: $a = 4$ feet in all cases.

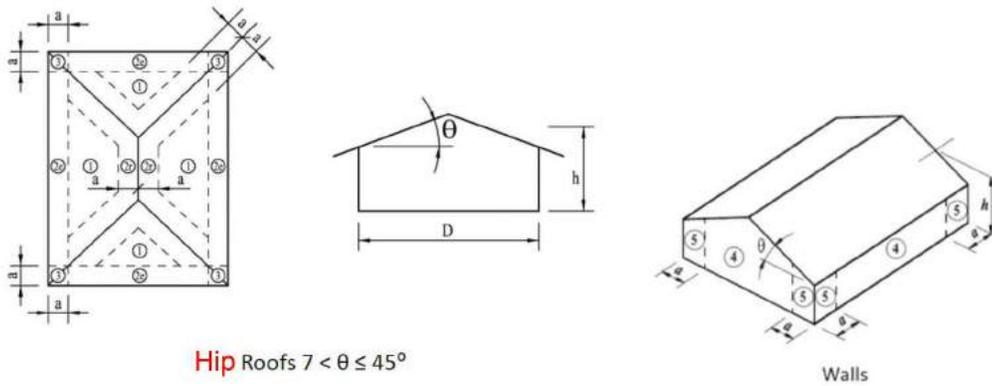
FIGURE R301.2(8)
COMPONENT AND CLADDING PRESSURE ZONES



Gable and Flat Roofs $\theta \leq 7^\circ$



Gable Roofs $7 < \theta \leq 45^\circ$



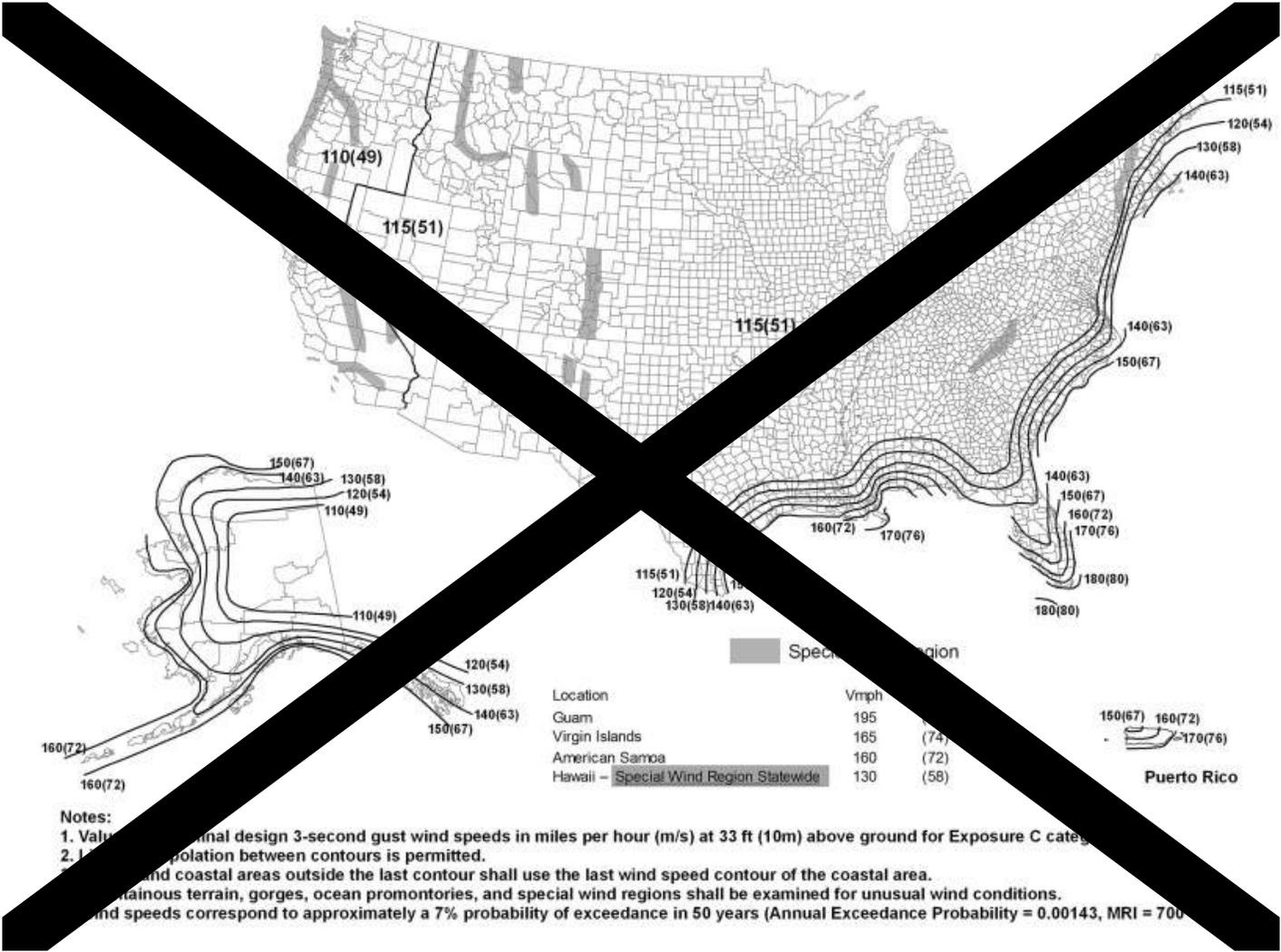
Hip Roofs $7 < \theta \leq 45^\circ$

Walls

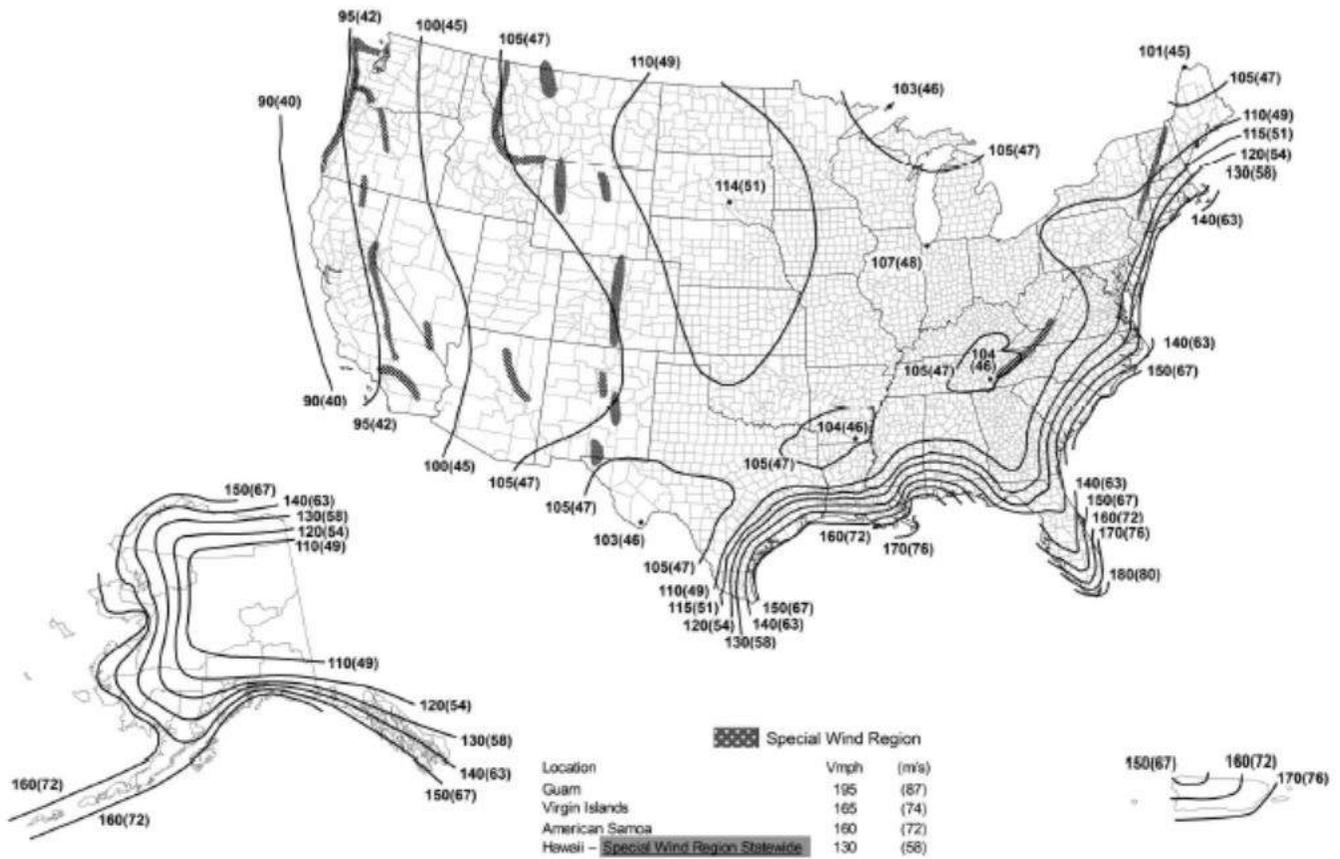
For SI: 1 foot = 304.8 mm, 1 degree = 0.0175 rad.

Note: a = 4 feet in all cases.

FIGURE R301.2(8)
COMPONENT AND CLADDING PRESSURE ZONES



**FIGURE R301.2(5)A
 ULTIMATE DESIGN WIND SPEEDS**

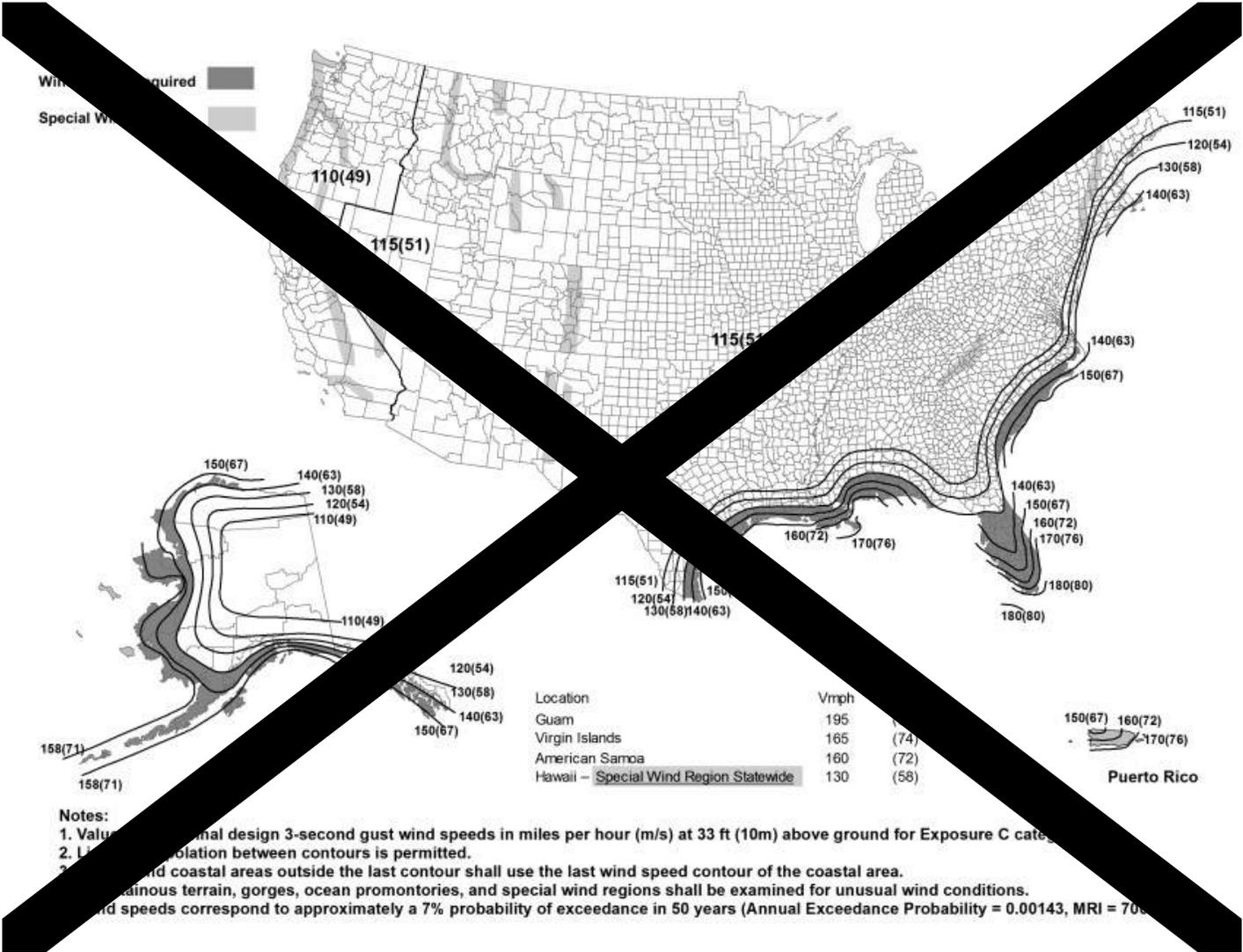


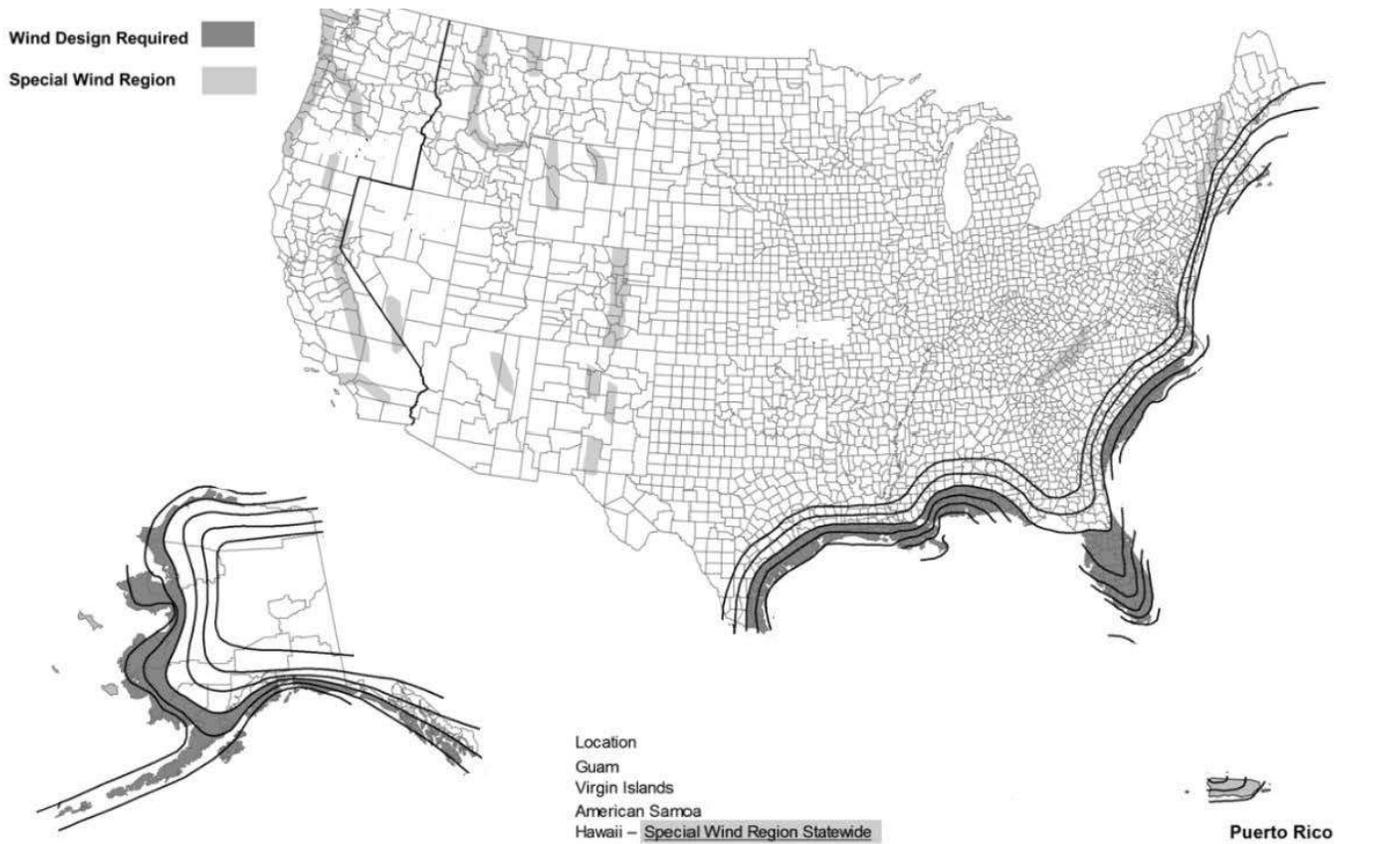
Notes:

1. Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33 ft (10m) above ground for Exposure C category.
2. Linear interpolation is permitted between contours. Point values are provided to aid with interpolation.
3. Islands, coastal areas, and land boundaries outside the last contour shall use the last wind speed contour.
4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.
5. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (Annual Exceedance Probability = 0.00143, MRI = 700 Years).
6. Location-specific basic wind speeds shall be permitted to be determined using www.atcouncil.org/windspeed

**FIGURE R301.2(5)A
ULTIMATE DESIGN WIND SPEEDS**

Revise as follows:





**FIGURE R301.2(5)B
 REGIONS WHERE WIND DESIGN IS REQUIRED**

Reason: This proposal coordinates the wind design criteria in the IRC with currently referenced 2016 edition of the loading standard *ASCE 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7-16).

There are two primary proposed changes to the IRC for coordination with the revised wind loading criteria in ASCE 7-16: (1) updated basic wind speed maps for Risk Category II buildings and (2) revised roof component and cladding loads for buildings with mean roof heights less than or equal to 60 feet.

(1) Updated Map:

In ASCE 7-16, wind speeds in non-hurricane prone areas of the contiguous United States have been revised using contours to better reflect the regional variation in the extreme wind climate. Point values are provided to aid interpolation, in a style similar to that used for the other hazard maps in ASCE 7. Summaries of the data and methods used to estimate both the non-hurricane and hurricane wind speeds are provided in the Commentary to ASCE 7-16 Chapter 26 (attached to this proposal). The wind speeds in the hurricane-prone region have not changed from ASCE 7-10, the previous edition. Revised Figure R301.2(4)A is the wind speed map from ASCE 7-16 for Risk Category II Buildings.

Update to R301.2(4)B removes the notes, only.

(2) Revised Tables:

The simplified component and cladding loads in Table R301.2(2) are proposed to be revised for correlation with the new roof component and cladding loads for buildings with mean roof heights less than or equal to 60 feet. The roof zones and pressure coefficients in ASCE 7-16 Figure 30.4-2 (which includes Figures 30.4-2A through

30.4-2I) have been revised based on an analysis of an extensive wind tunnel database. All source data used in the study are publically accessible through the National Institute of Standards and Technology (NIST) website. Compared to previous versions of ASCE 7, the pressure coefficients have been increased, and are now more consistent with coefficients for buildings higher than 60 feet. Roof zones sizes are also modified from those of earlier versions in order to minimize the increase of pressure coefficients in Zones 1 and 2. The data indicate that for these low-rise buildings, the size of the roof zones depend primarily on the building height, h . The G_Cp values given in ASCE 7-16 Figures 30.4-2A through 30.4-2I are associated with wind tunnel tests performed in both Exposure B and C. For ASCE 7-16 Figure 30.4-2A, the coefficients apply equally to Exposure B and C, based on wind tunnel data that show insignificant difference in (G_Cp) for Exposure B and C. Consequently, the truncation for K_z in Table 30.3-1 of ASCE 7-10 is not required for building below 30 feet, and the lower K_z values may be used as shown revised in Figure R301.2(3) of the IRC. More explanation is found in the Commentary to ASCE 7-16 Chapter 30 (attached to this proposal).

NOTE: Due to cdpAccess functionality, the revised table was added as a NEW table, however, it is intended to replace the existing R301.2(2). Also, in the NEW table, only footnotes f and g are NEW. The footnotes a to e remain unchanged from previous IRC, but only look new due to cdpAccess legislative format editor.

Cost Impact: The code change proposal will increase the cost of construction Component and cladding loads for roofs in buildings with mean roof heights less than or equal to 60 feet are higher for some roof slopes and zones than for similar roof slopes in 2018 IRC. Construction costs will increase for roofing products and decking for some areas of the country in the hurricane-prone region. However, for much of the country outside the hurricane-prone region, the wind speeds are actually lower and therefore even with an increase in G_Cp , the loads do not change and there is no impact on costs. Also, loads for wall components such as windows, doors, siding, etc., are lower for mean roof height under 30 feet. Loads on Main Wind Force Resisting Systems, such as shear walls and diaphragms, are decreasing in areas where the design wind speed has decreased.

Proposal # 5220

RB35-19

RB36-19

IRC@: R301.2.1, TABLE R301.2.1.5.1, TABLE R602.10.1.3, TABLE R602.10.3(1), TABLE R602.10.6.4, TABLE R703.3.2, TABLE AH106.4(1), FIGURE AH106.4.1

Proponent: Jennifer Goupil, American Society of Civil Engineers (ASCE), representing American Society of Civil Engineers (ASCE) (jgoupil@asce.org); T. Eric Stafford, Insurance Institute for Business and Home Safety (testafford@charter.net); Don Scott, PCS Structural Solutions, representing Representing National Council of Structural Engineers Association (dscott@pcs-structural.com)

2018 International Residential Code

Revise as follows:

R301.2.1 Wind design criteria. Buildings and portions thereof shall be constructed in accordance with the wind provisions of this code using the ultimate design wind speed in Table R301.2(1) as determined from Figure R301.2(5)A. The structural provisions of this code for wind loads are not permitted where wind design is required as specified in Section R301.2.1.1. Where different construction methods and structural materials are used for various portions of a building, the applicable requirements of this section for each portion shall apply. Where not otherwise specified, the wind loads listed in Table R301.2(2) adjusted for height and exposure using Table R301.2(3) shall be used to determine design load performance requirements for wall coverings, curtain walls, roof coverings, exterior windows, skylights, garage doors and exterior doors. Asphalt shingles shall be designed for wind speeds in accordance with Section R905.2.4. A continuous load path shall be provided to transmit the applicable uplift forces in Section R802.11.1 from the roof assembly to the foundation. Where ultimate design wind speeds in Figure R301.2(4)A are less than the lowest wind speed indicated in the prescriptive provisions of this code, the lowest wind speed indicated in the prescriptive provision of this code shall be used.

**TABLE R301.2.1.5.1
ULTIMATE DESIGN WIND SPEED MODIFICATION FOR TOPOGRAPHIC WIND EFFECT^{a, b}**

ULTIMATE DESIGN WIND SPEED FROM FIGURE R301.2(5)A (mph)	AVERAGE SLOPE OF THE TOP HALF OF HILL, RIDGE OR ESCARPMENT (percent)						
	0.10	0.125	0.15	0.175	0.20	0.23	0.25
	Required ultimate design wind speed-up, modified for topographic wind speed-up (mph)						
95	114	119	123	127	131	137	140
100	120	125	129	134	138	144	147
105	126	131	135	141	145	151	154
110	132	137	142	147	152	158	162
115	138	143	148	154	159	165	169
120	144	149	155	160	166	172	176
130	156	162	168	174	179	NA	NA
140	168	174	181	NA	NA	NA	NA
150	180	NA	NA	NA	NA	NA	NA

For SI: 1 mile per hour = 0.447 m/s, 1 foot = 304.8 mm.

NA = Not Applicable.

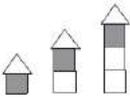
- a. Table applies to a feature height of 500 feet or less and dwellings sited a distance equal or greater than half the feature height.
- b. Where the ultimate design wind speed as modified by Table R301.2.1.5.1 equals or exceeds 140 miles per hour, the building shall be considered as “wind design required” in accordance with Section R301.2.1.1.

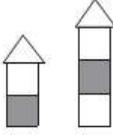
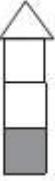
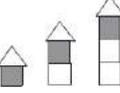
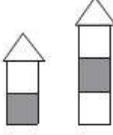
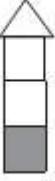
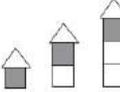
**TABLE R602.10.1.3
BRACED WALL LINE SPACING**

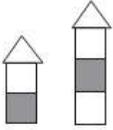
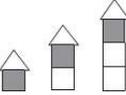
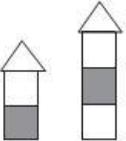
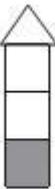
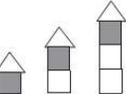
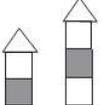
APPLICATION	CONDITION	BUILDING TYPE	BRACED WALL LINE SPACING CRITERIA	
			Maximum Spacing	Exception to Maximum Spacing
Wind bracing	Ultimate design wind speed 100 \leq 140 mph	Detached, townhouse	60 feet	None
Seismic bracing	SDC A – C	Detached	Use wind bracing	
	SDC A – B	Townhouse	Use wind bracing	
	SDC C	Townhouse	35 feet	Up to 50 feet when length of required bracing per Table R602.10.3(3) is adjusted in accordance with Table R602.10.3(4).
	SDC D ₀ , D ₁ , D ₂	Detached, townhouses, one- and two-story only	25 feet	Up to 35 feet to allow for a single room not to exceed 900 square feet. Spacing of all other braced wall lines shall not exceed 25 feet.
	SDC D ₀ , D ₁ , D ₂	Detached, townhouse	25 feet	Up to 35 feet when length of required bracing per Table R602.10.3(3) is adjusted in accordance with Table R602.10.3(4).

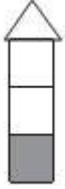
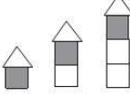
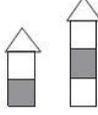
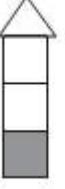
For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m², 1 mile per hour = 0.447 m/s.

**TABLE R602.10.3(1)
BRACING REQUIREMENTS BASED ON WIND SPEED**

• EXPOSURE CATEGORY B • 30-FOOT MEAN ROOF HEIGHT • 10-FOOT WALL HEIGHT • 2 BRACED WALL LINES			MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE ^a			
Ultimate Design Wind Speed (mph)	Story Location	Braced Wall Line Spacing ^c (feet)	Method LIB ^b	Method GB	Methods DWB, WSP, SFB, PBS, PCP, HPS, BV-WSP, ABW, PFH, PFC, CS-SFB	Methods CS-WSP, CS-G, CS-PF
		10	2.5	2.5	1.5	1.5
		20	4.5	4.5	2.5	2.5
		30	6.5	6.5	4.0	3.5
		40	8.5	8.5	5.0	4.0
		50	10.5	10.5	6.0	5.0

< 95 mph		60	12.5	12.5	7.0	6.0
		10	5.0	5.0	3.0	2.5
		20	8.5	8.5	5.0	4.5
		30	12.5	12.5	7.0	6.0
		40	16.0	16.0	9.5	8.0
		50	20.0	20.0	11.5	10.0
		60	23.5	23.5	13.5	11.5
		10	NP	7.0	4.0	3.5
		20	NP	13.0	7.5	6.5
		30	NP	18.5	10.5	9.0
		40	NP	24.0	13.5	11.5
		50	NP	29.5	17.0	14.5
		60	NP	35.0	20.0	17.0
	≤ 110		10	3.5	3.5	2.0
20			6.0	6.0	3.5	3.0
30			8.5	8.5	5.0	4.5
40			11.5	11.5	6.5	5.5
50			14.0	14.0	8.0	7.0
60			16.5	16.5	9.5	8.0
		10	6.5	6.5	3.5	3.0
		20	11.5	11.5	6.5	5.5
		30	16.5	16.5	9.5	8.0
		40	21.5	21.5	12.5	10.5
		50	26.5	26.5	15.5	13.0
		60	31.5	31.5	18.0	15.5
		10	NP	9.5	5.5	4.5
		20	NP	17.0	10.0	8.5
		30	NP	24.5	14.0	12.0
		40	NP	32.0	18.5	15.5
		50	NP	39.5	22.5	19.0
		60	NP	46.5	26.5	23.0
	10	3.5	3.5	2.0	2.0	
	20	6.5	6.5	3.5	3.5	
	30	9.5	9.5	5.5	4.5	
	40	12.5	12.5	7.0	6.0	
	50	15.0	15.0	9.0	7.5	
	60	18.0	18.0	10.5	9.0	

≤ 115		10	7.0	7.0	4.0	3.5
		20	12.5	12.5	7.5	6.5
		30	18.0	18.0	10.5	9.0
		40	23.5	23.5	13.5	11.5
		50	29.0	29.0	16.5	14.0
		60	34.5	34.5	20.0	17.0
		10	NP	10.0	6.0	5.0
		20	NP	18.5	11.0	9.0
		30	NP	27.0	15.5	13.0
		40	NP	35.0	20.0	17.0
		50	NP	43.0	24.5	21.0
		60	NP	51.0	29.0	25.0
≤ 120		10	4.0	4.0	2.5	2.0
		20	7.0	7.0	4.0	3.5
		30	10.5	10.5	6.0	5.0
		40	13.5	13.5	8.0	6.5
		50	16.5	16.5	9.5	8.0
		60	19.5	19.5	11.5	9.5
		10	7.5	7.5	4.5	3.5
		20	14.0	14.0	8.0	7.0
		30	20.0	20.0	11.5	9.5
		40	25.5	25.5	15.0	12.5
		50	31.5	31.5	18.0	15.5
		60	37.5	37.5	21.5	18.5
		10	NP	11.0	6.5	5.5
		20	NP	20.5	11.5	10.0
		30	NP	29.0	17.0	14.5
		40	NP	38.0	22.0	18.5
		50	NP	47.0	27.0	23.0
		60	NP	55.5	32.0	27.0
≤ 130		10	4.5	4.5	2.5	2.5
		20	8.5	8.5	5.0	4.0
		30	12.0	12.0	7.0	6.0
		40	15.5	15.5	9.0	7.5
		50	19.5	19.5	11.0	9.5
		60	23.0	23.0	13.0	11.0
		10	8.5	8.5	5.0	4.5
		20	16.0	16.0	9.5	8.0
		30	23.0	23.0	13.5	11.5
		40	30.0	30.0	17.5	15.0

		50	37.0	37.0	21.5	18.0
		60	44.0	44.0	25.0	21.5
		10	NP	13.0	7.5	6.5
		20	NP	24.0	13.5	11.5
		30	NP	34.5	19.5	17.0
		40	NP	44.5	25.5	22.0
		50	NP	55.0	31.5	26.5
		60	NP	65.0	37.5	31.5
< 140		10	5.5	5.5	3.0	2.5
		20	10.0	10.0	5.5	5.0
		30	14.0	14.0	8.0	7.0
		40	18.0	18.0	10.5	9.0
		50	22.5	22.5	13.0	11.0
		60	26.5	26.5	15.0	13.0
		10	10.0	10.0	6.0	5.0
		20	18.5	18.5	11.0	9.0
		30	27.0	27.0	15.5	13.0
		40	35.0	35.0	20.0	17.0
		50	43.0	43.0	24.5	21.0
		60	51.0	51.0	29.0	25.0
		10	NP	15.0	8.5	7.5
		20	NP	27.5	16.0	13.5
		30	NP	39.5	23.0	19.5
		40	NP	51.5	29.5	25.0
		50	NP	63.5	36.5	31.0
		60	NP	75.5	43.0	36.5

2030

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s.

NP = Not Permitted.

- Linear interpolation shall be permitted.
- Method LIB shall have gypsum board fastened to not less than one side with nails or screws in accordance with Table R602.3(1) for exterior sheathing or Table R702.3.5 for interior gypsum board. Spacing of fasteners at panel edges shall not exceed 8 inches.
- Where three or more parallel braced wall lines are present and the distances between adjacent braced wall lines are different, the average dimension shall be permitted to be used for braced wall line spacing.

TABLE R602.10.6.4

**TENSION STRAP CAPACITY FOR RESISTING WIND PRESSURES PERPENDICULAR TO METHODS PFH,
PFG AND CS-PF BRACED WALL PANELS^a**

Portions of table not shown remain unchanged.

MINIMUM WALL STUD FRAMING NOMINAL SIZE AND GRADE	MAXIMUM PONY WALL HEIGHT (feet)	MAXIMUM TOTAL WALL HEIGHT (feet)	MAXIMUM OPENING WIDTH (feet)	TENSION STRAP CAPACITY REQUIRED (pounds) ^a				
				Ultimate Design Wind Speed V _{ult} (mph)				
				≤110	115	130	≤110	115
				Exposure B			Exposure	

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s.

DR = Design Required.

- a. Straps shall be installed in accordance with manufacturer's recommendations.

**TABLE R703.3.2
LIMITS FOR ATTACHMENT PER TABLE R703.3(1)**

MAXIMUM MEAN ROOF HEIGHT			
Ultimate Wind Speed (mph 3-second gust)	Exposure		
	B	C	D
95	NL	NL	NL
100	NL	NL	NL
105	NL	NL	NL
110	NL	NL	40'
115	NL	50'	20'
120	NL	30'	DR
130	60'	15'	DR
140	35'	DR	DR

For SI: 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s.

NL = Not Limited by Table R703.3.2, DR = Design Required.

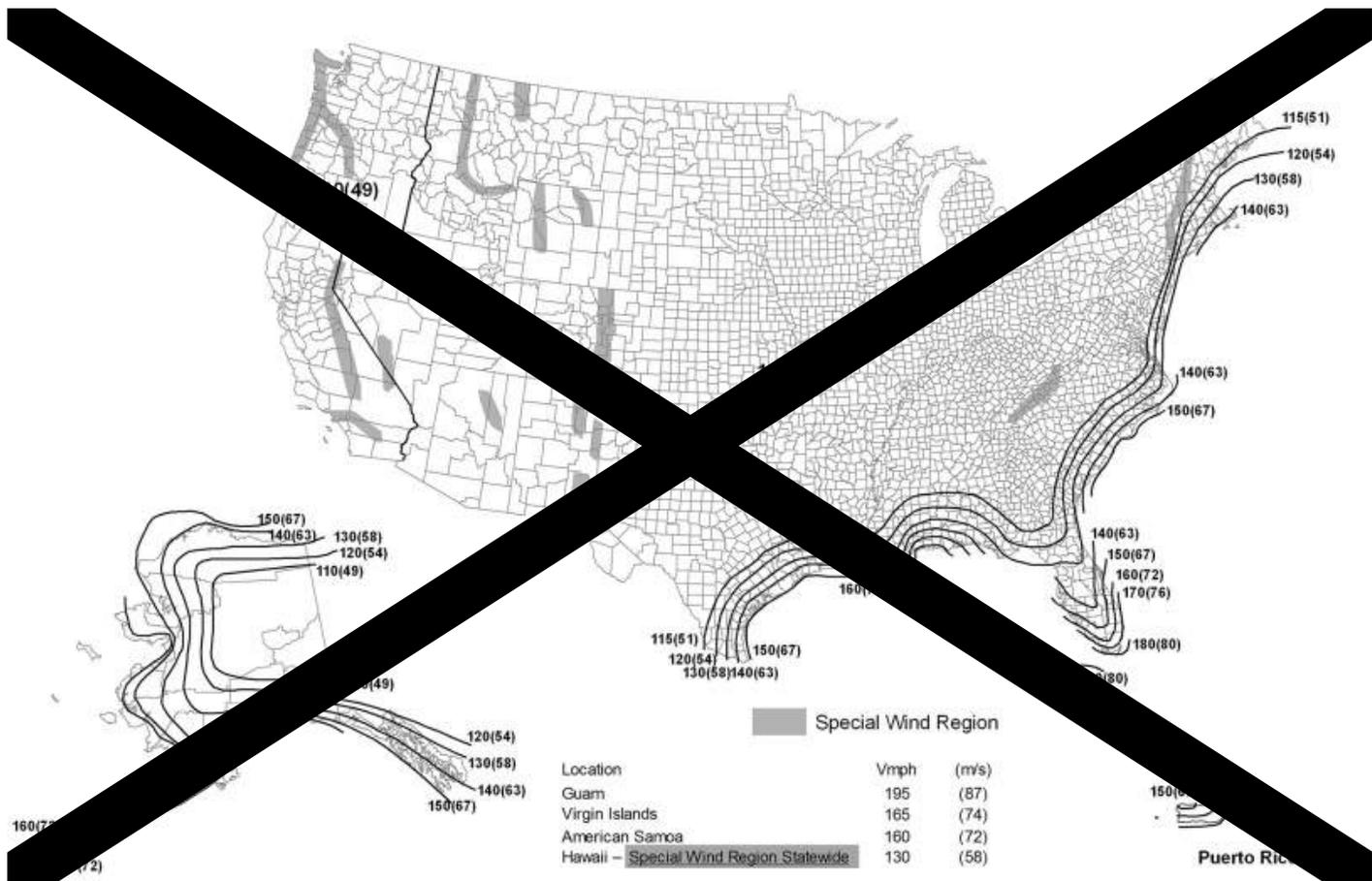
**TABLE AH106.4(1)
DESIGN WIND PRESSURES FOR SCREEN ENCLOSURE FRAMING^{a, b, e, f, g, h}**

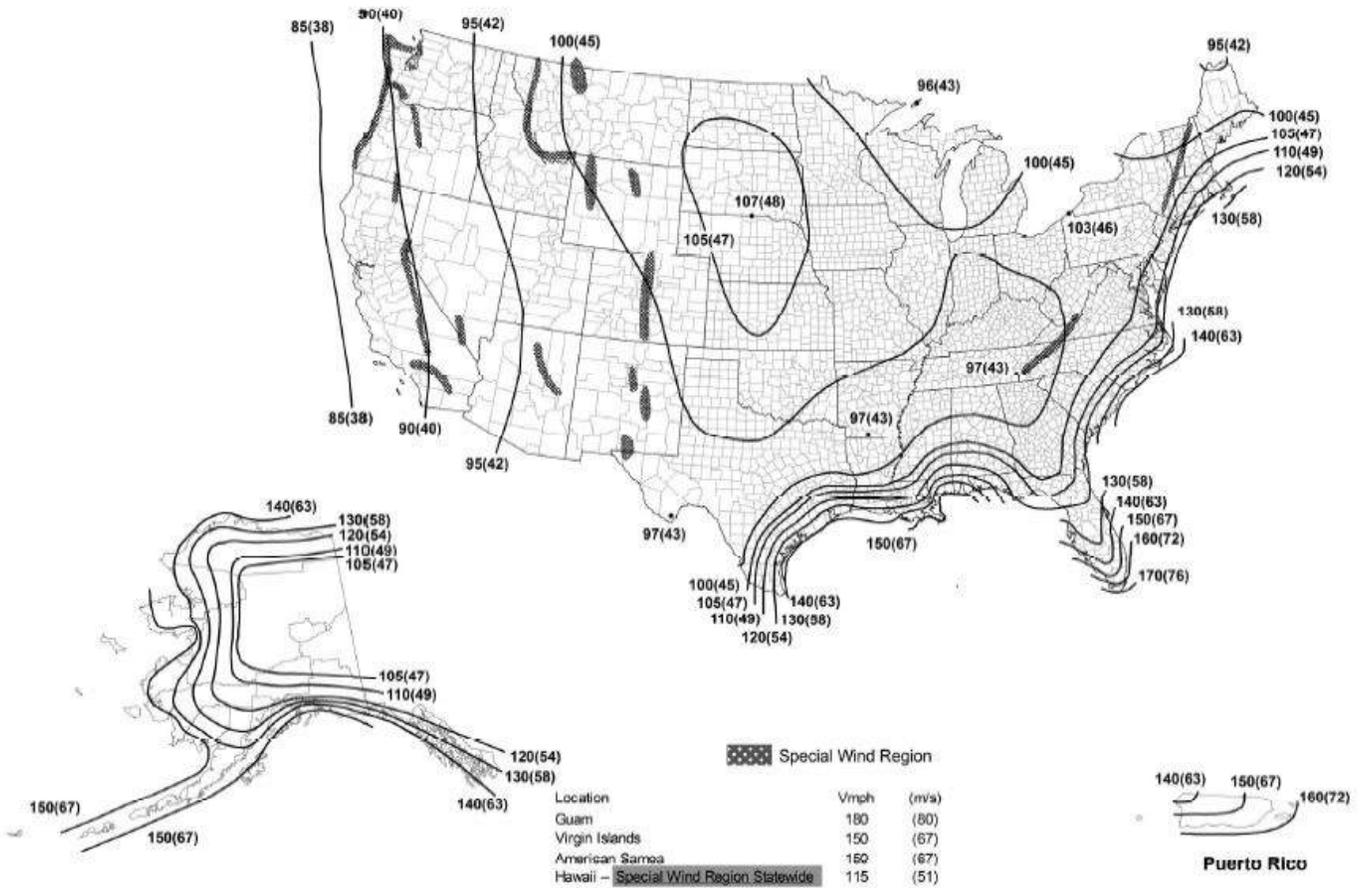
LOAD CASE	WALL	ULTIMATE DESIGN WIND SPEED, V _{ult} (mph)											
		90	95	100	105	110	120	130	140	150	160	170	180
		Exposure Category B Design Pressure (psf)											
A ^c	Windward and leeward walls (flow thru) and windward wall (nonflow thru) L/W = 0-1	5	6	6	7	8	9	11	13	14	16	18	21

A ^c	Windward and leeward walls (flow thru) and windward wall (nonflow thru) L/W = 2	<u>6</u>	<u>7</u>	7	8	9	11	12	14	16	19	21	24
B ^d	Windward: Nongable roof	<u>7</u>	<u>8</u>	9	10	11	13	15	18	21	23	26	30
B ^d	Windward: Gable roof	<u>10</u>	<u>10</u>	11	13	14	16	19	22	26	29	33	37
ROOF													
All ^e	Roof-screen	<u>2</u>	<u>2</u>	2	3	3	3	4	4	5	6	7	7
All ^e	Roof-solid	<u>6</u>	<u>6</u>	7	8	8	10	12	13	15	18	20	22

For SI: 1 inch = 25.4 mm, 1 mile per hour = 0.44 m/s, 1 pound per square foot = 0.0479 kPa, 1 foot = 304.8 mm.

- a. Design pressure shall be not less than 10 psf in accordance with Section AH106.4.1.
- b. Loads are applicable to screen enclosures with a mean roof height of 30 feet or less in Exposure B. For screen enclosures of different heights or exposure, the pressures given shall be adjusted by multiplying the table pressure by the adjustment factor given in Table AH106.4(2).
- c. For Load Case A flow thru condition, the pressure given shall be applied simultaneously to both the upwind and downwind screen walls acting in the same direction as the wind. The structure shall be analyzed for wind coming from the opposite direction. For the nonflow thru condition, the screen enclosure wall shall be analyzed for the load applied acting toward the interior of the enclosure.
- d. For Load Case B, the table pressure multiplied by the projected frontal area of the screen enclosure is the total drag force, including drag on screen surfaces parallel to the wind, that must be transmitted to the ground. Use Load Case A for members directly supporting the screen surface perpendicular to the wind. Load Case B loads shall be applied only to structural members that carry wind loads from more than one surface.
- e. The roof structure shall be analyzed for the pressure given occurring both upward and downward.
- f. Table pressures are MWFRS loads. The design of solid roof panels and their attachments shall be based on component and cladding loads for enclosed or partially enclosed structures as appropriate.
- g. Table pressures apply to 20-inch by 20-inch by 0.013-inch mesh screen. For 18-inch by 14-inch by 0.013-inch mesh screen, pressures on screen surfaces shall be permitted to be multiplied by 0.88. For screen densities greater than 20 inches by 20 inches by 0.013 inch, pressures for enclosed buildings shall be used.
- h. Linear interpolation shall be permitted.





Notes:

1. Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33 ft (10m) above ground for Exposure C category.
2. Linear interpolation is permitted between contours. Point values are provided to aid with interpolation.
3. Islands, coastal areas, and land boundaries outside the last contour shall use the last wind speed contour.
4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.
5. Wind speeds correspond to approximately a 15% probability of exceedance in 50 years (Annual Exceedance Probability = 0.00333, MRI = 300 Years).
6. Location-specific basic wind speeds shall be permitted to be determined using www.atcouncil.org/windspeed

Notes:

1. Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33 ft (10m) above ground for Exposure C category.
2. Linear interpolation between contours is permitted.
3. Islands and coastal areas outside the last contour shall use the last wind speed contour of the coastal area.
4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.
5. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (Annual Exceedance Probability = 0.00143, MRI = 700 Years).

**FIGURE AH106.4.1
ULTIMATE DESIGN WIND SPEEDS FOR PATIO COVERS AND SCREEN ENCLOSURES**

Reason: This proposal is a coordination proposal to accompany the proposal to update the wind map in Figure R301.2(4)A to the currently referenced ASCE 7-16 standard. As has been stated, the ASCE 7-16 wind maps include many areas of the country where wind speeds decreased below the speeds of the previous maps. To coordinate the IRC with the areas of lower wind speeds, this proposal adds or modifies existing provisions to account for these lower speeds. This proposal includes several changes that are bundled together in one proposal because they all reflect the effort to accommodate for these lower speeds in the existing tables and

figures. Each change within this proposal is explained below.

R301.2.1 Wind design criteria.

The last sentence was added to acknowledge the lower speeds and permit use of the prescriptive provisions.

Table R301.2.1.5.1 Ultimate Design Wind Speed Modification for Topographic Wind Effect

Three new lines are added to this table to accommodate the lower wind speeds of 95, 100, and 105mph.

Table R602.10.1.3 Braced Wall Line Spacing

Revision to this table includes removing the lower boundary of 100 mph to account for lower speeds now included on the map.

Table R602.10.3(1) Bracing Requirements Based on Wind Speed

This additional data is added to accommodate the lower wind speeds of <95mph.

Table R602.10.6.4 Tension Strap Capacity for Resisting Wind Pressures Perpendicular to Methods PFH, PFG and CS-PF Braces Wall Panels

The small revision to this table is to add “<=” to the lowest wind speed of 110, for both Exposure B and C, to indicate this is appropriate for use with lower wind speeds.

Table R703.3.2 Limits for Attachment Per Table R703.3(1)

This table was updated to include new lines for lower wind speeds of 95, 100, 105, and 110.

Table AH106.4(1) Design Wind Pressures for Screen Enclosures Framing

This update adds columns for lower wind speeds of 90 and 95 mph.

Figure AH106.4.1 Ultimate Design Wind Speeds for Patio Covers and Screen Enclosures

This updates the map to the ASCE 7-16 RC I MRI=300 years map.

Cost Impact: The code change proposal will decrease the cost of construction

By updating and adding in prescriptive provisions to reflect the lower wind speeds that appear in some areas of the country, this proposal on its own will lower construction costs. However, as this is a coordination proposal, the impacts of this proposal will depend on the situation and overall design.

Proposal # 5476

RB36-19

RB37-19

IRC@: R301.2.1.1

Proponent: T. Eric Stafford, representing Insurance Institute for Business and Home Safety
(testafford@charter.net)

2018 International Residential Code

Revise as follows:

R301.2.1.1 Wind limitations and wind design required. The wind provisions of this code shall not apply to the design of buildings where wind design is required in accordance with Figure R301.2(5)B, or where the ultimate design wind speed, V_{ult} , in Figure R301.2(5)A equals or exceeds 140 mph in a special wind region.

Exceptions:

1. For concrete construction, the wind provisions of this code shall apply in accordance with the limitations of Sections R404 and R608.
2. For structural insulated panels, the wind provisions of this code shall apply in accordance with the limitations of Section R610.
3. For cold-formed steel light-frame construction, the wind provisions of this code shall apply in accordance with the limitations of Sections R505, R603 and R804.

In regions where wind design is required in accordance with Figure R301.2(5)B or where the ultimate design wind speed, V_{ult} , in Figure R301.2(5)A equals or exceeds 140 mph in a special wind region, the design of buildings for wind loads shall be in accordance with one or more of the following methods:

1. *AWC Wood Frame Construction Manual (WFCM).*
2. *ICC Standard for Residential Construction in High-Wind Regions (ICC 600).*
3. *ASCE Minimum Design Loads for Buildings and Other Structures (ASCE 7).*
4. *AISI Standard for Cold-Formed Steel Framing—Prescriptive Method For One- and Two-Family Dwellings (AISI S230).*
5. International Building Code.

The elements of design not addressed by the methods in Items 1 through 5 shall be in accordance with the provisions of this code.

Where ASCE 7 or the International Building Code is used for the design of the building, the wind speed map and exposure category requirements as specified in ASCE 7 and the International Building Code shall be used.

Reason: This is one of a series of proposals to correct some errors regarding the applicability of the IRC to areas where wind speeds exceed the prescriptive provisions established by the IRC. Figure R301.2(5)B prohibits the use the prescriptive provisions in the IRC in the shaded areas of the map which are referred to as the "wind design required regions." The wind design required region in Figure R301.2(5)B essentially covers hurricane prone regions and other coastal areas where the wind speed exceeds 130 mph or 140 mph depending on location. However, the code does not explicitly prohibit the use of the prescriptive provisions in the IRC in special wind regions for any wind speed. This discrepancy is primarily due to changes in the 2015 IRC that introduced the strength design level wind speeds from ASCE 7-10 in Figure R301.2(5)A and coordinated with the wind design required map in Figure R301.2(5)B. The wind limitations in the 2012 IRC stated the following:

R301.2.1.1 Wind limitations and wind design required. The wind provisions of this code shall not apply to the design of buildings where wind design is required in accordance with Figure R301.2(4)B or where the basic wind speed from Figure R301.2(4) equals or exceeds 110 miles per hour (49 m/s).

By providing a wind speed limitation, in addition to the wind design required map, the prescriptive provisions of the IRC would have been prohibited in special wind regions where the wind speed exceeded 110 mph in the 2012 IRC. A similar limitation does not exist in the 2018 IRC. The current language in the 2018 IRC is in error and this proposal simply restores the limitation in the special wind regions that existed prior to the 2015 IRC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal will not increase the cost of construction as it simply corrects an error and restores a limitation that existed in the 2012 IRC and previous editions.

Proposal # 4711

RB37-19

RB38-19

IRC@: R301.2.1.1

Proponent: T. Eric Stafford, representing Insurance Institute for Business and Home Safety
(testafford@charter.net)

2018 International Residential Code

Revise as follows:

R301.2.1.1 Wind limitations and wind design required. ~~The wind provisions of this code shall not apply to the design of buildings where wind design is required in accordance with Figure R301.2(5)B.~~

Exceptions:

- ~~1. For concrete construction, the wind provisions of this code shall apply in accordance with the limitations of Sections R404 and R608.~~
- ~~2. For structural insulated panels, the wind provisions of this code shall apply in accordance with the limitations of Section R610.~~
- ~~3. For cold-formed steel light-frame construction, the wind provisions of this code shall apply in accordance with the limitations of Sections R505, R603 and R804.~~

In regions where wind design is required in accordance with Figure R301.2(5)B, the design of buildings for wind loads shall be in accordance with one or more of the following methods:

1. *AWC Wood Frame Construction Manual (WFCM).*
2. *ICC Standard for Residential Construction in High-Wind Regions (ICC 600).*
3. *ASCE Minimum Design Loads for Buildings and Other Structures (ASCE 7).*
4. *AISI Standard for Cold-Formed Steel Framing—Prescriptive Method For One- and Two-Family Dwellings (AISI S230).*
5. *International Building Code.*

The elements of design not addressed by the methods in Items 1 through 5 shall be in accordance with the provisions of this code.

Where ASCE 7 or the *International Building Code* is used for the design of the building, the wind speed map and exposure category requirements as specified in ASCE 7 and the *International Building Code* shall be used.

The prescriptive construction provisions of Chapters 4 through 9 of this code shall not apply to the design of buildings where wind design is required in accordance with Figure R301.2(5)B.

Exceptions:

1. For concrete construction, the provisions of this code apply in accordance with the limitations of Sections and R608.
2. For structural insulated panels, the provisions of this code shall apply in accordance with the limitations of Section R610.

3. For cold-formed steel light-frame construction, the provisions of this code shall apply in accordance with the limitations of Sections R505, R603 and R804.
4. For exterior wall coverings and soffits, the provisions of this code shall apply in accordance with the limitations of Section R703.3.2.
5. For roof coverings, the provisions of this code shall apply in accordance with Chapter 9.
6. For exterior windows and doors, the provisions of this code shall apply in accordance with Section R609.
7. The seismic requirements of Chapters 4 through 9 apply in accordance with the scope of Section R301.2.2.

Reason: This proposal is one of two proposals intended to clarify the wind limitations in the IRC. Currently, the IRC contains an assortment of requirements for wind loads scattered throughout the code. While Section R301.2.1.1 intends to limit the applicability of the IRC to areas where wind design is not required in accordance with Figure R301.2(5)B, it's not very clear what exactly applies in the IRC in regions where wind design is required. Current Section R301.2.1.1 states that the "wind provisions" of this code do not apply where wind design is required but is not clear anywhere in the code as to what the wind provisions in this code do apply to. The use of the phrase "wind provisions of this code" is very confusing. Clearly the prescriptive fastening schedule in Table R602.3(1) should not apply where wind design is required. However, it's not very clear that this table is actually part of the "wind provisions in this code." This proposal makes it clear that the prescriptive provisions in Chapters 4 through 9 do not apply where wind design is required. Provisions in the IRC that do apply to higher wind regions than indicated by Figure R301.2(5)B have been consolidated into the Exceptions to Section R301.2.1.1. The language that applies to elements of design not addressed by the methods in Items 1 through 5 of Section R301.2.1.1 is maintained by this proposal. Therefore, Section R405 (foundation drainage), Section R406 (dampproofing and waterproofing provisions), Section R702 (interior coverings), Section R806 (roof ventilation), Section R807 (attic access) and others would apply as specified in the code. Additionally, this proposal reorders the language so that the code tells the user directly what is required to be used when located in a wind design required region (WFCM, ICC 600, ASCE 7, AISI S230, and/or IBC). This improves the flow of the language and is similar to the approach used in the 2000, 2003, 2006 and 2009 IRC.

Lastly, a new exception is proposed to be added that clarifies that the seismic requirements in the code, including the scope as specified in Section R301.2.2, apply regardless.

This proposal is not intended to change any technical requirements in the IRC related to wind design. It is intended to simply clarify the wind limitations in the IRC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This code change proposal will not impact the cost of construction as it is simply a clarification.

Proposal # 4656

RB38-19

RB39-19

IRC@: R301.2.2.1.1

Proponent: Kelly Cobeen, Wiss Janney Elstner Associates, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (KCobeen@wje.com); Michael Mahoney, representing Federal Emergency Management Agency (mike.mahoney@fema.dhs.gov)

2018 International Residential Code

Revise as follows:

R301.2.2.1.1 Alternate determination of seismic design category. ~~The seismic design categories and corresponding short-period design spectral response accelerations, S_{DS} , shown in Figure R301.2(2), are based on soil Site Class D, used as an assumed default, as defined in Section 1613.2.2 of the International Building Code. If soil conditions are determined by the building official to be Site Class A, B, or D, the seismic design category and short-period design spectral response accelerations, S_{DS} , for a site shall be allowed to be determined in accordance with Figure R301.2(3), or Section 1613.2 of the International Building Code. The value of S_{DS} determined in accordance with Section 1613.2 of the International Building Code is permitted to be used to set the seismic design category in accordance with Table R301.2.2.1.1, and to interpolate between values in Tables R602.10.3(3), R603.9.2(1) and other seismic design requirements of this code.~~

Reason: The intent of this change proposal is to delete unnecessary and potentially confusing language. The proponent of this change authored Section R301.2.2.1.1 in the last code update cycle. The wording being struck has since been identified by users to be confusing. The authors have determined that the wording being struck is commentary and is not needed for proper implementation of the IRC provisions.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. No cost impact as this is an editorial change to remove potential user confusion.

Proposal # 4581

RB39-19

RB40-19

IRC@: 202 (New), R301.2.2.6

Proponent: Kelly Cobeen, Wiss Janney Elstner Associates, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (KCobeen@wje.com); Julie Furr, Rimkus Consulting Group, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (jfurr@rimkus.com); Michael Mahoney, representing Federal Emergency Management Agency (mike.mahoney@fema.dhs.gov)

2018 International Residential Code

Add new definition as follows:

CRIPPLE WALL CLEAR HEIGHT. The vertical height of a *cripple wall* from the top of the foundation to the underside of floor framing above.

Revise as follows:

R301.2.2.6 Irregular buildings. The seismic provisions of this code shall not be used for structures, or portions thereof, located in Seismic Design Categories C, D₀, D₁ and D₂ and considered to be irregular in accordance with this section. A building or portion of a building shall be considered to be irregular where one or more of the conditions defined in Items 1 through ~~7~~ 8 occur. Irregular structures, or irregular portions of structures, shall be designed in accordance with accepted engineering practice to the extent the irregular features affect the performance of the remaining structural system. Where the forces associated with the irregularity are resisted by a structural system designed in accordance with accepted engineering practice, the remainder of the building shall be permitted to be designed using the provisions of this code.

Exceptions: Fireplaces, chimneys and masonry veneer in accordance with this code.

1. **Shear wall or braced wall offsets out of plane.** Conditions where exterior shear wall lines or *braced wall panels* are not in one plane vertically from the foundation to the uppermost story in which they are required.

Exception: For wood light-frame construction, floors with cantilevers or setbacks not exceeding four times the nominal depth of the wood floor joists are permitted to support *braced wall panels* that are out of plane with *braced wall panels* below provided that all of the following are satisfied:

1. Floor joists are nominal 2 inches by 10 inches (51 mm by 254 mm) or larger and spaced not more than 16 inches (406 mm) on center.
2. The ratio of the back span to the cantilever is not less than 2 to 1.
3. Floor joists at ends of *braced wall panels* are doubled.
4. For wood-frame construction, a continuous rim joist is connected to ends of cantilever joists. Where spliced, the rim joists shall be spliced using a galvanized metal tie not less than 0.058 inch (1.5 mm) (16 gage) and 1½ inches (38 mm) wide fastened with six 16d nails on each side of the splice; or a block of the same size as the rim joist and of sufficient length to fit securely between the joist space at which the splice occurs, fastened with eight 16d nails on each side of the splice.
5. Gravity loads carried at the end of cantilevered joists are limited to uniform wall and roof loads and the reactions from headers having a span of 8 feet (2438 mm) or less.

2. Lateral support of roofs and floors. Conditions where a section of floor or roof is not laterally supported by shear walls or *braced wall lines* on all edges.

Exception: Portions of floors that do not support shear walls, braced wall panels above, or roofs shall be permitted to extend not more than 6 feet (1829 mm) beyond a shear wall or *braced wall line*.

3. Shear wall or braced wall offsets in plane. Conditions where the end of a braced wall panel occurs over an opening in the wall below and extends more than 1 foot (305 mm) horizontally past the edge of the opening. This provision is applicable to shear walls and braced wall panels offset in plane and to braced wall panels offset out of plane in accordance with the exception to Item 1.

Exception: For wood light-frame wall construction, one end of a *braced wall panel* shall be permitted to extend more than 1 foot (305 mm) over an opening not more than 8 feet (2438 mm) in width in the wall below provided that the opening includes a header in accordance with all of the following:

1. The building width, loading condition and framing member species limitations of Table R602.7(1) shall apply.
 2. The header is composed of:
 - 2.1. Not less than one 2 × 12 or two 2 × 10 for an opening not more than 4 feet (1219 mm) wide.
 - 2.2. Not less than two 2 × 12 or three 2 × 10 for an opening not more than 6 feet (1829 mm) in width.
 - 2.3. Not less than three 2 × 12 or four 2 × 10 for an opening not more than 8 feet (2438 mm) in width.
 3. The entire length of the *braced wall panel* does not occur over an opening in the wall below.
4. Floor and roof opening. Conditions where an opening in a floor or roof exceeds the lesser of 12 feet (3658 mm) or 50 percent of the least floor or roof dimension.
 5. Floor level offset. Conditions where portions of a floor level are vertically offset.

Exceptions:

1. Framing supported directly by continuous foundations at the perimeter of the building.
 2. For wood light-frame construction, floors shall be permitted to be vertically offset where the floor framing is lapped or tied together as required by Section R502.6.1.
6. Perpendicular shear wall and wall bracing. Conditions where shear walls and *braced wall lines* do not occur in two perpendicular directions.
 7. Wall bracing in stories containing masonry or concrete construction. Conditions where stories above *grade plane* are partially or completely braced by wood wall framing in accordance with Section R602 or cold-formed steel wall framing in accordance with Section R603 include masonry or concrete construction. Where this irregularity applies, the entire story shall be designed in accordance with accepted engineering practice.

Exception: Fireplaces, chimneys and masonry veneer in accordance with this code.

8. Hillside Light-Frame Construction. Light-frame construction in which both Items 1 and 2 below apply:

1. The grade slope exceeds 1 vertical in 5 horizontal where averaged across the full length of any side of the dwelling, and
2. The tallest *cripple wall clear height* exceeds 7'-0", or where a post and beam

system occurs at the dwelling perimeter, the post and beam system tallest post clear height exceeds 7'-0".

Exception : Light-frame construction in which the lowest framed floor is supported directly on concrete or masonry walls over the full length of all sides except the downhill side of the dwelling need not be considered an irregular dwelling under Item 8.

Reason: As part of work contributing to FEMA P-1100 (Vulnerability-Based Seismic Assessment and Retrofit of One- and Two-Family Dwellings Volume 1 - Prestandard), it was identified that for light-frame dwellings on steep hillsides (Figure 1), adequate seismic performance does not occur when seismic design is based on typical seismic force distribution assumptions (tributary area, flexible diaphragm). Whether loading is in the cross-slope or out-of-hill direction (Figure 2), seismic forces follow the stiffest load path to the uphill foundation, rather than distributing uniformly to all the bracing walls in the way assumed in development of IRC seismic bracing provisions. For this reason, design using the IRC bracing provisions will not provide adequate seismic performance. This change proposal triggers an engineered lateral force design for hillside dwellings by adding the hillside dwelling configuration to the already existing list of configurations deemed to be irregular for seismic design purposes.

This dwelling configuration was illustrated to be vulnerable in the 1994 Northridge, California Earthquake. The Earthquake Spectra Northridge Earthquake Reconnaissance Report (Volume 2, EERI, 1996) reported 117 significantly damaged hillside dwellings of the bearing wall type and 40 of the post and beam (stilt) type. Fifteen dwellings were reported to have collapsed or were so near collapse that they were immediately demolished and another fifteen came close to collapsing. HUD (1994) also reported significant damage to hillside dwellings. As examples of vulnerable hillside dwelling performance, Figure 3 illustrates a dwelling that pulled about six inches away from the uphill foundation, but did not collapse, and Figure 4 illustrates one of the collapsed dwellings.

Blaney et. Al (2018), illustrates results from numerical studies used in development of FEMA P-1100. Figure 18 of this reference indicates that for a studied hillside dwelling, the probability of collapse in the risk-adjusted maximum considered earthquake (MCE_R) was reduced by more than a factor of seven by changing from typical prescriptive bracing practice to an engineered methodology that considered the seismic response. More background on dwelling past performance and the numerical studies are found in FEMA P-1100.

The Item 1 grade slope trigger is used to limit applicability of this irregularity to dwellings that are on sites with a significant slope (Figure 5). Averaging the grade slope along the side of the dwelling is intended to focus on the overall drop in grade elevation across the dwelling and not trigger the irregularity based only on limited areas of higher grade slope. This is consistent with the numerical studies that form the basis of this proposal. For most dwellings this criterion will be evaluated by looking at each of the four primary elevations. For large and more complex dwellings, additional "sides" will need to be evaluated.

Item 2 adds a second trigger of downhill cripple wall height greater than 7'-0" (Figure 6) or downhill post clear height in post and pier dwelling (Figure 7) based on the FEMA P-1100 numerical studies. Both Items 1 and 2 need to be triggered in order to qualify for dwelling to be qualified as irregular. These triggers were observed to be the points at which damage and displacements at the uphill foundation were thought to significantly increase the likelihood of collapse.

The exception scopes out of irregularity Item 8 dwellings that have full-height concrete or masonry walls (Figure 8) because this configuration was not part of the numerical studies that form the basis of this proposal. For a dwelling with a simple rectangular floor plan, full height concrete or masonry walls would need to occur on three sides to qualify for the exception. For a more complex dwelling plan configuration, additional concrete or masonry walls would be required to qualify for the exception. Dwellings with doors and windows in the concrete or masonry walls still qualify for the exception. In all dwellings the concrete or masonry walls will need to conform to applicable IRC provisions.

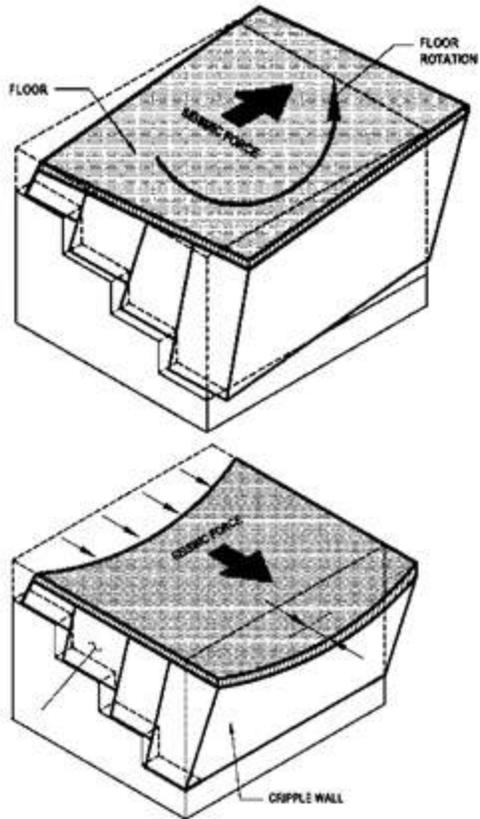


Figure 1 Hillside light-frame structure. Figure 2. Hillside structure cross-slope and out-of-hill loading.

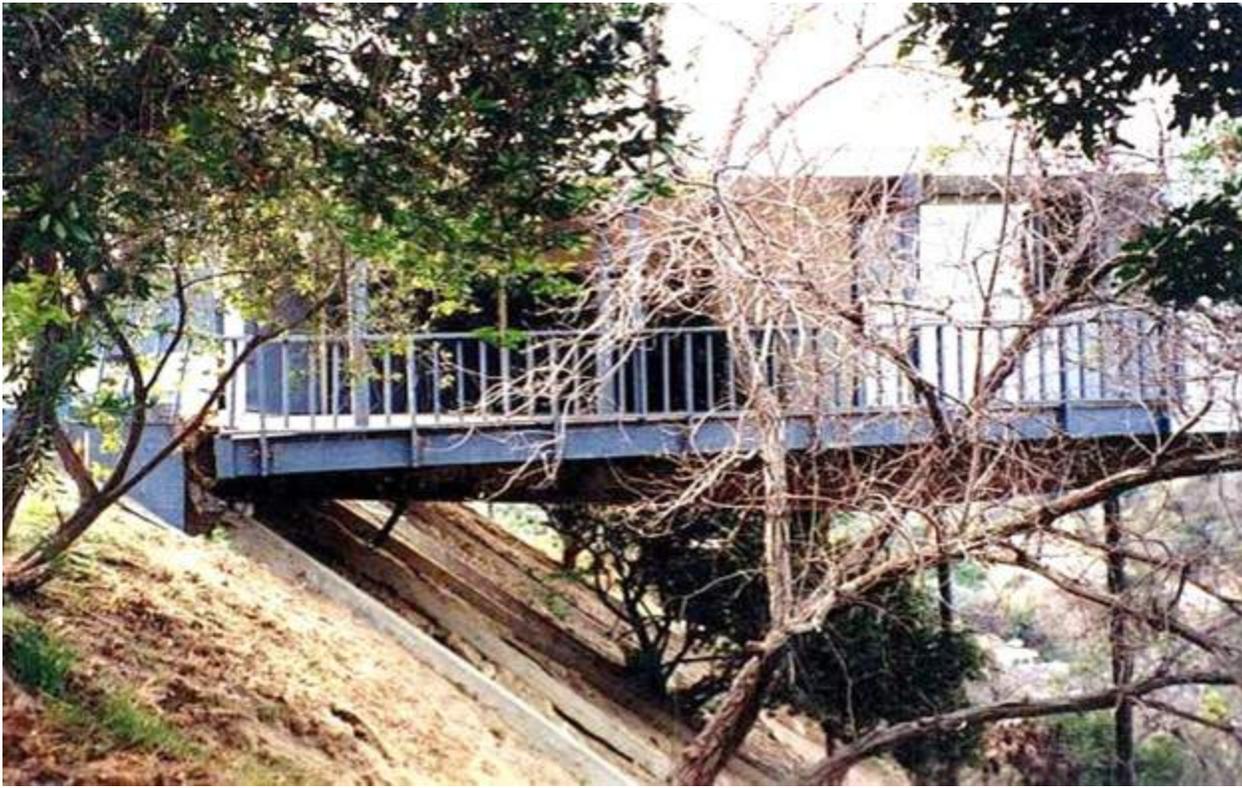


Figure 3. Hillside dwelling pulled away from uphill foundation in the 1994 Northridge, California Earthquake (Credit: City of Los Angeles Department of Building and Safety). Red arrow shows location where floor framing has pulled six to eight inches away from the uphill foundation.



Figure 4. Hillside dwelling collapsed in the 1994 Northridge, California Earthquake (Credit: City of Los Angeles Department of Building and Safety).

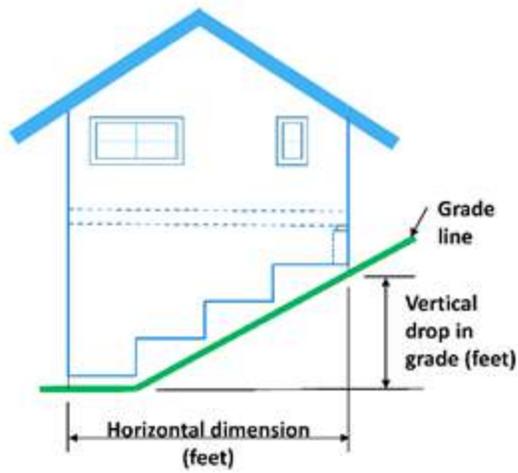


Figure 5. Grade slope triggering the hillside dwelling irregularity exceeds 1 vertical in 5 horizontal across the full width of any side of the dwelling.

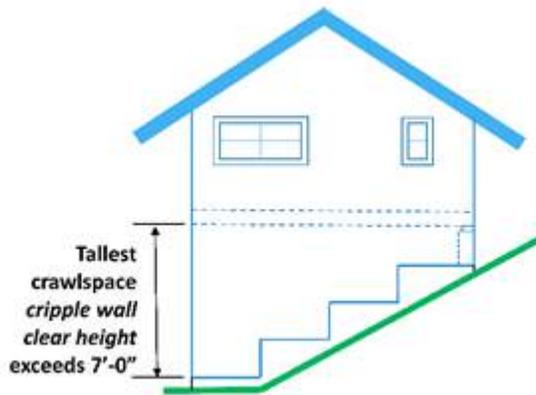


Figure 6. Downhill cripple wall height triggering the hillside dwelling irregularity.

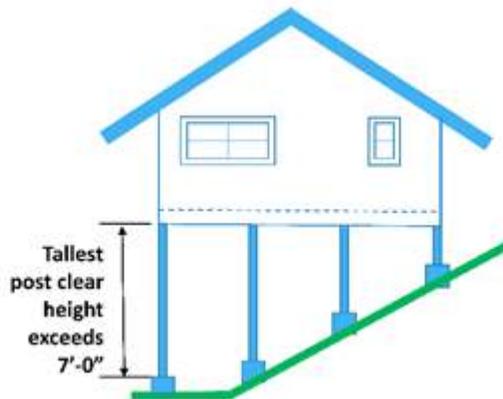


Figure 7. Downhill post height triggering the hillside dwelling irregularity.

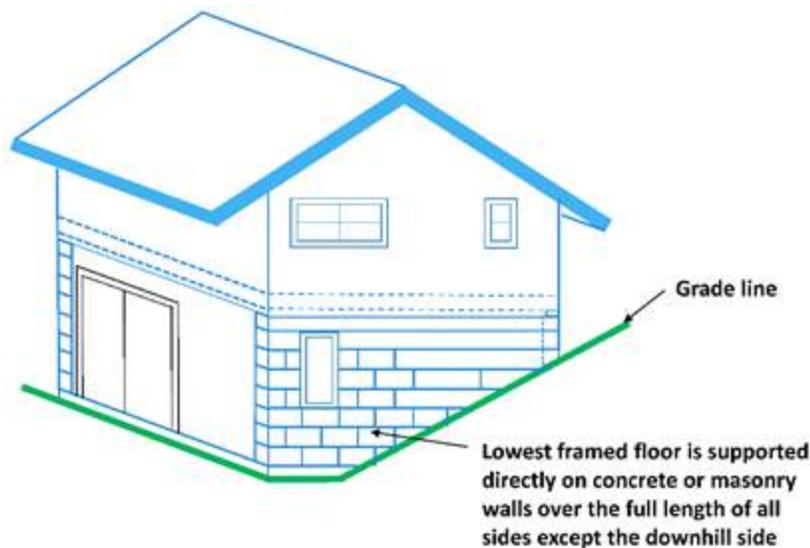


Figure 8. Concrete or masonry wall configuration that does not tripper the hillside dwelling irregularity.

Bibliography: FEMA, 2018. *Vulnerability-Based Seismic Assessment and Retrofit of One- and Two-Family Dwellings Volume 1 - Prestandard (FEMA P-1100)*, Federal Emergency Management Agency, Washington, DC.
 Blaney et. Al., 2018. "Prestandard for Seismic Assessment and Retrofit of One- and Two-Family Dwellings (FEMA P-1100, ATC-110 Project)," *Proceedings of the 2018 SEAOC Convention*, SEAOC, Sacramento, CA.

EERI, 1996. 1994 Northridge California Earthquake. *The Earthquake Spectra Northridge Earthquake Reconnaissance Report*, EERI, Oakland, CA.

HUD, 1994. *Performance of HUD-Assisted Properties During the January 17, 1994 Northridge Earthquake*, U.S. Department of Housing and Urban Development, Washington, D.C.

Cost Impact: The code change proposal will increase the cost of construction

This proposal is anticipated to increase the number of dwellings required to have an engineered lateral force design for moderately steep to very steep sites. In regions where these dwellings are believed to already be predominantly engineered, the cost impact is thought to be negligible. In other regions where these dwellings are not predominantly engineered, additional costs will be incurred for engineered design and more robust anchorage to the foundation.

Proposal # 4575

RB40-19

RB41-19

IRC®: R301.2.2.7

Proponent: Kelly Cobeen, Wiss Janney Elstner Associates, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (KCobeen@wje.com); Julie Furr, Rimkus Consulting Group, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (jfurr@rimkus.com); Michael Mahoney, representing Federal Emergency Management Agency (mike.mahoney@fema.dhs.gov)

2018 International Residential Code

Revise as follows:

R301.2.2.7 Height limitations. Wood-framed buildings shall be limited to three stories above *grade plane* or the limits given in Table R602.10.3(3). Wood-framed buildings in Seismic Design Category D₂ exceeding two stories shall be designed for wind and seismic loads in accordance with accepted engineering practice. Cold-formed steel-framed buildings shall be limited to less than or equal to three stories above *grade plane* in accordance with AISI S230. Mezzanines as defined in Section R202 that comply with Section R325 shall not be considered as stories. Structural insulated panel buildings shall be limited to two stories above *grade plane*.

Reason: This proposal adds language in the seismic scopeing provisions of Section R301.2.2 to clearly communicate that three-story dwellings in SDC D2 are beyond the scope of the IRC wall bracing provisions. This limitation already exists based on the Section R602.10 bracing tables, however it is more appropriate for this to be in a text provision, and it is more beneficial to the user to make this limit clear in Chapter 3 so as to remove all ambiguity prior to reading Chapter 6.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. No cost impact. This is an editorial clarification of the intent of current provisions.

Proposal # 4578

RB41-19

RB42-19

IRC@: R301.2.2.10

Proponent: Stephanie Young, representing National Council of Structural Engineers Associations
(stephanie@mattsonmacdonald.com)

2018 International Residential Code

Revise as follows:

R301.2.2.10 Anchorage of water heaters. In Seismic Design Categories D₀, D₁ and D₂, and in townhouses in Seismic Design Category C, water heaters and thermal storage units shall be anchored against movement and overturning in accordance with Section ~~M1307.2~~, M1307.2 or P2801.8.

Reason: In Section M1307.2, appliances consist of both water heaters and thermal storage tanks. Also, Section M1307.2 applies not only to Seismic Design Categories D₀, D₁ and D₂, but also to townhouses in Seismic Design Category C. This code change is presented to coordinate Sections R301.2.2.10 and M1307.2.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Clarifying language only, no change to actual design or construction requirements for appliance bracing.

Proposal # 4598

RB42-19

RB43-19

IRC@: R301.3

Proponent: Cesar Lujan, representing National Association of Home Builders (clujan@nahb.org); Gary Ehrlich, National Association of Home Builders, representing National Association of Home Builders (gehrlich@nahb.org)

2018 International Residential Code

Revise as follows:

R301.3 Story height. The wind and seismic provisions of this code shall apply to buildings with *story heights* not exceeding the following:

1. For wood wall framing, the *story height* shall not exceed 11 feet 7 inches (3531 mm) and the laterally unsupported bearing wall stud height permitted by Table R602.3(5).
Exception: A story height not exceeding 13 feet 7 inches is permitted provided the maximum wall stud clear height does not exceed 12 feet (3658 mm), the wall studs are in accordance with Exception 2 or Exception 3 of Section R602.3.1 or an engineered design is provided for the wall framing members, and wall bracing for the building is in accordance with Section R602.10.
2. For cold-formed steel wall framing, the *story height* shall be not more than 11 feet 7 inches (3531 mm) and the unsupported bearing wall stud height shall be not more than 10 feet (3048 mm).
3. For masonry walls, the *story height* shall be not more than 13 feet 7 inches (4140 mm) and the bearing wall clear height shall be not more than 12 feet (3658 mm).
Exception: An additional 8 feet (2438 mm) of bearing wall clear height is permitted for gable end walls.
4. For insulating concrete form walls, the maximum story height shall not exceed 11 feet 7 inches (3531 mm) and the maximum unsupported wall height per *story* as permitted by Section R608 tables shall not exceed 10 feet (3048 mm).
5. For structural insulated panel (SIP) walls, the story height shall be not more than 11 feet 7 inches (3531 mm) and the bearing wall height per *story* as permitted by Section R610 tables shall not exceed 10 feet (3048 mm).

For walls other than wood-framed walls. Individual walls or wall studs shall be permitted to exceed these limits as permitted by Chapter 6 provisions, provided that the story heights of this section are not exceeded. An engineered design shall be provided for the wall or wall framing members where the limits of Chapter 6 are exceeded. Where the *story height* limits of this section are exceeded, the design of the building, or the noncompliant portions thereof, to resist wind and seismic loads shall be in accordance with the International Building Code .

Reason: The purpose of this code change is to finally address a long-standing conflict and point of confusion in the IRC story height provisions and restore the original intent of the IRC.

In the 2003 through 2006 IRC, the default provisions of Section R301.3 specified wood-frame buildings could have a maximum bearing wall stud height of 10 feet supporting framing members not exceeding 16" in depth. An exception allowed a maximum bearing wall stud height of 12 feet provided an engineered design for the wall and studs was provided for everything other than the wall bracing for wind and seismic loads, which could be determined per Section R602.10 with adjustment factors to increase the bracing amounts for the higher walls.

For the 2009 IRC, a successful proposal from SBCA revised Section R301.3 to allow floor framing members (e.g. I-joists or trusses) deeper than 16" to be used if the bearing wall stud height was less than 10 feet. This

was accomplished by specifying an overall story height limit of 11'-7", or the sum of a 10'-0" tall stud, 2x top and bottom plates, and 16" deep framing.

This technically overrode the exception allowing bearing wall studs up to 12 feet with wall bracing per the Section R602.10 adjustment factors and engineering design otherwise, not to mention conflicting with the 12 foot bearing wall height limit for masonry walls and additional 8 feet allowed for gable end walls. However, to our recollection this was not brought up in floor testimony, committee discussion, or in public comments, and the change passed.

For the 2015 IRC, the BCAC further revised this section by deleting the 11'-7" story height limit from the final paragraph of Section R301.3 and placing it in each of the individual items to which it applied. This addressed the conflict with masonry walls but still did not fix the conflict with Section R602.10. To make matters worse, former members of the ICC Ad-Hoc Wall Bracing Committee advanced a proposal to delete the entire exception for bearing wall studs up to 12 feet out of a concern code users would double-count the multipliers on the wall bracing, which are reflected in the respective tables of adjustment factors for wind and seismic bracing. Neither the BCAC nor the former AHC-WB members provided a fix for the conflict between the story height limits and the wall bracing provisions.

For the 2018 IRC, NAHB added the new Table R602.3(6) allowing bearing wall studs up to 12 feet in height for limited cases. We still did not directly address the conflict between the story height limits and the wall bracing provisions, let alone the conflict with the new table. In essence, NAHB (and others modifying Section R301.3) have relied on the statement in the last paragraph that individual walls or wall studs could exceed the limits of R301.3 as long as overall story heights were not exceeded.

This proposal generally restores the exception present in the 2000 through 2012 IRC stating "the wall stud clear height used to determine the maximum permitted story height may be increased to 12 feet without requiring an engineered design for the building wind and seismic force resisting systems" provided R602.10 is complied with, including mandated increases for stud heights up to 12 feet. At the same time, language is added pointing to the two exceptions to 10 foot bearing wall heights under Section R602.3, including the exception leading to the new Table R602.3(6). This will provide a critical link to both exceptions that is currently missing in the 2018 IRC. The requirement to use engineering design for studs in these tall walls not otherwise complying with one of the two exceptions to Section R602.3 is maintained.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code change will not increase cost for builders in jurisdictions making a jump from the 2006 IRC or earlier directly to the 2021 IRC. The code change will also not increase cost for builders using subsequent editions and interpreting the language allowing individual walls or wall studs to exceed the limits of Section R301.3 to permit certain walls (e.g. foyers, great rooms, garages) to exceed the 11'-7" story height limit provided the average story height remains within the limit. The code change may decrease the cost of construction for builders who have been forced to hire structural engineers to design the lateral force-resisting system for houses with 11 or 12 foot bearing walls that would have met the 2000 through 2006 IRC but were excluded from the structural provisions of the IRC due to a strict interpretation of the language in the 2009 IRC and subsequent editions.

Proposal # 4713

RB43-19

RB44-19

IRC®: R301.5, TABLE R301.5, R502.3, R502.3.1, R502.3.2, R502.3.3

Proponent: Gary Ehrlich, National Association of Home Builders, representing National Association of Home Builders (gehrlich@nahb.org)

2018 International Residential Code

R301.5 Live load. The minimum uniformly distributed live load shall be as provided in Table R301.5.

Revise as follows:

TABLE R301.5
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS (in pounds per square foot)

USE	LIVE LOAD
Uninhabitable attics without storage ^b	10
Uninhabitable attics with limited storage ^{b, g}	20
Habitable attics and attics served with fixed stairs	30
Balconies (exterior) and decks ^e	40
Fire escapes	40
Guards and handrails ^d	200 ^h
Guard in-fill components ^f	50 ^h
Passenger vehicle garages ^a	50 ^a
Areas Rooms other than sleeping areas rooms	40
Sleeping areas rooms	30
Stairs	40 ^c

For SI: 1 pound per square foot = 0.0479 kPa, 1 square inch = 645 mm², 1 pound = 4.45 N.

- a. Elevated garage floors shall be capable of supporting a 2,000-pound load applied over a 20-square-inch area.
- b. Uninhabitable attics without storage are those where the clear height between joists and rafters is not more than 42 inches, or where there are not two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses. This live load need not be assumed to act concurrently with any other live load requirements.
- c. Individual stair treads shall be designed for the uniformly distributed live load or a 300-pound concentrated load acting over an area of 4 square inches, whichever produces the greater stresses.
- d. A single concentrated load applied in any direction at any point along the top.
- e. See Section R507.1 for decks attached to exterior walls.
- f. Guard in-fill components (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds on an area equal to 1 square foot. This load need not be assumed to act concurrently with any other live load requirement.
- g. Uninhabitable attics with limited storage are those where the clear height between joists and

rafters is 42 inches or greater, or where there are two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses. The live load need only be applied to those portions of the joists or truss bottom chords where all of the following conditions are met:

1. The attic area is accessed from an opening not less than 20 inches in width by 30 inches in length that is located where the clear height in the attic is not less than 30 inches.
2. The slopes of the joists or truss bottom chords are not greater than 2 inches vertical to 12 units horizontal.
3. Required insulation depth is less than the joist or truss bottom chord member depth.

The remaining portions of the joists or truss bottom chords shall be designed for a uniformly distributed concurrent live load of not less than 10 pounds per square foot.

- h. Glazing used in handrail assemblies and guards shall be designed with a safety factor of 4. The safety factor shall be applied to each of the concentrated loads applied to the top of the rail, and to the load on the in-fill components. These loads shall be determined independent of one another, and loads are assumed not to occur with any other live load.

R502.3 Allowable joist spans. Spans for floor joists shall be in accordance with Tables R502.3.1(1) and R502.3.1(2). For other grades and species and for other loading conditions, refer to the AWC STJR.

R502.3.1 Sleeping areas and attic joists. Table R502.3.1(1) shall be used to determine the maximum allowable span of floor joists that support sleeping areas and *attics* that are accessed by means of a fixed stairway in accordance with Section R311.7 provided that the design live load does not exceed 30 pounds per square foot (1.44 kPa) and the design dead load does not exceed 20 pounds per square foot (0.96 kPa). The allowable span of ceiling joists that support *attics* used for limited storage or no storage shall be determined in accordance with Section R802.5.

R502.3.2 Other floor joists. Table R502.3.1(2) shall be used to determine the maximum allowable span of floor joists that support other areas of the building, other than sleeping ~~rooms~~ areas and *attics*, provided that the design live load does not exceed 40 pounds per square foot (1.92 kPa) and the design dead load does not exceed 20 pounds per square foot (0.96 kPa).

R502.3.3 Floor cantilevers. Floor cantilever spans shall not exceed the nominal depth of the wood floor joist. Floor cantilevers constructed in accordance with Table R502.3.3(1) shall be permitted where supporting a light-frame bearing wall and roof only. Floor cantilevers supporting an exterior balcony are permitted to be constructed in accordance with Table R502.3.3(2).

Reason: The purpose of this code change is to align the IRC with the IBC and ASCE 7 for live loads on dwelling floors. Questions have been raised about the fact Table R301.5 refers to “sleeping rooms” and whether this means the bathrooms, closets, hallways, and other non-bedroom spaces on the floor of a dwelling need to be designed for a 40 psf live load even if the total area of bedrooms predominates.

Table 1607.1 of the IBC and Table 4.3-1 of ASCE 7 both apply the 30 psf live load to “habitable attics and ***sleeping areas***”. The IBC applies the 40 psf load to “all other areas”, ASCE 7 applies it to “all other areas except stairs”. Both the IBC and ASCE 7 require 40 psf for stairs in one- and two-family dwellings, as does the existing Table R301.5. There is no reason for the IRC to be more stringent than the IBC and ASCE 7. Further, it is not the intent of the IRC to require the builder to apply a patchwork of different live loads across a floor primarily consisting of bedrooms and wind up with different joist sizes and spacings just because some joists happen to pass under bathrooms and closets as well as bedroom spaces and some do not.

This change also aligns Table R301.5 with Section R502.3.1 and R502.3.2 and the respective Tables

R502.3.1(1) and R502.3.1(2) for floor joists. Section R502.3.1 and Table R502.3.1(1), which is based on the 30 psf live load, refers specifically to “sleeping areas”. Table R502.3.1(3) refers to “living areas” and is based on a 40 psf live load. While not explicitly stated as such, the intent of “living areas” is clearly the same as “areas other than sleeping areas”. However, Section R502.3.2 appears to be an outlier in referring to “sleeping rooms”, and this proposal makes the correlating change to “sleeping areas”.

Further, this change aligns with both the traditional bearing wall footing table that was present in the 2000 through 2012 IRC and the revised and expanded tables in the 2015 and 2018 IRC. Both sets of tables apply a 40 psf load uniformly across the ground floor where dining rooms, living rooms, dens, etc. are typically located and 30 psf uniformly across the upper floor or floors that are dominated by bedrooms (i.e. sleeping rooms).

This change does not preclude a builder, building designer or registered design professional from conservatively designing all floors of the home to 40 psf regardless of whether a floor mostly consists of bedrooms used primarily for sleeping or rooms used primarily for dining, recreation, entertainment and other purposes. Many do so for serviceability (i.e. reduce deflections or “bounce” on the bedroom floors) or for the ease of design and potential economy of using the same floor framing sizes and layouts for all the floors. However, the IRC is intended to be a minimum code.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code change is primarily a clarification and maintains current minimum practice for the design of one- and two-family dwellings.

Proposal # 5074

RB44-19

RB45-19

IRC@: TABLE R301.5 (New)

Proponent: Robert Rice C.B.O., Northwest Code Professionals, representing Southern Oregon Chapter-ICC (RobertR@nwcodepros.com)

2018 International Residential Code

Revise as follows:

TABLE R301.5
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS (in pounds per square foot)

USE	LIVE LOAD
Uninhabitable attics without storage ^b	10
Uninhabitable attics with limited storage ^{b, g}	20
Habitable attics and attics served with fixed stairs	30
Balconies (exterior) and decks ^e	40
Fire escapes	40
Guards and handrails ^d	200 ^h
Guard in-fill components ^f	50 ^h
Passenger vehicle garages ^a	50 ^a
Rooms other than sleeping rooms	40
Sleeping rooms	30
Stairs	40 ^c

For SI: 1 pound per square foot = 0.0479 kPa, 1 square inch = 645 mm², 1 pound = 4.45 N.

- a. Elevated garage floors shall be capable of supporting a 2,000-pound load applied over a 20-square-inch area.
- b. Uninhabitable attics without storage are those where the clear height between joists and rafters is not more than 42 inches, or where there are not two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses. This live load need not be assumed to act concurrently with any other live load requirements.
- c. Individual stair treads shall be designed for the uniformly distributed live load or a 300-pound concentrated load acting over an area of 4 square inches, whichever produces the greater stresses.
- d. A single concentrated load applied in any direction at any point along the top.
- e. See Section R507.1 for decks attached to exterior walls.
- f. Guard in-fill components (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds on an area equal to 1 square foot. This load need not be assumed to act concurrently with any other live load requirement.
- g. Uninhabitable attics with limited storage are those where the clear height between joists and rafters is 42 inches or greater, or where there are two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses.

The live load need only be applied to those portions of the joists or truss bottom chords where all of the following conditions are met:

1. The attic area is accessed from an opening not less than 20 inches in width by 30 inches in length that is located where the clear height in the attic is not less than 30 inches.
2. The slopes of the joists or truss bottom chords are not greater than 2 ~~inches~~ units vertical to 12 units horizontal.
3. Required insulation depth is less than the joist or truss bottom chord member depth.

The remaining portions of the joists or truss bottom chords shall be designed for a uniformly distributed concurrent live load of not less than 10 pounds per square foot.

- h. Glazing used in handrail assemblies and guards shall be designed with a safety factor of 4. The safety factor shall be applied to each of the concentrated loads applied to the top of the rail, and to the load on the in-fill components. These loads shall be determined independent of one another, and loads are assumed not to occur with any other live load.

Reason: This code change is intended to merely clean up a technical error in the existing language.

Item 2 of footnote "g" is technically incorrect. As currently written, it mixes "units" with "inches" which would be undefined. It should either say, "...2 **inches** vertical to 12 **inches** horizontal." or "...2 **units** vertical to 12 **units** horizontal.". The preferred option would be to use units as shown in the proposal.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal does not add or remove any existing code requirements. Therefore, there is no cost impact.

Proposal # 4088

RB45-19

RB46-19

IRC@: TABLE R301.5

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

TABLE R301.5
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS (in pounds per square foot)

USE	LIVE LOAD
Uninhabitable attics without storage ^b	10
Uninhabitable attics with limited storage ^{b, g}	20
Habitable attics and attics served with fixed stairs	30
Balconies (exterior) and decks ^e	40
Fire escapes	40
Guards and handrails ^{d, i}	200 ^{h, j}
Guard in-fill components ^f	50 ^h
Handrails ^d	200 ^h
Passenger vehicle garages ^a	50 ^a
Rooms other than sleeping rooms	40
Sleeping rooms	30
Stairs	40 ^c

For SI: 1 pound per square foot = 0.0479 kPa, 1 square inch = 645 mm², 1 pound = 4.45 N.

- a. Elevated garage floors shall be capable of supporting a 2,000-pound load applied over a 20-square-inch area.
- b. Uninhabitable attics without storage are those where the clear height between joists and rafters is not more than 42 inches, or where there are not two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses. This live load need not be assumed to act concurrently with any other live load requirements.
- c. Individual stair treads shall be designed for the uniformly distributed live load or a 300-pound concentrated load acting over an area of 4 square inches, whichever produces the greater stresses.
- d. A single concentrated load applied in any direction at any point along the top.
- e. See Section R507.1 for decks attached to exterior walls.
- f. Guard in-fill components (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds on an area equal to 1 square foot. This load need not be assumed to act concurrently with any other live load requirement.
- g. Uninhabitable attics with limited storage are those where the clear height between joists and rafters is 42 inches or greater, or where there are two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24

inches in width, or greater, within the plane of the trusses. The live load need only be applied to those portions of the joists or truss bottom chords where all of the following conditions are met:

1. The attic area is accessed from an opening not less than 20 inches in width by 30 inches in length that is located where the clear height in the attic is not less than 30 inches.
 2. The slopes of the joists or truss bottom chords are not greater than 2 inches vertical to 12 units horizontal.
 3. Required insulation depth is less than the joist or truss bottom chord member depth. The remaining portions of the joists or truss bottom chords shall be designed for a uniformly distributed concurrent live load of not less than 10 pounds per square foot.
- h. Glazing used in handrail assemblies and guards shall be designed with a safety factor of 4. The safety factor shall be applied to each of the concentrated loads applied to the top of the rail, and to the load on the in-fill components. These loads shall be determined independent of one another, and loads are assumed not to occur with any other live load.
- i. For a guard system not required to serve as a handrail, a single concentrated load applied at any point along the top, in the vertical downward direction and in the horizontal direction toward the lower surface. For a guard also serving as a handrail, a single concentrated load applied in any direction at any point along the top.

Reason: The purpose of this proposal is to revise the load on guard systems for one- and two-family dwellings to align with common industry practice. Extensive discussion has occurred in recent code cycles on load requirements and details for guard systems on decks accessory to one- and two-family dwellings. In particular, the directions in which the 200 pound guard load needs to be applied has been a topic of debate.

The IRC and IBC define a guard as “a building component or a system of building components located near the open sides of elevated walking surfaces that minimizes the possibility of a fall from the walking surface to the lower level.” The ASCE definition of a guardrail system is very similar. Clearly, a fall from the edge of an unprotected deck to the ground, which can be as much as 10 feet or more, carries a much greater risk of injury than a fall backwards onto the surface of the deck, which is only a few feet.

Further, a guard system can be constructed without a handrail, as under both the IRC and IBC a handrail is only required at a flight of stairs, a ramp, a stepped aisle, or a ramped aisle. Nor is the top rail of a guard system required to be graspable by occupants of a deck or other elevated walking surface, unless the guard is specifically designed to also serve as a handrail. In fact, a guard need not even have a top rail unless specifically required by the codes or the reference standards for guard systems, or desired as part of the design of the guard system.

As such, industry standards such as ASTM D7032 for wood and plastic composite decks boards and guards (referenced in both the IBC and IRC) and code evaluation acceptance criteria such as ICC-ES AC 174 for deck boards and guardrails, call for applying the 200 pound load in the outward and downward directions only, not inward or upward and certainly not parallel to the guard. Despite this apparent deviation from the IRC, IBC and ASCE 7 load requirements, thousands of guard systems, when designed, tested, and constructed in accordance with these industry standards and acceptance criteria and used properly, have performed exceptionally well and have protected occupants of decks against falls from the deck.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code change will recognize existing practices in the design and testing of guard systems as specified in ASTM D7032, ICC-ES AC 174 and other industry standards for guard systems and components. Manufacturers with existing products designed and tested to those standards will remain compliant with the IRC and will not need to conduct additional engineering or testing. If this change is not approved, manufacturers may eventually be required to test or design their products for additional load directions, which would substantially increase

cost.

Proposal # 4044

RB46-19

RB47-19

IRC@: TABLE R301.5

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

TABLE R301.5
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS (in pounds per square foot)

USE	LIVE LOAD
Uninhabitable attics without storage ^b	10
Uninhabitable attics with limited storage ^{b, g}	20
Habitable attics and attics served with fixed stairs	30
Balconies (exterior) and decks ^e	40
Fire escapes	40
Guards and handrails ^d	200 ^h
Guard in-fill components ^f	50 ^h
Handrails ^d	200 ^h
Passenger vehicle garages ^a	50 ^a
Rooms other than sleeping rooms	40
Sleeping rooms	30
Stairs	40 ^c

For SI: 1 pound per square foot = 0.0479 kPa, 1 square inch = 645 mm², 1 pound = 4.45 N.

- a. Elevated garage floors shall be capable of supporting a 2,000-pound load applied over a 20-square-inch area.
- b. Uninhabitable attics without storage are those where the clear height between joists and rafters is not more than 42 inches, or where there are not two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses. This live load need not be assumed to act concurrently with any other live load requirements.
- c. Individual stair treads shall be designed for the uniformly distributed live load or a 300-pound concentrated load acting over an area of 4 square inches, whichever produces the greater stresses.
- d. A single concentrated load applied in any direction at any point along the top. For a guard not required to serve as a handrail, the load need not be applied to the top element of the guard in a direction parallel to such element.
- e. See Section R507.1 for decks attached to exterior walls.
- f. Guard in-fill components (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds on an area equal to 1 square foot. This load need not be assumed to act concurrently with any other live load requirement.
- g. Uninhabitable attics with limited storage are those where the clear height between joists and

rafters is 42 inches or greater, or where there are two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses. The live load need only be applied to those portions of the joists or truss bottom chords where all of the following conditions are met:

1. The attic area is accessed from an opening not less than 20 inches in width by 30 inches in length that is located where the clear height in the attic is not less than 30 inches.
 2. The slopes of the joists or truss bottom chords are not greater than 2 inches vertical to 12 units horizontal.
 3. Required insulation depth is less than the joist or truss bottom chord member depth. The remaining portions of the joists or truss bottom chords shall be designed for a uniformly distributed concurrent live load of not less than 10 pounds per square foot.
- h. Glazing used in handrail assemblies and guards shall be designed with a safety factor of 4. The safety factor shall be applied to each of the concentrated loads applied to the top of the rail, and to the load on the in-fill components. These loads shall be determined independent of one another, and loads are assumed not to occur with any other live load.

Reason: The purpose of this proposal is to revise the load on guard systems for one- and two-family dwellings to align with common industry practice. Extensive discussion has occurred in recent code cycles on load requirements and details for guard systems on decks accessory to one- and two-family dwellings. In particular, the directions in which the 200 pound guard load needs to be applied has been a topic of debate. The IRC and IBC define a guard as “a building component or a system of building components located near the open sides of elevated walking surfaces that minimizes the possibility of a fall from the walking surface to the lower level.” The ASCE 7 definition of a guardrail system is very similar. Clearly, a fall from the edge of an unprotected deck to the ground, which can be as much as 10 feet or more, carries a much greater risk of injury than a fall backwards onto the surface of the deck, which is only a few feet.

Further, a guard system can be constructed without a handrail, as under both the IRC and IBC a handrail is only required at a flight of stairs, a ramp, a stepped aisle, or a ramped aisle. Nor is the top rail of a guard system required to be graspable by occupants of a deck or other elevated walking surface, unless the guard is specifically designed to also serve as a handrail. In fact, a guard need not even have a top rail unless specifically required by the codes or the reference standards for guard systems, or desired as part of the design of the guard system.

As such, industry standards such as ASTM D7032 for wood and plastic composite decks boards and guards (referenced in both the IBC and IRC) and code evaluation acceptance criteria such as ICC-ES AC 174 for deck boards and guardrails, call for applying the 200 pound load in the outward and downward directions only, representing the most significant loads on a guard and the most significant directions in which a fall need be prevented. Since by code a guard need not meet the requirements of a handrail, these standards and criteria do not require the 200 pound load be applied in-line along the top of the rail. Despite this apparent deviation from the IRC, IBC and ASCE 7 load requirements, thousands of guard systems, when designed, tested, and constructed in accordance with these industry standards and acceptance criteria and used properly, have performed exceptionally well and have protected occupants of decks against falls from the deck.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code change will recognize existing practices in the design and testing of guard systems as specified in ASTM D7032, ICC-ES AC 174 and other industry standards for guard systems and components. Manufacturers with existing products designed and tested to those standards will remain compliant with the IRC and will not need to conduct additional engineering or testing. If this change is not approved, manufacturers may eventually be required to test or design their products for additional load directions, which would substantially increase

cost.

Proposal # 4125

RB47-19

RB48-19

IRC®: TABLE R301.5

Proponent: Stephanie Young, representing National Council of Structural Engineers Associations
(stephanie@mattsonmacdonald.com)

2018 International Residential Code

Revise as follows:

TABLE R301.5
MINIMUM UNIFORMLY DISTRIBUTED AND CONCENTRATED LIVE LOADS (in pounds per square foot)

<u>OCCUPANCY OR USE</u>	<u>UNIFORM LIVE LOAD</u>	<u>CONCENTRATED LOAD</u>
	<u>(psf)</u>	<u>(lbs)</u>
Uninhabitable attics without storage ^b	10	=
Uninhabitable attics with limited storage ^{b, g}	20	=
Habitable attics and attics served with fixed stairs	30	=
Balconies (exterior) and decks ^e	40	=
Fire escapes	40	=
Guards and handrails ^d	200	<u>200^h</u>
Guard in-fill components ^f	50	<u>50^h</u>
Passenger vehicle garages ^a	50 ^a	<u>2,000^a</u>
Rooms other than sleeping rooms	40	=
Sleeping rooms	30	=
Stairs	40 ^c	<u>300^c</u>

For SI: 1 pound per square foot = 0.0479 kPa, 1 square inch = 645 mm², 1 pound = 4.45 N.

- a. Elevated garage floors shall be capable of supporting the uniformly distributed live load or a 2,000-pound load applied over a 20-square-inch area; concentrated load applied on an area of 4 1/2 inches by 4 1/2 inches, whichever produces the greater stresses.
- b. Uninhabitable attics without storage are those where the clear height between joists and rafters is not more than 42 inches, or where there are not two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses. This live load need not be assumed to act concurrently with any other live load requirements.
- c. Individual stair treads shall be ~~designed for~~ capable of supporting the uniformly distributed live load or a 300-pound concentrated load ~~acting over~~ applied on an area of ~~4 square~~ 2 inches by 2 inches, whichever produces the greater stresses.
- d. A single concentrated load applied in any direction at any point along the top.
- e. See Section R507.1 for decks attached to exterior walls.
- f. Guard in-fill components (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds on an area equal to 1

square foot. This load need not be assumed to act concurrently with any other live load requirement.

- g. Uninhabitable attics with limited storage are those where the clear height between joists and rafters is 42 inches or greater, or where there are two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses.

The live load need only be applied to those portions of the joists or truss bottom chords where all of the following conditions are met:

1. The attic area is accessed from an opening not less than 20 inches in width by 30 inches in length that is located where the clear height in the attic is not less than 30 inches.
2. The slopes of the joists or truss bottom chords are not greater than 2 inches vertical to 12 units horizontal.
3. Required insulation depth is less than the joist or truss bottom chord member depth.

The remaining portions of the joists or truss bottom chords shall be designed for a uniformly distributed concurrent live load of not less than 10 pounds per square foot.

- h. Glazing used in handrail assemblies and guards shall be designed with a safety load adjustment factor of 4. The safety load adjustment factor shall be applied to each of the concentrated loads applied to the top of the rail, and to the load on the in-fill components. These loads shall be determined independent of one another, and loads are assumed not to occur with any other live load.

Reason: As currently presented, the title of Table R301.5 states that loads shown are uniformly distributed and are listed in pounds per square foot. This is incorrect as the guardrail and handrail loads shown are intended as concentrated loads. By splitting the loads into two columns, the Live Load table will more accurately represent the necessary information. It will also allow for loads only previously noted in the footnotes to be incorporated into the body of the table. These changes will make the IRC Live Load table more closely match the format and values of the ASCE7 and IBC Live Load tables.

The language added to the footnote regarding garage slab design is intended to reiterate that both the uniform load condition as well as the concentrated load condition must be evaluated to determine the most severe case. This footnote will now more closely match that of the similar note indicated for determining the proper design load conditions for stair treads.

There has been much confusion regarding the use of the words 'safety factor' when dealing with glazing used as handrails, guards, and infill components. 'Safety factors' and the use of them can be confusing as to whether you are using them from the load side or from the material strength side of the design. By changing the word 'safety' to 'load adjustment', it should be more apparent that the intent is to multiply the minimum design load found in the table by the factor indicated.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The modified language is only intended to clarify existing requirements.

Proposal # 4600

RB48-19

RB49-19

IRC®: TABLE R301.5

Proponent: Stephanie Young, representing National Council of Structural Engineers Associations
(stephanie@mattsonmacdonald.com)

2018 International Residential Code

Revise as follows:

TABLE R301.5

MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS (in pounds per square foot, unless otherwise noted)

USE	LIVE LOAD
Uninhabitable attics without storage ^b	10
Uninhabitable attics with limited storage ^{b, g}	20
Habitable attics and attics served with fixed stairs	30
Balconies (exterior) and decks ^e	40
Fire escapes	40
Guards and handrails ^d	200 ^h
Guard in-fill components ^f	50 ^h
Passenger vehicle garages ^a	50 ^a
Rooms other than sleeping rooms	40
Sleeping rooms	30
Stairs	40 ^c

For SI: 1 pound per square foot = 0.0479 kPa, 1 square inch = 645 mm², 1 pound = 4.45 N.

- a. ~~Elevated garage floors shall be capable of supporting the uniformly distributed live load or a 2,000-pound load applied over a 20 square inch area.~~ concentrated load applied on an area of 4 1/2 inches by 4 1/2 inches, whichever produces the greater stresses.
- b. Uninhabitable attics without storage are those where the clear height between joists and rafters is not more than 42 inches, or where there are not two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses. This live load need not be assumed to act concurrently with any other live load requirements.
- c. Individual stair treads shall be ~~designed for~~ capable of supporting the uniformly distributed live load or a 300-pound concentrated load ~~acting over~~ applied on an area of ~~4 square~~ 2 inches by 2 inches, whichever produces the greater stresses.
- d. A single concentrated load applied in any direction at any point along the top.
- e. See Section R507.1 for decks attached to exterior walls.
- f. Guard in-fill components (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds on an area equal to 1 square foot. This load need not be assumed to act concurrently with any other live load requirement.

- g. Uninhabitable attics with limited storage are those where the clear height between joists and rafters is 42 inches or greater, or where there are two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses.

The live load need only be applied to those portions of the joists or truss bottom chords where all of the following conditions are met:

1. The attic area is accessed from an opening not less than 20 inches in width by 30 inches in length that is located where the clear height in the attic is not less than 30 inches.
2. The slopes of the joists or truss bottom chords are not greater than 2 inches vertical to 12 units horizontal.
3. Required insulation depth is less than the joist or truss bottom chord member depth.

The remaining portions of the joists or truss bottom chords shall be designed for a uniformly distributed concurrent live load of not less than 10 pounds per square foot.

- h. Glazing used in handrail assemblies and guards shall be designed with a safety load adjustment factor of 4. The safety load adjustment factor shall be applied to each of the concentrated loads applied to the top of the rail, and to the load on the in-fill components. These loads shall be determined independent of one another, and loads are assumed not to occur with any other live load.

Reason: The language added to the title of the Table simply indicates that the table contains values other than 'pounds per square foot'.

The language added to the footnote regarding garage slab design is intended to reiterate that both the uniform load condition as well as the concentrated load condition must be evaluated to determine the most severe case. This footnote will now more closely match that of the similar note indicated for determining the proper design load conditions for stair treads.

There has been much confusion regarding the use of the words 'safety factor' when dealing with glazing used as handrails, guards, and infill components. 'Safety factors' and the use of them can be confusing as to whether you are using them from the load side or from the material strength side of the design. By changing the word 'safety' to 'load adjustment', it should be more apparent that the intent is to multiply the minimum design load found in the table by the factor indicated.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The modified language is only intended to clarify existing requirements.

Proposal # 4599

RB49-19

RB50-19

IRC@: TABLE R301.5

Proponent: Jonathan Siu, representing City of Seattle Department of Construction and Inspections (Jon.Siu@seattle.gov)

2018 International Residential Code

Revise as follows:

TABLE R301.5

MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS (in pounds per square foot)

Portions of table not shown remain unchanged.

USE	LIVE LOAD
Balconies (exterior) and decks ^e	40 <u>60</u> ⁱ

For SI: 1 pound per square foot = 0.0479 kPa, 1 square inch = 645 mm², 1 pound = 4.45 N.

- a. Elevated garage floors shall be capable of supporting a 2,000-pound load applied over a 20-square-inch area.
- b. Uninhabitable attics without storage are those where the clear height between joists and rafters is not more than 42 inches, or where there are not two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses. This live load need not be assumed to act concurrently with any other live load requirements.
- c. Individual stair treads shall be designed for the uniformly distributed live load or a 300-pound concentrated load acting over an area of 4 square inches, whichever produces the greater stresses.
- d. A single concentrated load applied in any direction at any point along the top.
- e. See Section R507.1 for decks attached to exterior walls.
- f. Guard in-fill components (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds on an area equal to 1 square foot. This load need not be assumed to act concurrently with any other live load requirement.
- g. Uninhabitable attics with limited storage are those where the clear height between joists and rafters is 42 inches or greater, or where there are two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses. The live load need only be applied to those portions of the joists or truss bottom chords where all of the following conditions are met:
 - 1. The attic area is accessed from an opening not less than 20 inches in width by 30 inches in length that is located where the clear height in the attic is not less than 30 inches.
 - 2. The slopes of the joists or truss bottom chords are not greater than 2 inches vertical to 12 units horizontal.
 - 3. Required insulation depth is less than the joist or truss bottom chord member depth.

The remaining portions of the joists or truss bottom chords shall be designed for a uniformly distributed concurrent live load of not less than 10 pounds per square foot.

- h. Glazing used in handrail assemblies and guards shall be designed with a safety factor of 4. The safety factor shall be applied to each of the concentrated loads applied to the top of the rail, and to the load on the in-fill components. These loads shall be determined independent of one another, and loads are assumed not to occur with any other live load.
- i. Where structural tables in Section R507 only specify snow loads, the values corresponding to 70 psf snow loads shall be used.

Reason: The purpose of this code change proposal is to align the IRC deck and balcony live load with the IBC and ASCE 7.

The new Footnote i is intended to coordinate this proposal with new tables for deck structure (beams, columns, and footings) we understand are being proposed by others. It is based on a discussion with one of the people who was involved with the development of the new tables.

While we realize this is a controversial issue, it is our opinion and judgment that there is no reason why the IRC should not align with IBC and ASCE 7, for the reasons following. For those who have not participated in the history of the issue, a summary of how we got to where we are is also below.

- ASCE 7 is the proper forum to debate and deliberate what live loads should be—they are the acknowledged experts. Deviating from ASCE 7 is substituting ICC's judgment for the experts' judgment.
- ASCE determined through their deliberative process 1.5 times the live load served is the prudent design live load.
- For all intents and purposes, what the IRC is doing is amending the reference standard—a practice that is frowned on in this process, unless it's absolutely necessary.
- Deviating from ASCE 7 in this case is the beginnings of a slippery slope for other cases—on what basis do we decide to maintain or amend the current live load values for other areas of the building?
- Opposing arguments essentially revolve around “show me the bodies—we don't have a history of failures.” Our counter to that is, this is a life-safety issue. Do we need or want to have bodies to show before we fix it?

History: For the first 3 versions of the IBC and IRC (2000 through 2006), deck and balcony live loads were separate items. In the IRC, decks were designed for 40 psf, and balconies were designed for 60 psf. The difference between decks and balconies was their supporting structure—decks were supported by posts, and balconies were cantilevered from the building.

In the 2009 IBC and IRC, through code change S9-06/07, the difference in live loads between decks and balconies was eliminated on the basis that how a structure is used should dictate the live load, not the support condition. Although several live loads were proposed for decks and balconies, through the code development process, both the IBC and the IRC ended up with a requirement for 40 psf.

During the development of the 2010 version of ASCE 7, in an attempt to keep IBC/IRC and ASCE 7 aligned, we submitted a proposal to the ASCE process to consolidate the deck and balcony loads into one item, and to change the deck and balcony live load to 40 psf. In their deliberative process, it became clear that in the professional judgment of many members of the relevant ASCE 7 committees, 40 psf was too low. While several live load proposals were suggested and debated, the proposal that everyone could agree on set deck and balcony live loads at 1.5 times the live load of the area served.

For the 2018 IBC, code change S85-16, submitted by ASCE, realigned the IBC deck and balcony loading with ASCE 7. For the 2018 IRC, the City of Seattle Department of Construction and Inspections (SDCI) and the Washington Association of Building Officials Technical Code Development Committee (WABO TCD) submitted proposals to realign IRC deck and balcony live loads with ASCE 7. Code change proposal R26-16 (SDCI's

submittal) set the live load at 1.5 times the area served, exactly as determined through the ASCE 7 process. Code change proposal R27-16 (WABO TCD's proposal) took a more simplified approach and set the live load at 60 psf—1.5 times the normal residential live load of 40 psf. The IRC-Building Committee gave direction that the more simplified approach was preferred, but disapproved R27-16 as well, partly because the prescriptive tables for deck/balcony structure had not been updated. SDCI and WABO TCD submitted a public comment on R27-16 to update the relevant tables, which received the necessary 2/3 majorities on the two votes to approve the modified item at the Public Comment Hearings. However, the proposal was ultimately disapproved through the subsequent online vote.

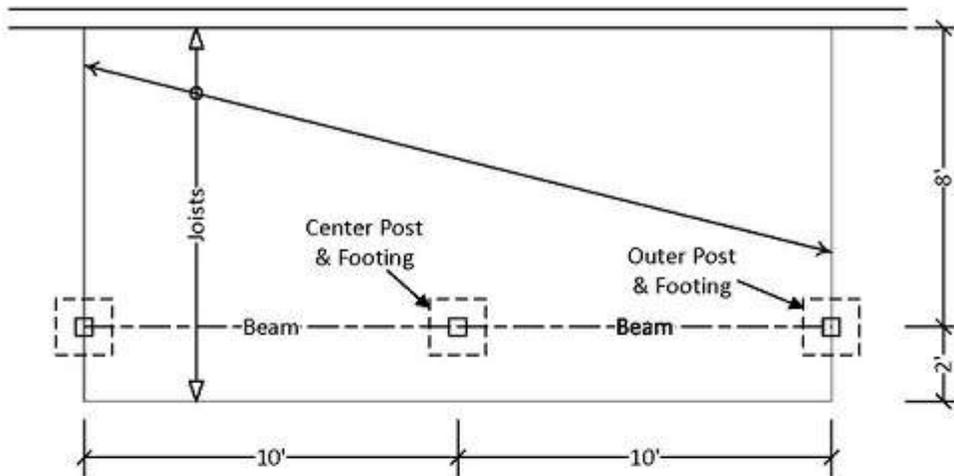


Fig. 1 – Case 1

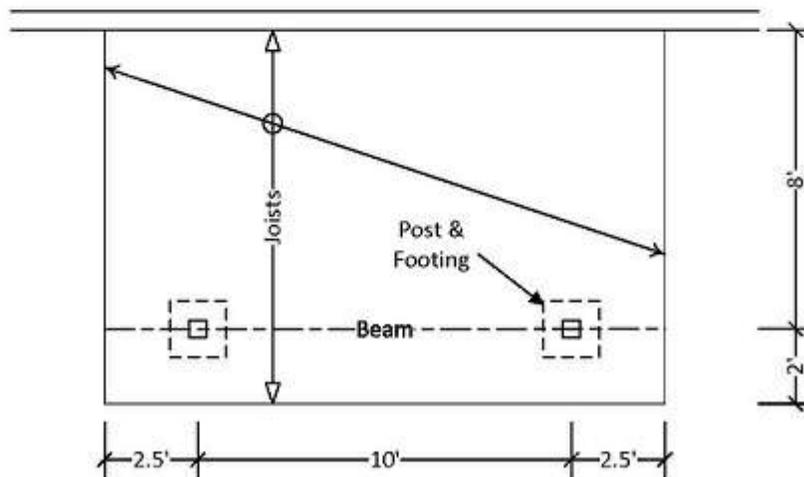


Fig. 2 – Case 2

Cost Impact: The code change proposal will increase the cost of construction

As stated, increasing the live load will increase costs. The question is, how much? A full parametric study of every size, shape, and configuration of decks is not practical, as there are too many variables. However, there are several ways to show what the differences might be between a 40 psf design and a 60 psf design, which then leads to costs.

Case Studies

Using the tables in the 2018 IRC and the tables being proposed by others for the deck structure, I looked at two very simple designs, and compared the results for 40 psf live load with a 60 psf live load (= 70 psf ground snow load).

- **Case 1 (see Fig. 1)** - 10'x20' elevated deck. Height = 9'. Joists span 8', with a 2' cantilever. Two beams each spanning 10' support the cantilevered end of the joists. The other end of the joists is supported by a ledger with ½" through-bolts and assume 1" of sheathing. Wood species assumed to be Hem-Fir (typical in the Pacific Northwest).
- **Case 2 (see Fig. 2)** - 10'x15' elevated deck. Everything is the same as Case 1, except instead of using two beams spanning 10' between posts, a single beam spans 10' between posts with 2'-6" cantilevers at each end to support the cantilevered end of the joists.

[INSERT FIGURES HERE]

Results:

Case 1

	40 psf Live Load	60 psf Live Load/ 70 psf Ground Snow Load
Joists	2x8 @ 24" o.c.	2x8 @ 24" o.c.
Beams	3-2x10	3-2x12
Ledger bolt spacing	36" o.c.	26" o.c.
Posts		
Outer	4x4	4x4
Center	4x4	4x6 ¹
Footings		
Outer	14" x 14" x 6"	18" x 18" x 6"
Center	17" x 17" x 6"	21" x 21" x 8"

1. Max. height for 4x4 = 7'-11".

Case 2

	40 psf Live Load	60 psf Live Load/ 70 psf Ground Snow Load
Joists	2x8 @ 24" o.c.	2x8 @ 24" o.c.
Beams	3-2x10	3-2x12
Ledger bolt spacing	36" o.c.	26" o.c.
Posts	4x4	4x4
Footings	14" x 14" x 6"	18" x 18" x 6"

Conclusions:

For these two case studies, the biggest impacts are to ledger bolt spacing and footing sizes. Other differences are nominal, and in a few cases, no change in structure is required.

Another way to look at cost impacts is to compare what would be allowed for the various components—allowable beam and joist spans, required ledger connection spacing, allowable post heights, and required footing sizes. Based on the IRC and proposed tables by others:

Maximum Joist Spans:

To get the same maximize joist spans as allowed for 40 psf live loads, in general, the increased live load would require either one joist size larger, or one step tighter spacing. For example, a 2x8 HF joist is allowed

to span 9'-1" at 24" o.c. when loaded at 40 psf. For 60 psf, the joists would need to be upsized to a 2x10 at 24" o.c., or 2x8s at 16" o.c. could be used. Note that tighter spacing may already be required for allowable deck board spans.

Maximum Beam Spans:

In general, at 60 psf, larger beam depths or more members will be required to achieve the same spans as for 40 psf loads. For example, a beam needed to span 8' between supports and supporting the 9'-1 span allowed for 2x8 HF joists at 40 psf would need to be a 3-2x10. A 3-2x12 would be required at 60 psf.

Ledger Bolt Spacing

Given the table structure, there's not much that can be done to match ledger bolt spacing between 40 and 60 psf loads. The only way to match them is to reduce joist spans or sheathing thickness under 60 psf loads, neither of which is practical.

Allowable Post Heights

To achieve the same post heights for 40 psf when designing for 60 psf, in most cases, either post size must increase or tributary area must be decreased (=> add more posts). However, as post sizes get larger, fewer adjustments are needed. For example, a 4x4 HF post is allowed up to a 9'-3" height, at 40 psf with a tributary area of 80 square feet. At 60 psf, a 6x6 is required if the tributary remains the same, but 4x4s can still be used if the tributary area is halved. A 4x6 post with 60 square feet of tributary area will also work at 60 psf. Other combinations of post size increases and reduced tributary areas can be used.

Footing Size

Given the table structure, similar to posts, tributary areas must be reduced (=> more footings) in order for footings supporting 60 psf to be a similar size as those supporting 40 psf loads. The amount of reduction varies considerably, depending on the tributary area and the soil bearing allowable. For example, a footing supporting 60 square feet of tributary area at 40 psf load and 1500 psf bearing is required to be 17"x17"x6". At 60 psf live load, a 18"x18"x6" footing is required for 40 square feet of tributary area.

Conclusions:

If the desire is for a 60 psf live load design to maintain the maximum spans and heights for 40 psf live load, as well as the minimum footing sizes, member sizes or numbers of members will need to be increased. How much depends on the particulars of the design.

Proposal # 4343

RB50-19

RB51-19

IRC@: R301.6

Proponent: Stephanie Young, representing National Council of Structural Engineers Associations
(stephanie@mattsonmacdonald.com)

2018 International Residential Code

Revise as follows:

R301.6 Roof load. The roof shall be designed for the live load indicated in Table R301.6 or the ground snow load indicated in Table R301.2(1), whichever is greater.

Reason: Table R301.2(1) lists only a value for 'ground snow load', not 'snow load', nor does a method exist to make the conversion between the two values and to direct the user to the proper value.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The modified language is intended to coordinate the two sections.

Proposal # 4602

RB51-19

RB52-19

IRC®: TABLE R301.7

Proponent: Stephanie Young, representing National Council of Structural Engineers Associations
(stephanie@mattsonmacdonald.com)

2018 International Residential Code

Revise as follows:

TABLE R301.7
ALLOWABLE DEFLECTION OF STRUCTURAL MEMBERS^{b, c}

STRUCTURAL MEMBER	ALLOWABLE DEFLECTION
Rafters having slopes greater than 3:12 with finished ceiling not attached to rafters	L/180
Interior walls and partitions	H/180
Floors	L/360
Ceilings with brittle finishes (including plaster and stucco)	L/360
Ceilings with flexible finishes (including gypsum board)	L/240
All other structural members	L/240
Exterior walls—wind loads ^a with plaster or stucco finish	H/360
Exterior walls—wind loads ^a with other brittle finishes	H/240
Exterior walls—wind loads ^a with flexible finishes	H/120 ^d
Lintels supporting masonry veneer walls ^e	L/600

Note: L = span length, H = span height.

- a. For the purpose of the determining deflection limits herein, the wind load shall be permitted to be taken as 0.7 times the component and cladding (ASD) loads obtained from Table R301.2(2).
- b. For cantilever members, L shall be taken as twice the length of the cantilever.
- c. For aluminum structural members or panels used in roofs or walls of sunroom additions or patio covers, not supporting edge of glass or sandwich panels, the total load deflection shall not exceed $L/60$. For continuous aluminum structural members supporting edge of glass, the total load deflection shall not exceed $L/175$ for each glass lite or $L/60$ for the entire length of the member, whichever is more stringent. For sandwich panels used in roofs or walls of sunroom additions or patio covers, the total load deflection shall not exceed $L/120$.
- d. Deflection for exterior walls with interior gypsum board finish shall be limited to an allowable deflection of $H/180$.
- e. Refer to Section R703.8.2. Dead load of supported materials shall be included when calculating the deflection of these members.

Reason: The section which references this Table (Section R301.7) indicates that the Table contains the deflection limits when a member is subjected to live, snow, and/or wind loads. However, the section referenced by footnote 'e' (Section R703.8.2) notes that the weight of the material shall be considered in the design and limits the member deflection to $L/600$. The addition to the footnote simply clarifies the requirement in this specific case and eliminates conflicting information.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The modified language is only intended to clarify existing requirements.

Proposal # 4603

RB52-19

RB53-19

IRC®: R302.1, [RB] 202

Proponent: David Renn, PE, SE, City and County of Denver, representing Code Change Committee of Colorado Chapter of ICC (david.renn@denvergov.org)

2018 International Residential Code

Revise as follows:

R302.1 Exterior walls. Construction, projections, openings and penetrations of *exterior walls* of *dwelling*s, *townhouses* and accessory buildings shall comply with Table R302.1(1); or *dwelling*s and *townhouses* equipped throughout with an *automatic sprinkler system* installed in accordance with Section P2904 shall comply with Table R302.1(2).

Exceptions:

1. Walls, projections, openings or penetrations in walls perpendicular to the line used to determine the *fire separation distance*.
2. Walls of *individual dwelling units* and their *accessory structures* located on the same *lot*.
3. Detached tool sheds and storage sheds, playhouses and similar structures exempted from permits are not required to provide wall protection based on location on the *lot*. Projections beyond the *exterior wall* shall not extend over the *lot line*.
4. Detached garages accessory to a *dwelling or townhouse* located within 2 feet (610 mm) of a *lot line* are permitted to have roof eave projections not exceeding 4 inches (102 mm).
5. Foundation vents installed in compliance with this code are permitted.

[RB] FIRE SEPARATION DISTANCE. The distance measured from the building face to one of the following:

1. To the closest interior *lot line*.
2. To the centerline of a street, an alley or public way.
3. To an imaginary line between two buildings *or townhouses* on the *lot*.

The distance shall be measured at a right angle from the face of the wall.

Reason: Prior to the 2015 IRC, Section R302.2 required each townhouse to be considered a separate building and be separated by fire-resistance-rated walls meeting requirements for exterior walls, with an exception to provide a fire-resistance-rated common wall. The 2015 IRC revised this section to only deal with common walls and a reference to exterior walls was removed. Since R302.1 only requires fire-resistance-rated exterior walls for *dwelling*s and accessory buildings, all townhouse exterior wall requirements were essentially removed from the code since a townhouse does not meet the definition of a *dwelling*. Prior to 2015 IBC, an imaginary line would be established between each townhouse since they were considered separate buildings and fire separation distance would be measured to the imaginary line, and it is believed that most jurisdictions still enforce this way.

This proposal brings back the 2012 townhouse exterior wall requirements that are assumed to have been inadvertently removed from the code. It does this by adding townhouses to the scoping of R302.1 for exterior walls and by revising the definition of fire separation distance to include imaginary lines between townhouses (rather than calling townhouses separate buildings, which they are not). Townhouse exterior walls that are adjacent to lot lines would meet exterior wall requirements based on fire separation distance to the lot lines. Townhouse exterior walls that are adjacent to other townhouses, would meet exterior wall requirements based on fire separation distance to the imaginary line between two townhouses. See Figures 1 and 2 below for

application examples for this proposal. This proposal is necessary to fill the current hole in the code regarding exterior wall requirements for townhouses.

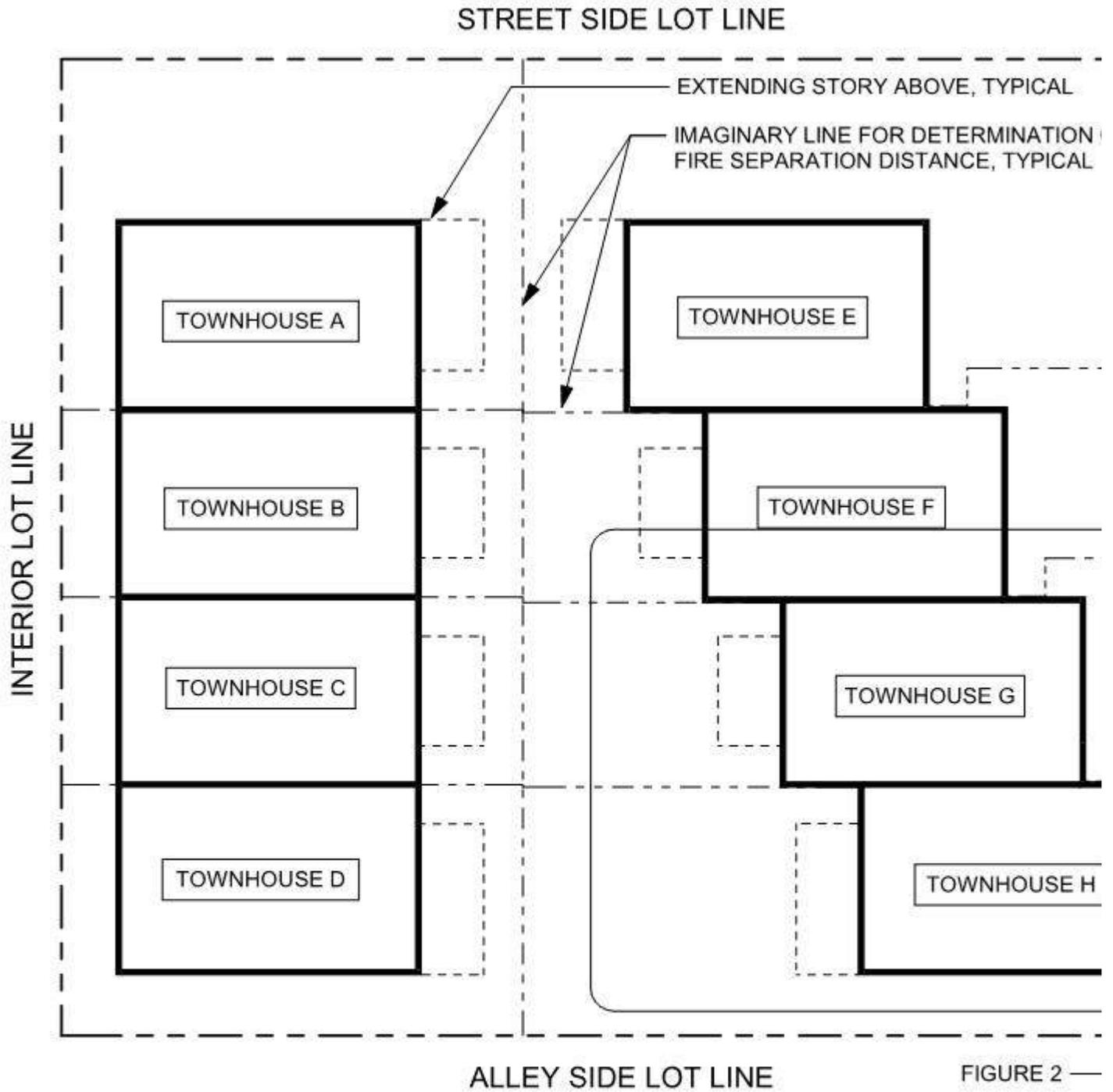
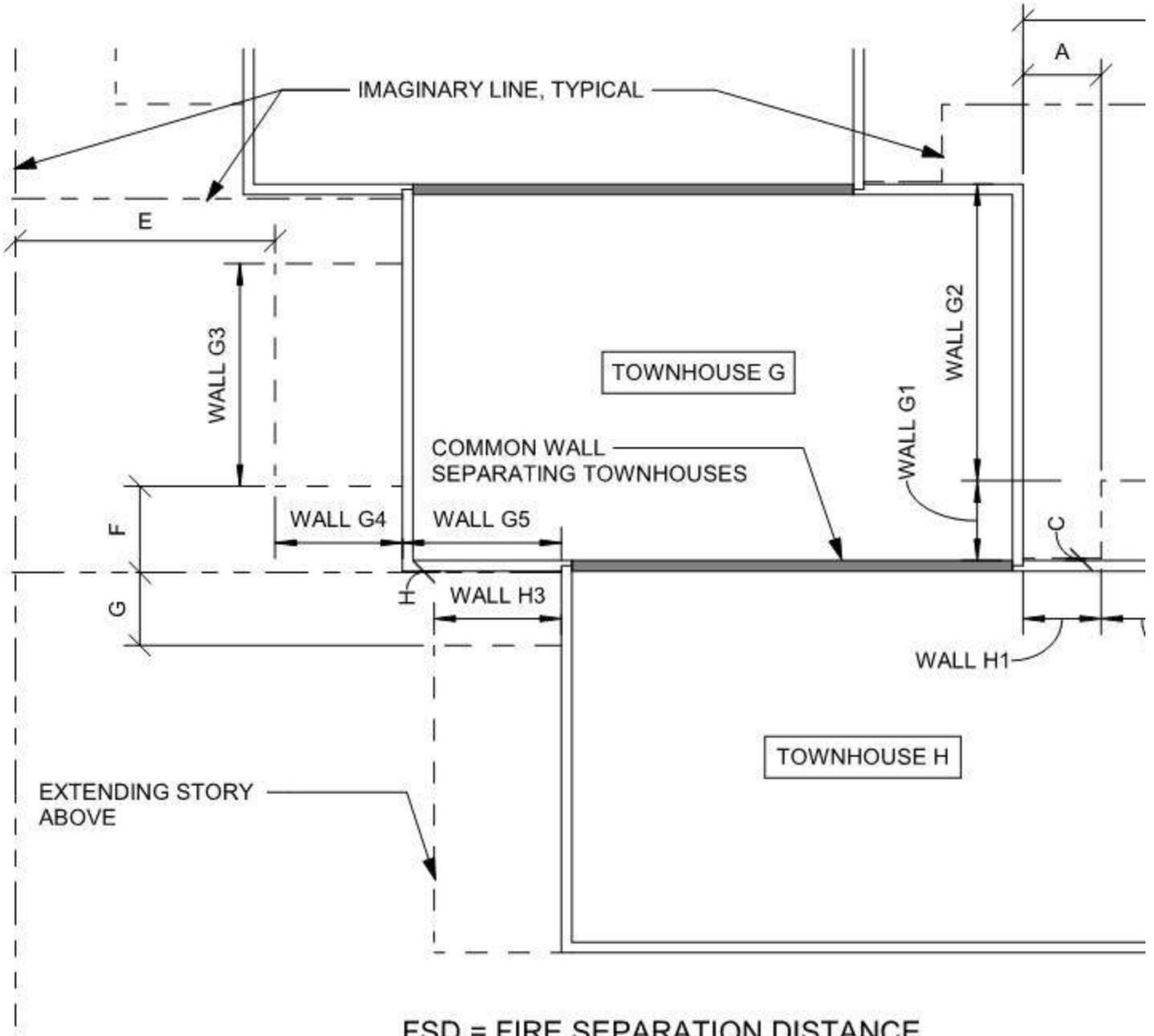


FIGURE 1 - IMAGINARY LINES BETWEEN TOWNHOUSES



- A = FSD FOR WALL G1
- B = FSD FOR WALL G2
- C = FSD = 0 FOR WALL H1
- D = FSD FOR WALL H2
- E = FSD FOR EXTENDING STORY WALL G3
- F = FSD FOR EXTENDING STORY WALL G4
- G = FSD FOR EXTENDING STORY WALL H3
- H = FSD = 0 FOR WALL G5

FIGURE 2 - EXAMPLE FIRE SEPARATION DISTANCES

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal brings back previous code requirements that I believe are currently being enforced due to the lack of specific townhouse exterior wall requirements in the current code, so there should be no increase or decrease in the cost of construction.

Proposal # 4161

RB53-19

RB54-19

IRC®: R302.1

Proponent: Ronald Clements Jr, representing Chesterfield County (clementsro@chesterfield.gov)

2018 International Residential Code

Revise as follows:

R302.1 Exterior walls. Construction, projections, openings and penetrations of *exterior walls of dwellings* and accessory buildings shall comply with Table R302.1(1); or *dwellings* equipped throughout with an *automatic sprinkler system* installed in accordance with Section P2904 shall comply with Table R302.1(2).

Exceptions:

1. Walls, projections, openings or penetrations in walls perpendicular to the line used to determine the *fire separation distance*.
2. Walls of *individual dwelling units* and their *accessory structures* located on the same *lot*.
3. Detached tool sheds and storage sheds, playhouses and similar structures exempted from permits are not required to provide wall protection based on location on the *lot*. Projections beyond the *exterior wall* shall not extend over the *lot line*.
4. Detached garages accessory to a *dwelling* located within 2 feet (610 mm) of a *lot line* are permitted to have roof eave projections not exceeding 4 inches (102 mm).
5. Foundation vents installed in compliance with this code are permitted.
6. Walls of dwellings and accessory structures located on lots in subdivisions or zoning districts where building setbacks established by local ordinance prohibit the walls of the structures on adjacent lots from being closer than 10 feet (3048 mm) to each other at any point along the exterior walls.

Reason: It has become a routine process to issue building code modifications on a sub-division wide basis to allow dwellings on adjacent lots to be constructed without the fire-resistance rating required by R302 because the local zoning ordinance prohibits dwellings from being closer than 10 feet from each other. The zoning ordinance established set-backs effectively satisfy the intent of the code.

Cost Impact: The code change proposal will decrease the cost of construction. There is no cost impact for localities already allowing this through code modification. For localities not allowing through modification I would estimate \$1000 to \$5000 depending on the size and configuration of the wall required to be fire rated.

Proposal # 5608

RB54-19

RB55-19

IRC®: R302.1, TABLE R302.1(1)

Proponent: Terry Kozlowski, representing Southern Nevada Chapter; Amanda Moss, representing SN-ICC Member; Cassidy Wilson, representing SN-ICC Member; Valarie Evans, representing Southern Nevada Chapter

2018 International Residential Code

Revise as follows:

R302.1 Exterior walls. Construction, projections, openings and penetrations of *exterior walls* of *dwellings* and accessory buildings shall comply with Table R302.1(1); or *dwellings* equipped throughout with an *automatic sprinkler system* installed in accordance with Section P2904 shall comply with Table R302.1(2). For use of this Table, fire separation distance in the field shall be measured from the lot line to the foundation.

Exceptions:

1. Walls, projections, openings or penetrations in walls perpendicular to the line used to determine the *fire separation distance*.
2. Walls of *individual dwelling units* and their *accessory structures* located on the same *lot*.
3. Detached tool sheds and storage sheds, playhouses and similar structures exempted from permits are not required to provide wall protection based on location on the *lot*. Projections beyond the *exterior wall* shall not extend over the *lot line*.
4. Detached garages accessory to a *dwelling* located within 2 feet (610 mm) of a *lot line* are permitted to have roof eave projections not exceeding 4 inches (102 mm).
5. Foundation vents installed in compliance with this code are permitted.

**TABLE R302.1(1)
EXTERIOR WALLS**

EXTERIOR WALL ELEMENT		MINIMUM FIRE-RESISTANCE RATING	MINIMUM FIRE SEPARATION DISTANCE
Walls	Fire-resistance rated	1 hour—tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code with exposure from both sides	0 feet
	Not fire-resistance rated	0 hours	≥ 5 feet
Projections	Not allowed	NA	< 2 feet
	Fire-resistance rated	1 hour on the underside, or heavy timber, or fire-retardant-treated wood ^{a, b}	≥ 2 feet to < 5 feet
	Not fire-resistance rated	0 hours ^c	≥ 5 feet
Openings in	Not allowed	NA	< 3 feet

Openings in walls	25% maximum of wall area	0 hours	3 feet
	Unlimited	0 hours	5 feet
Penetrations	All	Comply with Section R302.4	< 3 feet
		None required	3 feet

For SI: 1 foot = 304.8 mm.

NA = Not Applicable.

- a. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave overhang if fireblocking is provided from the wall top plate to the underside of the roof sheathing.
- b. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the rake overhang where gable vent openings are not installed.
- c. Non rated exterior walls finishes shall not project more than 4 inches into the fire separation distance.

Reason: Footnote (c) allows for non-rated exterior wall finishes to project not more than 4 inches into the fire separation distance. Chapter 2 – Defines exterior wall covers as “A material or assembly of materials applied on the exterior side of exterior walls for the purpose of providing a weather-resistive barrier, insulation or for aesthetics, including but not limited to, veneers, siding, exterior insulation and finish systems, architectural trim and embellishments such as cornices, soffits, and fascias.”

Chapter 2 defines “fire separation distance” and requires the measurements to be taken from the lot line to the building face. For use of this table, field measurements shall be taken from the lot line to the foundation and not the building face.

This proposed amendment changes Table 302.1 (1) to provide a specific dimension to building face in footnote (c).

This proposed amendment will allow builders who have parcels with 5 foot building setbacks to the property line to construct buildings without the requirement for fire-resistant construction.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This code proposal does not increase or decrease the cost of construction. It only provides clarity on the intent of the code language.

Proposal # 4339

RB55-19

RB56-19

IRC@: R302.2.2

Proponent: David Renn, PE, SE, City and County of Denver, representing City and County of Denver (david.renn@denvergov.org)

2018 International Residential Code

Revise as follows:

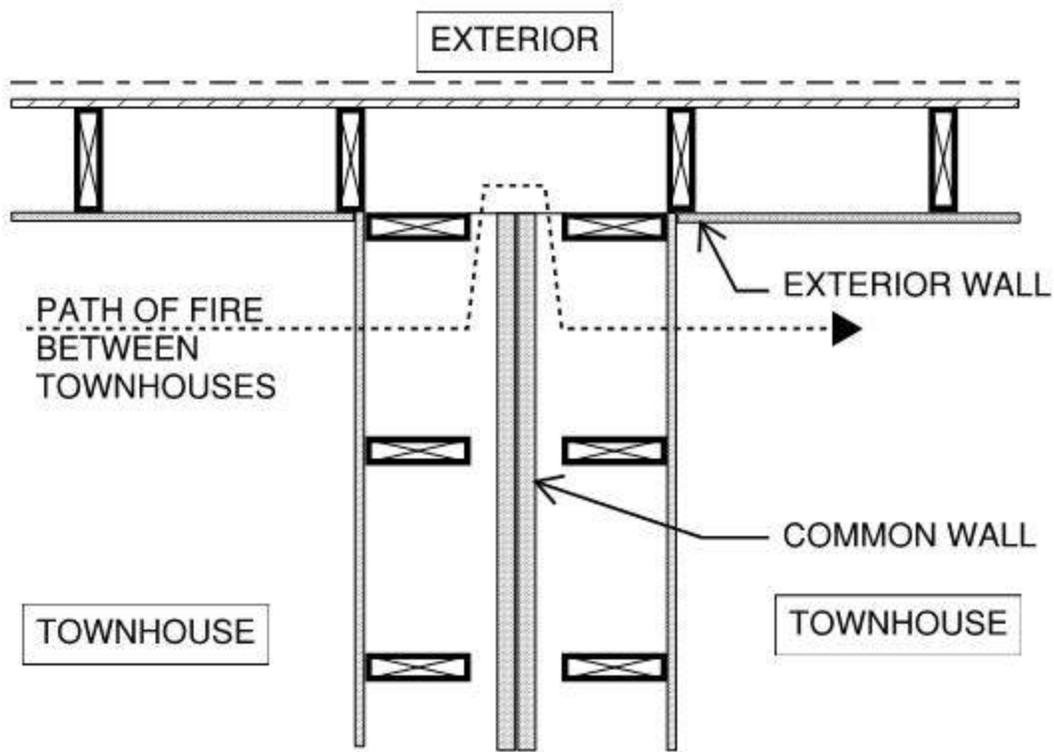
R302.2.2 Common walls. Common walls separating *townhouses* shall be assigned a fire-resistance rating in accordance with Item 1 or ~~2~~ and shall be rated for fire exposure from both sides. Common walls shall extend to and be tight against the exterior sheathing of the exterior walls, or the inside face of exterior walls without stud cavities, and the underside of the roof sheathing. The common wall shared by two *townhouses* shall be constructed without plumbing or mechanical equipment, ducts or vents in the cavity of the common wall. ~~The wall shall be rated for fire exposure from both sides and shall extend to and be tight against exterior walls and the underside of the roof sheathing.~~ Electrical installations shall be in accordance with Chapters 34 through 43. Penetrations of the membrane of common walls for electrical outlet boxes shall be in accordance with Section R302.4.

1. Where a fire sprinkler system in accordance with Section P2904 is provided, the common wall shall be not less than a 1-hour fire-resistance-rated wall assembly tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code.
2. Where a fire sprinkler system in accordance with Section P2904 is not provided, the common wall shall be not less than a 2-hour fire-resistance-rated wall assembly tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code.

Exception: Common walls are permitted to extend to and be tight against the inside of the exterior walls if the cavity between the end of the common wall and the exterior sheathing is filled with a minimum of two two-inch nominal thickness wood studs.

Reason: The code currently allows a townhouse common wall to stop at the interior face of the exterior wall, which can create a path for a fire to spread from one townhouse to the next through the exterior wall. A typical common wall construction is two layers of gypsum board in metal H-studs that are connected to stud walls on either side for stability only, with a gap between the gypsum board and the stud walls. With the gap in this configuration, there is a path a fire can take that is only protected by two layers of 1/2" non-classified gypsum board (or other sheathing) - one on the stud wall adjacent to the common wall on the fire side and one on the same wall of the adjacent townhouse. Two layers of 1/2" gypsum board only provides approximately 30 minutes of fire protection until a fire can spread to the next townhouse. See figure below for clarification of this type of common wall construction.

This proposal requires common walls to continue to the exterior sheathing of the exterior wall, which will eliminate the path of fire described above and will provide the intended fire rating duration of the common wall. For solid exterior walls, such as concrete or masonry, this proposal allows common walls to stop at the inside face since a path for fire to spread from townhouse to townhouse doesn't exist in a solid exterior wall. The exception allows (2) 2x wood studs to be used to extend the common wall through the exterior wall stud cavity. Typical wood studs have a char rate of approximately 1.5" per hour, so this provides the required fire-resistance rating of the common wall.



Cost Impact: The code change proposal will not increase or decrease the cost of construction. The common wall extent requirement in this proposal is the typical way common walls are constructed, so there should be no change in construction or cost of construction.

Proposal # 4297

RB56-19

RB57-19

IRC@: R302.2

Proponent: Jeffrey Shapiro, P.E., representing Self (jeff.shapiro@intlcodeconsultants.com)

2018 International Residential Code

Revise as follows:

R302.2 Townhouses. Walls separating townhouse units shall be constructed in accordance with Section R302.2.1 or R302.2.2, and shall comply with Sections 302.2.3 through 302.2.5.

Reason: Sections 302.2.3 through 302.2.5 also apply to townhouse wall construction. It is appropriate for these sections to be referenced by the introductory section on townhouses, which is focused on townhouse walls.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Clarifies existing requirements.

Proposal # 5692

RB57-19

RB58-19

IRC®: TABLE R302.1(1), TABLE R302.1(2)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

**TABLE R302.1(1)
EXTERIOR WALLS**

EXTERIOR WALL ELEMENT		MINIMUM FIRE-RESISTANCE RATING	MINIMUM FIRE SEPARATION DISTANCE
Walls	Fire-resistance rated	1 hour—tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code with exposure from both sides	0 feet
	Not fire-resistance rated	0 hours	≥ 5 feet
Projections	Not allowed	NA	< 2 feet
	Fire-resistance rated	1 hour on the underside, or heavy timber, or fire-retardant-treated wood ^{a, b}	≥ 2 feet to < 5 feet
	Not fire-resistance rated	0 hours	≥ 5 feet
Openings in walls	Not allowed	NA	< 3 feet
	25% maximum of wall area	0 hours	3 feet
	Unlimited	0 hours	5 feet
Penetrations	All	Comply with Section R302.4	< 3 feet
		None required	3 feet

For SI: 1 foot = 304.8 mm.

NA = Not Applicable.

- a. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave overhang if fireblocking is provided from the wall top plate to the underside of the roof sheathing.
- b. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the rake overhang where gable vent openings are not installed in the overhang or in any gable end walls that are common to attic areas.

**TABLE R302.1(2)
EXTERIOR WALLS—DWELLINGS WITH FIRE SPRINKLERS**

EXTERIOR WALL ELEMENT		MINIMUM FIRE-RESISTANCE RATING	MINIMUM FIRE SEPARATION DISTANCE
Walls	Fire-resistance rated	1 hour—tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code with exposure from the outside	0 feet
	Not fire-resistance rated	0 hours	3 feet ^a
Projections	Not allowed	NA	< 2 feet
	Fire-resistance rated	1 hour on the underside, or heavy timber, or fire-retardant-treated wood ^{b, c}	2 feet ^a
	Not fire-resistance rated	0 hours	3 feet
Openings in walls	Not allowed	NA	< 3 feet
	Unlimited	0 hours	3 feet ^a
Penetrations	All	Comply with Section R302.4	< 3 feet
		None required	3 feet ^a

For SI: 1 foot = 304.8 mm.

NA = Not Applicable.

- a. For residential subdivisions where all dwellings are equipped throughout with an automatic sprinkler system installed in accordance with Section P2904, the fire separation distance for exterior walls not fire-resistance rated and for fire-resistance-rated projections shall be permitted to be reduced to 0 feet, and unlimited unprotected openings and penetrations shall be permitted, where the adjoining lot provides an open setback yard that is 6 feet or more in width on the opposite side of the property line.
- b. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave overhang if fireblocking is provided from the wall top plate to the underside of the roof sheathing.
- c. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the rake overhang where ~~gable vent openings are not installed~~ in the overhang or in any gable end walls that are common to attic areas.

Reason: Staff continues to get questions regarding these footnotes. The existing language remains unclear, despite recent attempts to fix it. Ray Allshouse, the proponent of the code change that brought this language into the code, was contacted. He indicated that the intent was that if there were no vents at the underside of the overhang, or in any gable end walls (both of which would allow fire to freely move into attic areas), then there should be no requirement to rate the underside of the overhang. Mr. Allshouse also indicated that this concept could be applied gable, hip and any other roof style with overhangs. Where additional attic ventilation is required to make up for the loss of vents at overhangs where fire-separation distance is an issue in accordance these tables and footnotes, additional vents could be added at the underside of eaves in other areas of the dwelling

where the fire-separation distance is not an issue, or at roof ridges.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes.

Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/building-code-action-committee-bcac/>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This code change is a clarification of current code requirements.

Proposal # 4132

RB58-19

RB59-19

IRC®: R302.2.3.1 (New)

Proponent: Kirk Nagle, representing Myself (knagle@auroragov.org)

2018 International Residential Code

Add new text as follows:

R302.2.3.1 Occupied Roof Rated Separation. Townhome separation, where the roof is intended to be occupied, shall continue the common wall between units to a height of 8 feet above the walking surface with a minimum one hour fire-resistance-rated wall assembly tested in accordance with ASTM E119, UL 263 or Section 703.3 of the *International Building Code* and shall have noncombustible faces for the uppermost 18 inches (457 mm), including counterflashing and coping materials.

Reason: Occupied roofs are a new building element that has the potential to cause connected townhomes to be at a significant risk of fire hazard. In reviewing plans and looking at the current code requirements, the potential for risk of fire conflagration to involve connected townhome units does not seem to be addressed by the 2018 IRC. Fire data from the NFPA related to fires caused by gas grills alone would suggest that not having some protection to connected units leaves the occupants at risk. People will have the gas grills, charcoal grills and other fire related uses to occur on the occupied roofs. Even when fire sprinklers are installed the potential fire propagation from one unit to another is not addressed. Loss of life or even just losing the use of a home after a fire is significant. This proposal would help increase the chance that the fire would not involve connected units and allow the fire department response to contain the fire on the original unit.

NFPA Report fact sheet U.S. Home Fires Involving Grills

From 2011–2015, U.S. fire departments responded to an average of 9,600 home fires involving grills, hibachis, or barbecues per year. That number included an average of 4,100 structure fires and 5,500 outside or unclassified fires. These 9,600 fires caused annual averages of 10 civilian deaths, 160 reported civilian injuries, and \$133 million in direct property damage.

Almost all the losses resulted from structure fires.

July (17%) was the peak month for grill fires, followed by May (14%), June (14%), and August (13%). Three percent of

the fires occurred in each of the winter months of December, January, and February.

Causes of Grill Fires

Gas vs. Solid-Fuel Grills

Five out of six (82%) grills involved in home fires were fueled by gas, while 14% used charcoal or other solid fuel.

Gas grills were involved in an average of 7,900 home fires per year, including 3,300 structure fires and 4,700 outdoor

fires annually. Leaks or breaks were primarily a problem with gas grills. Twelve percent of gas grill structure fires and

24% of outside gas grill fires were caused by leaks or breaks.

Charcoal or other solid-fuel grills were involved in 1,300 home fires per year, including 600 structure fires and 700

outside fires annually.

Fire and Non-Fire Emergency Room Visits Due to Grills

From 2012–2016, an average of 16,600 patients per year went to emergency rooms because of injuries

involving grills.²

Half (8,200 or 49%) of the injuries were thermal burns, including burns both from fire and from contact with hot objects.

About 4,500 of the thermal burns were caused by such contact or other non-fire events.

Children under age 5 accounted for an average of 1,600 or one-third (35%) of the contact-type burns. The burns typically

occurred when someone, often a child, bumped into, touched, or fell on the grill, grill part, or hot coals. Keep children away

from the grill.

Cost Impact: The code change proposal will increase the cost of construction

The cost of construction will be increased but the amount is not static because it is based on the variables of the finishes and type of construction.

Proposal # 5671

RB59-19

RB60-19

IRC®: R302.2.6

Proponent: Jeffrey Shapiro, P.E., representing Self (jeff.shapiro@intlcodeconsultants.com)

2018 International Residential Code

Revise as follows:

R302.2.6 Structural independence. Each individual *townhouse* shall be structurally independent.

Exceptions:

1. Foundations supporting *exterior walls* or common walls.
2. Structural roof and wall sheathing from each unit fastened to the common wall framing.
3. Nonstructural wall and roof coverings.
4. Flashing at termination of roof covering over common wall.
5. *Townhouses* separated by a common wall as provided in Section R302.2.2, Item 1 or 2.
6. *Townhouses* protected by a fire sprinkler system complying with Section P2904 or NFPA 13D.

Reason: The IBC now allows townhouses to be built without structural independence provided that height and area limits for the overall townhouse building are not exceeded. This is true because the firewall requirement to separate units is no longer applicable in such cases. Therefore, only the 1-hour dwelling unit requirement applies, and that assembly is a fire barrier, which has no structural independence requirement. For reference IBC Section 706.1.1, Exception 2 states:

Fire walls are not required on lot lines dividing a building for ownership purposes where the aggregate height and area of the portions of the building located on both sides of the lot line do not exceed the maximum height and area requirements of this code. For the code official's review and approval, he or she shall be provided with copies of dedicated access easements and contractual agreements that permit the owners of portions of the building located on either side of the lot line access to the other side for purposes of maintaining fire and life safety systems necessary for the operation of the building.

It makes no sense for the IRC to be more restrictive than the IBC with respect to requiring structural independence when townhouses are sprinklered.

Disclosure: although I am a consultant to the National Fire Sprinkler Association, this proposal is submitted on my own behalf and was not reviewed or endorsed by NFSA prior to submittal.

Cost Impact: The code change proposal will decrease the cost of construction. Construction costs are reduced, consistent with the IBC, based on the allowance to not require structural independence of townhouse units.

Proposal # 5691

RB60-19

RB61-19

IRC®: R302.2.6

Proponent: David Renn, PE, SE, City and County of Denver, representing self (david.renn@denvergov.org)

2018 International Residential Code

Revise as follows:

R302.2.6 Structural independence. Each individual *townhouse* shall be structurally independent.

Exceptions:

1. Foundations supporting *exterior walls* or common walls.
2. ~~Structural roof and wall sheathing from each unit fastened to the common wall framing.~~
3. Nonstructural wall and roof coverings.
4. Flashing at termination of roof covering over common wall.
5. *Townhouses* separated by a common wall as provided in Section R302.2.2, Item 1 or 2.

Reason: The current Exception 2 is for sheathing fastened to common wall framing, which is not necessary since Exception 5 completely exempts townhouses separated by a common wall. In other words, if the townhouse is exempt, the sheathing is also exempt, so Exception 2 is not needed.

Note that there is another proposal to revise Exception 5 to only apply to structural common walls. If this proposal is approved, the deletion of Exception 2 is still valid since there is no reason to fasten sheathing to a nonstructural common wall. For this condition, there will be structural framing adjacent to the non-structural common wall to fasten the sheathing to.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal is simply a deletion of a non-relevant exception, so there should be no change to the cost of construction.

Proposal # 5655

RB61-19

RB62-19

IRC@: R302.2.6

Proponent: David Renn, PE, SE, City and County of Denver, representing Code Change Committee of Colorado Chapter of ICC (david.renn@denvergov.org)

2018 International Residential Code

Revise as follows:

R302.2.6 Structural independence. Each individual *townhouse* shall be structurally independent.

Exceptions:

1. Foundations supporting *exterior walls* or common walls.
2. Structural roof and wall sheathing from each unit fastened to the common wall framing.
3. Nonstructural wall and roof coverings.
4. Flashing at termination of roof covering over common wall.
5. *Townhouses* separated by a structural common wall as provided in Section R302.2.2, Item 1 or 2.

Reason: A regularly used townhouse common wall consists of two layers of 1" thick gypsum panels installed between steel H-studs and these H-studs are connected to stud walls of each townhouse for stability only - the fire-resistance rating is achieved entirely by the two layers of gypsum panels between steel H-studs. This type of common wall is a non-structural wall and for this condition there is no reason to exempt the townhouses from structural independence since floor and roof framing are supported on separate stud walls within each unit.

Cost Impact: The code change proposal will increase the cost of construction. This proposal typically will not change the cost of construction since it clarifies a condition that provides structural independence without cost. However, if the current exemption is used to share lateral loads (wind and seismic) between townhouses, a slight increase in cost may be realized since separate lateral systems will be required for each townhouse.

Proposal # 5103

RB62-19

RB63-19

IRC®: TABLE R302.1(1), TABLE R302.1(2), 302.2.6 (New), 302.2.6.1 (New)

Proponent: Matthew Dobson, representing Suburban Exterior Fire Work Group (mdobson@vinylsiding.org)

2018 International Residential Code

Revise as follows:

**TABLE R302.1(1)
EXTERIOR WALLS**

EXTERIOR WALL ELEMENT		MINIMUM FIRE-RESISTANCE RATING	MINIMUM FIRE SEPARATION DISTANCE
Walls	Fire-resistance rated	1 hour—tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code with exposure from both sides	0 feet
	Not fire-resistance rated	0 hours	≥ 5 feet
Projections	Not allowed	NA	< 2 feet
	Fire-resistance rated	1 hour on the underside, or heavy timber, or fire-retardant-treated wood ^{a, b}	≥ 2 feet to < 5 feet
	Not fire-resistance rated	0 hours	≥ 5 feet
Openings in walls	Not allowed	NA	< 3 feet
	25% maximum of wall area	0 hours	3 feet
	Unlimited	0 hours	5 feet
Penetrations	All	Comply with Section R302.4	< 3 feet
		None required	3 feet
<u>Soffits Above Exterior Doors^c</u>	<u>Fire-resistance rated or comply with Section R302.2.6</u>	<u>1 Hour on underside or prescriptive vented protected soffit complying with Section R302.2.6.1</u>	<u>See footnote c</u>

For SI: 1 foot = 304.8 mm.

NA = Not Applicable.

- a. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave overhang if fireblocking is provided from the wall top plate to the underside of the roof sheathing.
- b. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the rake overhang where gable vent openings are not installed.
- c. Applies to soffits constructed outside of exterior doors, including garage doors. Applies to the soffit area over doors and extending 3 feet horizontally in both directions from the vertical edges of doors.

**TABLE R302.1(2)
EXTERIOR WALLS—DWELLINGS WITH FIRE SPRINKLERS**

EXTERIOR WALL ELEMENT		MINIMUM FIRE-RESISTANCE RATING	MINIMUM FIRE SEPARATION DISTANCE
Walls	Fire-resistance rated	1 hour—tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code with exposure from the outside	0 feet
	Not fire-resistance rated	0 hours	3 feet ^a
Projections	Not allowed	NA	< 2 feet
	Fire-resistance rated	1 hour on the underside, or heavy timber, or fire-retardant-treated wood ^{b, c}	2 feet ^a
	Not fire-resistance rated	0 hours	3 feet
Openings in walls	Not allowed	NA	< 3 feet
	Unlimited	0 hours	3 feet ^a
Penetrations	All	Comply with Section R302.4	< 3 feet
		None required	3 feet ^a
<u>Soffits Above Exterior Doors^d</u>	<u>Soffits Outside of Exterior Doors^d</u>	<u>1 hour on underside, or prescriptive vented protected soffit complying with Section R302.2.6.1</u>	See footnote c

For SI: 1 foot = 304.8 mm.

NA = Not Applicable.

- a. For residential subdivisions where all dwellings are equipped throughout with an automatic sprinkler system installed in accordance with Section P2904, the fire separation distance for exterior walls not fire-resistance rated and for fire-resistance-rated projections shall be permitted to be reduced to 0 feet, and unlimited unprotected openings and penetrations shall be permitted, where the adjoining lot provides an open setback yard that is 6 feet or more in width on the opposite side of the property line.
- b. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave overhang if fireblocking is provided from the wall top plate to the underside of the roof sheathing.
- c. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the rake overhang where gable vent openings are not installed.
- d. Applies to soffits constructed outside of exterior doors, including garage doors. Applies to the soffit area over doors and extending 3 feet horizontally in both directions from the vertical edges of doors.

Add new text as follows:

302.2.6 Protected Soffit. Soffit projections above exterior doors shall be 1-hour fire-resistance-rated on the soffit underside or constructed in accordance with Section R302.2.6.1.

302.2.6.1 Prescriptive Vented Protected Soffit. Soffits shall be constructed in accordance with one of the following:

1. Fasten one layer of Type X 5/8" gypsum panel attached to the underside of bottom of truss bottom chord or soffit framing member. Bottom panel shall have a venting space not more than 4" from the fascia board.
2. Fasten one layer of Type X 5/8" gypsum panel to the top of truss bottom chord or soffit framing member. Top panel shall have venting space not more than 4" from the top plate of the wall.

Ventilation cut into panels should not align vertically. Ventilation space shall have mesh applied with both panels in accordance with Section R806.1.

Reason: Recent trends in smoker habits have led to fires starting on the outside of homes and residences. Smokers are now discarding their cigarettes outside of entrances and into combustible mulch or trash cans with combustible materials in them. This change would provide an added protection in these areas where the fire risk has been identified.

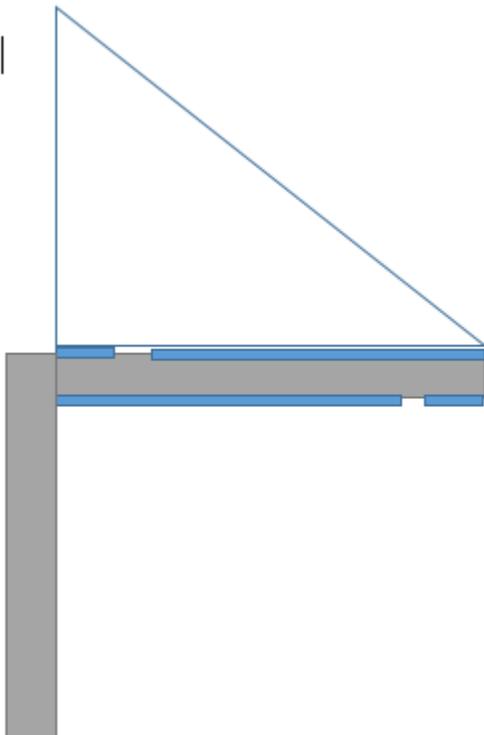
There has been concern that by creating this fire block, ventilation at the soffit could become an issue. In exploratory testing by the Suburban Exterior Fire Work Group, it was found that by creating a chamber at the soffit, the assembly still provides ventilation but also creates an environment that slows down the movement of the fire due to lack of oxygen.

Here are photos of the test assemblies:





As proposed a 1 hour rated assembly can be used and ventilation would be found in other areas of the roof assembly or a prescriptive vented protected soffit could be constructed. Below is a abstract sketch of a profile of this assembly.



Cost Impact: The code change proposal will increase the cost of construction
This change will add labor and material costs associated with the added protection gypsum panels, fasteners,
and mesh.

Proposal # 5538

RB63-19

RB64-19

IRC®: R302.3, NFPA Chapter 44

Proponent: Jeffrey Shapiro, P.E., International Code Consultants, representing Self
(jeff.shapiro@intlcodeconsultants.com)

2018 International Residential Code

Revise as follows:

R302.3 Two-family dwellings. *Dwelling units* in two-family dwellings shall be separated from each other by wall and floor assemblies having not less than a 1-hour fire-resistance rating where tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code. Fire-resistance-rated floor/ceiling and wall assemblies shall extend to and be tight against the *exterior wall*, and wall assemblies shall extend from the foundation to the underside of the roof sheathing.

Exceptions:

1. A fire-resistance rating of $\frac{1}{2}$ hour shall be permitted in buildings equipped throughout with an automatic sprinkler system installed in accordance with Section P2904 or NFPA 13D.
2. Wall assemblies need not extend through *attic* spaces where the ceiling is protected by not less than $\frac{5}{8}$ -inch (15.9 mm) Type X gypsum board, an *attic* draft stop constructed as specified in Section R302.12.1 is provided above and along the wall assembly separating the *dwellings* and the structural framing supporting the ceiling is protected by not less than $\frac{1}{2}$ -inch (12.7 mm) gypsum board or equivalent.

NFPA

National Fire Protection
Association
1 Batterymarch Park
Quincy MA 02169-7471

~~13~~—16: Standard for Installation of Sprinkler Systems

Reason: The current exception will never be used because the cost of installing a full NFPA 13 system (typically associated with commercial structures) in a duplex will far outweigh savings associated with reducing the separation wall rating from one-hour to 30 minutes. From a parity perspective, it makes no sense to allow Section P2904 or NFPA 13D protection as a basis for reducing townhouse separations but require NFPA 13 for duplexes.

Perhaps the logic associated with the current provision was intending to gain sprinkler protection in the attic (which would typically be required by NFPA 13) as a basis of qualifying for the reduced fire rating. But, townhouse separations are allowed to be reduced in unsprinklered attics of sprinklered townhouses, recognizing that the vast majority of residential fires start in occupied spaces, where sprinklers are present to control a fire before extension into the attic. True, a reduced townhouse separation maintains a one-hour rating, versus 30 minutes in a duplex, but 30 minutes is still a sufficient separation rating to accommodate fire department response and setup at a duplex.

Note that IRC Section R313 only requires NFPA 13D for duplexes, so this change will align with Section R313. Also, the reference to NFPA 13 is proposed for deletion since this is the only place in the IRC where that standard is referenced.

Disclosure: although I am a consultant to the National Fire Sprinkler Association, this proposal is submitted on

my own behalf and was not reviewed or endorsed by NFSA prior to submittal.

Cost Impact: The code change proposal will decrease the cost of construction
The change allows a reduction from NFPA 13 to NFPA 13D for duplex separation wall rating reduction.

Proposal # 5595

RB64-19

RB65-19

IRC®: R302.3

Proponent: Jeffrey Shapiro, P.E., International Code Consultants, representing IRC Fire Sprinkler Coalition (jeff.shapiro@intlcodeconsultants.com)

2018 International Residential Code

Revise as follows:

R302.3 Two-family dwellings. *Dwelling units* in two-family dwellings shall extend from foundation to roof, shall have a yard or public way on not less than three sides, and shall be separated from each other by wall and floor assemblies having not less than a 1-hour fire-resistance rating where tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code. Fire-resistance-rated ~~floor/ceiling and wall~~ assemblies shall extend to and be tight against the *exterior wall*, and ~~wall assemblies~~ shall extend from the foundation to the underside of the roof sheathing.

Exceptions:

1. A fire-resistance rating of $1/2$ hour shall be permitted in buildings equipped throughout with an automatic sprinkler system installed in accordance with Section P2904 or NFPA 13D.
2. Wall assemblies need not extend through *attic* spaces where the ceiling is protected by not less than $5/8$ -inch (15.9 mm) Type X gypsum board, an *attic* draft stop constructed as specified in Section R302.12.1 is provided above and along the wall assembly separating the *dwellings* and the structural framing supporting the ceiling is protected by not less than $1/2$ -inch (12.7 mm) gypsum board or equivalent.
3. *Dwelling units* in two-family dwellings shall be permitted to be stacked vertically where both *dwelling units* are equipped with an automatic sprinkler system installed in accordance with Section P2904 or NFPA 13D. The floor/ceiling assembly separating the dwelling units shall be permitted to have a fire-resistance rating of 1/2 hour where tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code.

Reason: Stacked duplexes are much more hazardous than side-by-side duplexes for several reasons. An upstairs unit is significantly more dangerous because smoke, heat and flames from a fire in the first-floor unit will attempt to travel vertically into the upstairs unit. Smoke alarms are not interconnected between duplex units and there is no fire alarm. So the upstairs occupant warning will be delayed until a fire in the lower has grown significantly, particularly if the downstairs unit occupant is not home or is home but doesn't or is unable to warn the upstairs unit occupant

The IRC does not require the floor/ceiling fire separation to be a smoke barrier, so once the fire is large enough, the upstairs unit will flood with smoke. The smoke alarm in the upstairs unit may not provide adequate warning time for escape because smoke alarms are designed to provide escape from fires detected in incipient stages, not well-developed fires. Further, the IRC does not provide a rated enclosure for egress from the upper unit, so the means of egress might go directly through the rated floor/ceiling assembly and directly into the fire and smoke below. Even an outside stair is of questionable adequacy because windows and doors are often stacked vertically. Once a fire breaks out of the lower unit, upper unit escape windows and stairs can be quickly compromised.

The prevalence of stacked duplexes is increasing in some areas, and the associated fire risk is being amplified by the fact that such units can be two stories with an additional story and an occupied attic above (essentially a 4 story structure). This begs the question of why townhouses aren't allowed to include stacked units. The answer is that such designs become multifamily occupancies and are required to be constructed in accordance

with the IBC in response to the increased fire risk.

It isn't feasible to expect that a duplex could be built with a fire-resistive means of egress for upstairs units, a smoke-rated floor ceiling assembly and opening protectives and listed penetration smoke seals and fire stops to protect the upstairs unit, so this proposal recommends that fire sprinklers be specifically provided for stacked duplex buildings.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Technically, the IRC requires all buildings to be sprinklered, so this doesn't have a cost impact with respect to the model code. However, in jurisdictions that choose to amend the IRC by removing the sprinkler requirement, there would be a cost increase.

Proposal # 5685

RB65-19

RB66-19

IRC®: R302.3

Proponent: Stephen Thomas, representing Himself (sthomas@coloradocode.net)

2018 International Residential Code

Revise as follows:

R302.3 Two-family dwellings. *Dwelling units* in two-family dwellings shall be separated from each other by wall and floor assemblies having not less than a 1-hour fire-resistance rating where tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code. Such separation shall be provided regardless of whether a lot line exists between the two dwelling units or not. Fire-resistance-rated floor/ceiling and wall assemblies shall extend to and be tight against the *exterior wall*, and wall assemblies shall extend from the foundation to the underside of the roof sheathing.

Exceptions:

1. A fire-resistance rating of $\frac{1}{2}$ hour shall be permitted in buildings equipped throughout with an automatic sprinkler system installed in accordance with NFPA 13.
2. Wall assemblies need not extend through *attic* spaces where the ceiling is protected by not less than $\frac{5}{8}$ -inch (15.9 mm) Type X gypsum board, an *attic* draft stop constructed as specified in Section R302.12.1 is provided above and along the wall assembly separating the *dwellings* and the structural framing supporting the ceiling is protected by not less than $\frac{1}{2}$ -inch (12.7 mm) gypsum board or equivalent.

Reason: The intent of this proposal is to clarify the separation between the dwelling units in a two-family dwelling. A proposal (RB52-16) was submitted last cycle that required two 1-hour walls between the units if a lot line existed and a single wall if a lot line was not present. The committee disapproved the change because they felt that the revised language complicated the existing requirements in the code. The proposal intends to simplify the requirements. The presence of a lot line between the dwelling units does not change the impact of fire spread from one unit to another. The fire does not know whether there is a lot line there or not. This issue has been raised for many years. That indicates that there is a serious problem with this requirement. The proposal clearly indicates that the one-hour separation is required regardless of the presence of a lot line. Many people, including the commentary, state that if there is a lot line between the two units, that two 1-hour walls are required. I challenge anyone to show me where in Section 302.3 it states that. This section only requires a single 1-hour wall. There is also no requirement that states that the two units are separate buildings similar to what we used to do with townhouses. So, the application of Section 302.1 is not referenced in this section. The definition of dwelling states that it is any building that contains one or two dwelling units... It is a single building, not two separate buildings as some would like to say.

Cost Impact: The code change proposal will decrease the cost of construction. Since many jurisdictions are requiring two 1-hour walls when a lot line is present, the cost of the separation will be reduced with this change.

Proposal # 5499

RB66-19

RB67-19

IRC@: R302.4.1

Proponent: Jeffrey Shapiro, P.E., representing Self (jeff.shapiro@intlcodeconsultants.com)

2018 International Residential Code

Revise as follows:

R302.4.1 Through penetrations. Through penetrations of fire-resistance-rated wall or floor assemblies shall comply with Section R302.4.1.1 or R302.4.1.2.

Exception: Where the penetrating items are steel, ferrous or copper pipes, tubes or conduits, or listed fire sprinkler piping, the annular space shall be protected as follows:

1. In concrete or masonry wall or floor assemblies, concrete, grout or mortar shall be permitted where installed to the full thickness of the wall or floor assembly or the thickness required to maintain the fire-resistance rating, provided that both of the following are complied with:
 - 1.1. The nominal diameter of the penetrating item is not more than 6 inches (152 mm).
 - 1.2. The area of the opening through the wall does not exceed 144 square inches (92 900 mm²).
2. The material used to fill the annular space shall prevent the passage of flame and hot gases sufficient to ignite cotton waste where subjected to ASTM E119 or UL 263 time temperature fire conditions under a positive pressure differential of not less than 0.01 inch of water (3 Pa) at the location of the penetration for the time period equivalent to the fire-resistance rating of the construction penetrated.

Reason: Listed fire sprinkler piping is ignition resistant and will not sustain combustion. Allowing common fire sprinkler piping to protect multiple units in a townhouse can significantly reduce installation costs, and the IBC now allows penetration of townhouse separation walls in any townhouse that does not exceed the height and area limits. For reference IBC Section 706.1.1, Exception 2 states:

Fire walls are not required on lot lines dividing a building for ownership purposes where the aggregate height and area of the portions of the building located on both sides of the lot line do not exceed the maximum height and area requirements of this code. For the code official's review and approval, he or she shall be provided with copies of dedicated access easements and contractual agreements that permit the owners of portions of the building located on either side of the lot line access to the other side for purposes of maintaining fire and life safety systems necessary for the operation of the building.

It makes no sense for the IRC to be more restrictive than the IBC with respect to allowing penetration of sprinkler piping through townhouse separation walls.

Disclosure: although I am a consultant to the National Fire Sprinkler Association, this proposal is submitted on my own behalf and was not reviewed or endorsed by NFSA prior to submittal.

Cost Impact: The code change proposal will decrease the cost of construction. The allowance for sprinkler piping to penetrate townhouse separation walls will reduce the infrastructure required to install a fire sprinkler system in some cases by allowing a shared feed for multiple units.

RB68-19

IRC@: SECTION R302, R302.5, R302.5.1, R302.5.2, TABLE R302.6

Proponent: Sharon Bonesteel, representing Salt River Project (sharon.bonesteel@srpnet.com)

2018 International Residential Code

SECTION R302 FIRE-RESISTANT CONSTRUCTION

Revise as follows:

R302.5 Dwelling-garage and Dwelling-Energy Storage System Room opening and penetration protection. Openings and penetrations through the walls or ceilings separating the *dwelling* from the garage or from rooms containing energy storage systems, shall be in accordance with Sections R302.5.1 through R302.5.3.

R302.5.1 Opening protection. Openings from a private garage or a room containing an energy storage system(s), directly into a room used for sleeping purposes shall not be permitted. Other openings between the garage and residence, and between an energy storage system room and residence, shall be equipped with solid wood doors not less than 1³/₈ inches (35 mm) in thickness, solid or honeycomb-core steel doors not less than 1³/₈ inches (35 mm) thick, or 20-minute fire-rated doors, equipped with a self-closing or automatic-closing device.

R302.5.2 Duct penetration. Ducts in the garage and ducts penetrating the walls or ceilings separating the *dwelling* from the garage shall be constructed of a minimum No. 26 gage (0.48 mm) sheet steel or other *approved* material and shall not have openings into the garage.

**TABLE R302.6
DWELLING-GARAGE AND DWELLING-ENERGY STORAGE SYSTEM (ESS) ROOM, SEPARATION**

SEPARATION	MATERIAL
From the residence and attics	Not less than 1/2-inch gypsum board or equivalent applied to the garage side <u>or energy storage system room side</u>
From habitable rooms above the garage <u>or an energy storage system room</u>	Not less than 5/8-inch Type X gypsum board or equivalent
Structure(s) supporting floor/ceiling assemblies used for separation required by this section	Not less than 1/2-inch gypsum board or equivalent
Garages <u>or energy storage system buildings</u> located less than 3 feet from a dwelling unit on the same lot	Not less than 1/2-inch gypsum board or equivalent applied to the interior side of exterior walls that are within this area

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

Reason: The evolution of battery technologies is moving faster than the building codes. This code change provides a reasonable amount of protection for energy storage in residential structures, by utilizing the existing separation requirements already in the code in section R302.5.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code currently requires this separation for garages; this code change just directs you to place energy

storage systems within that space or a space equally protected.

Proposal # 5572

RB68-19

RB69-19

IRC@: R302.5.1

Proponent: Kevin Duerr-Clark, NYS Department of State, representing NYS Department of State (kevin.duerr-clark@dos.ny.gov); Ronald Stark, NYS Department of State, representing NYS Department of State (ronald.stark@dos.ny.gov)

2018 International Residential Code

Revise as follows:

R302.5.1 Opening protection. Openings from a private garage directly into a room used for sleeping purposes shall not be permitted. Other openings between the garage and residence shall be equipped with solid wood doors not less than 1³/₈ inches (35 mm) in thickness, solid or honeycomb-core steel doors not less than 1³/₈ inches (35 mm) thick, or 20-minute fire-rated doors, equipped with a self-closing or automatic-closing device and self-latching device.

Reason: In order for the door between the garage and residence to properly prevent the passage of smoke, fire, and carbon monoxide, the door must be latched. Self-latching is just as important as self-closing. If the door does not latch in the closed position, it is not properly secured. Air pressures caused by a fire could cause doors without a self-latching device to open. Some door knobs and handles enable self-latching by design and proper installation, thus the provision is often taken for granted, but this is not necessarily true of all installations. The language of this proposal would prevent the installation of a push/pull knob without latching.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. If the intent of the code is for the garage door to be safely closed, then self-latching has already been part of the provision, though not clearly stated. Therefore, placing the language in the code will simply make it clearer and does not affect the cost of construction.

Proposal # 4169

RB69-19

RB70-19

IRC@: R302.8

Proponent: Marcelo M Hirschler, GBH International, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Revise as follows:

R302.8 Foam plastics. ~~For requirements for foam plastics, see~~ Foam plastics shall not be used as interior finish materials except as permitted by Section R316.

Reason: It is important to clarify that foam plastics shall not be used as interior finish materials unless they meet the requirements of section R316. The existing code language just sends the code user to R316 but does not specifically state that foam plastic products are not to be used as interior finish materials unless they meet the appropriate requirements, based on testing to NFPA 286 (which typical foam plastics do not meet) or are covered by a thermal barrier. Experience indicates that it is not safe to have exposed foam plastics that have been tested only to ASTM E84.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is simple clarification.

Proposal # 4348

RB70-19

RB71-19

IRC®: R302.9.4 (New)

Proponent: Marcelo M Hirschler, GBH International, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Add new text as follows:

R302.9.4 High density polyethylene (HDPE) and polypropylene (PP). Where high density polyethylene or polypropylene is used as an interior finish material, it shall be tested in accordance with NFPA 286 and comply with the requirements in Section R302.9.4.

Reason: This proposal brings in a key fire safety requirement from the IBC and the IFC. The new section addresses the issue that it is not appropriate to allow testing of high density polyethylene (HDPE) and polypropylene (PP) materials used as interior finish in accordance with ASTM E84 or UL 723, because the test results are misleading. Such materials must be tested to NFPA 286, as shown in the existing section R302.9.4. A proposal that reorganizes the section on testing of interior finish places the requirements for NFPA 286 into section R302.9.1.1.

Cost Impact: The code change proposal will increase the cost of construction
It is unsafe to test HDPE and PP materials for use as interior finish with ASTM E84 or UL 723.

Proposal # 4507

RB71-19

RB72-19

IRC@: R302.9, R302.9.1, R302.9.2, R302.9.3, R302.9.4, R302.9 (New), R302.9.1 (New), R302.9.1.1 (New), R302.9.2 (New), R302.9.3 (New), R302.9.4 (New), R302.9.5 (New), R302.9.6 (New), R302.9.7 (New), R302.9.8 (New), R302.9.8.1 (New), R302.9.8.2 (New), R302.9.8.3 (New), R302.9.9 (New), ASTM Chapter 44 (New), NFPA Chapter 44 (New)

Proponent: Marcelo M Hirschler, GBH International, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Delete without substitution:

~~**R302.9 Flame spread index and smoke-developed index for wall and ceiling finishes.** Flame spread and smoke-developed indices for wall and ceiling finishes shall be in accordance with Sections R302.9.1 through R302.9.4.~~

~~**R302.9.1 Flame spread index.** Wall and ceiling finishes shall have a flame spread index of not greater than 200.~~

~~**Exception:** Flame spread index requirements for finishes shall not apply to trim defined as picture molds, chair rails, baseboards and handrails; to doors and windows or their frames; or to materials that are less than $\frac{1}{28}$ inch (0.91 mm) in thickness cemented to the surface of walls or ceilings if these materials exhibit flame spread index values not greater than those of paper of this thickness cemented to a noncombustible backing.~~

~~**R302.9.2 Smoke-developed index.** Wall and ceiling finishes shall have a smoke-developed index of not greater than 450.~~

~~**R302.9.3 Testing.** Tests shall be made in accordance with ASTM E84 or UL 723.~~

~~**R302.9.4 Alternative test method.** As an alternative to having a flame spread index of not greater than 200 and a smoke-developed index of not greater than 450 where tested in accordance with ASTM E84 or UL 723, wall and ceiling finishes shall be permitted to be tested in accordance with NFPA 286. Materials tested in accordance with NFPA 286 shall meet the following criteria:~~

~~The interior finish shall comply with the following:~~

- ~~1. During the 40 kW exposure, flames shall not spread to the ceiling.~~
- ~~2. The flame shall not spread to the outer extremity of the sample on any wall or ceiling.~~
- ~~3. Flashover, as defined in NFPA 286, shall not occur.~~
- ~~4. The peak heat release rate throughout the test shall not exceed 800 kW.~~
- ~~5. The total smoke released throughout the test shall not exceed 1,000 m².~~

Add new text as follows:

R302.9 Interior wall and ceiling finishes. Interior wall and ceiling finish materials shall be classified for fire performance and smoke development in accordance with Section R302.9.1 or R302.9.2, unless otherwise shown in Sections R302.9.3 through R302.9.9. Materials tested in accordance with Section R302.9.1 shall not be required to be tested in accordance with Section R302.9.2.

R302.9.1 NFPA 286. Interior wall and ceiling finish materials shall be classified in accordance with NFPA 286 and comply with Section R302.9.1.1. Materials complying with Section R302.9.1.1 shall be considered to also comply with the requirements of Section R302.9.2.

R302.9.1.1 Acceptance criteria for NFPA 286. The interior finish shall comply with the following:

1. During the 40 kW exposure, flames shall not spread to the ceiling.
2. The flame shall not spread to the outer extremity of the sample on any wall or ceiling.
3. Flashover, as defined in NFPA 286, shall not occur.
4. The peak heat release rate throughout the test shall not exceed 800 kW.
5. The total smoke released throughout the test shall not exceed 1,000 m².

R302.9.2 ASTM E84 or UL 723. Wall and ceiling finishes shall exhibit a flame spread index not exceeding 200 and a smoke-developed index not exceeding 450 (Class C) where tested in accordance with ASTM E84 or UL 723, except as shown in Section R302.9.1 and in Sections R302.9.3 through R302.9.9.

R302.9.3 Interior trim. The requirements of Section R302.9.1 and those of Section R302.9.2, for interior wall and ceiling finishes, shall not apply to interior trim, defined as picture molds, chair rails, baseboards and handrails; or to doors and windows or their frames.

R302.9.4 Thickness exemption. The requirements of Section R302.9.1 and those of Section R302.9.2, for interior wall and ceiling finishes, shall not apply to materials having a thickness less than 0.036 inch (0.9 mm) and applied directly to the surface of walls or ceilings.

R302.9.5 High density polyethylene and polypropylene. Where high density polyethylene or polypropylene is used as an interior finish material, it shall be tested in accordance with NFPA 286 and comply with the requirements of Section R302.9.1.1.

R302.9.6 Facings or wood veneers intended to be applied on site over a wood substrate. Facings or veneers intended to be applied on site over a wood substrate shall comply with one of the following:

1. The facing or veneer shall meet the criteria of Section R302.9.1.1 where tested in accordance with NFPA 286 using the product mounting system, including adhesive, as described in Section 5.9 of NFPA 286.
2. The facing or veneer shall exhibit a Class C flame spread index and smoke-developed index where tested in accordance with ASTM E84 or UL 723. Test specimen preparation and mounting shall be in accordance with ASTM E2404.

R302.9.7 Laminated products factory-produced with a wood substrate. Laminated products factory-produced with a wood substrate shall comply with one of the following:

1. The laminated product shall meet the criteria of Section R309.2.1.1 where tested in accordance with NFPA 286 using the product-mounting system, including adhesive, as described in Section 5.8 of NFPA 286.
2. The laminated product shall have a Class C flame spread index and smoke-developed index where tested in accordance with ASTM E84 or UL 723. Test specimen preparation and mounting shall be in accordance with ASTM E2579.

R302.9.8 Textile or expanded vinyl wall covering materials. Where textile wall covering materials or expanded vinyl wall covering materials are used as interior finish materials they shall be tested for fire performance in accordance with Sections R302.9.8.1, R302.9.8.2 or R302.9.8.3.

R302.9.8.1 Testing of textile or expanded vinyl wall covering materials to NFPA 286. Textile wall covering materials or expanded vinyl wall covering materials shall be tested in the manner intended for use in accordance with NFPA 286 using the product-mounting system, including adhesive, and comply with the requirements of Section R302.9.1.1.

R302.9.8.2 Testing of textile or expanded vinyl wall covering materials to ASTM E84 or UL 723. Textile wall covering materials or expanded vinyl wall covering materials shall exhibit a flame spread index not exceeding 200 and a smoke-developed index not exceeding 450 (Class C) where tested in accordance with

ASTM E84 or UL 723. Test specimen preparation and mounting shall be in accordance with ASTM E2404.

R302.9.8.3 Testing of textile or expanded vinyl wall covering materials to NFPA 265. Textile wall covering materials and expanded vinyl wall covering materials shall be tested in the manner intended for use in accordance with the Method B protocol of NFPA 265 using the product-mounting system, including adhesive. The wall coverings shall comply with the following:

1. During the 40 kW exposure, flames shall not spread to the ceiling.
2. The flame shall not spread to the outer extremities of the samples on the 8-foot by 12-foot (203 by 305 mm) walls.
3. Flashover, as defined in NFPA 265, shall not occur.
4. The total smoke released throughout the test shall not exceed 1,000 m².

R302.9.9 Textile or expanded vinyl ceiling covering materials. Textile ceiling covering materials or expanded vinyl ceiling covering materials shall be fire tested in accordance with ASTM E84 or UL 723, with the acceptance criteria of Section R302.9.2, or in accordance with NFPA 286, with the acceptance criteria of Section R302.9.1.1. Where tested in accordance with ASTM E84 or UL 723, specimen preparation and mounting shall be in accordance with ASTM E2404.

Add new standard(s) as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428

E2404: Standard Practice for Specimen Preparation and Mounting of Textile, Paper or Polymeric (Including Vinyl) and Wood Wall or Ceiling Coverings, Facings and Veneers, to Assess Surface Burning Characteristics (2017)

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428

E2579-15: Standard Practice for Specimen Preparation and Mounting of Wood Products to Assess Surface Burning Characteristics

NFPA

National Fire Protection
Association
1 Batterymarch Park
Quincy MA 02169-7471

265: Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile or Expanded Vinyl Wall Coverings on Full Height Panels and Walls (2019)

Reason: This proposal reorganizes the section in the way that it is organized also in the IBC and IFC without changing requirements. Any material can be fire tested to NFPA 286 and those requirements are placed first, in R3029.1. With regard to the base requirement (testing for flame spread index and smoke-developed index by means of ASTM E84 or UL 723, with the corresponding criteria) it is still a Class C (flame spread index of 200 or less and smoke developed index of 450 or less) and it is all in a single section, namely R302.9.2. There is no change in the sense that, just like in the present code, materials can be tested to ASTM E84 or UL 723 (and get a Class C), or they can be tested to NFPA 286, with the requirements presently in the code.

The following sections address requirements for materials that require special consideration.

Sections R302.9.3 and R302.9.4 address the exceptions: for trim and for very thin materials, adhered directly to the wall or ceiling. The requirement that the very thin material be tested contradicts the point that it is an exception and that it does not need testing. This requirement for testing the very thin material has been eliminated from the IBC and IFC also.

Section R302.9.5 addresses a key fire safety issue: high density polyethylene (HDPE) and polypropylene (PP) materials used as interior finish should not be tested using ASTM E84 because the test results are misleading. Such materials must be tested to NFPA 286, as shown in R302.9.1. This is a fire safety requirement also contained in the IBC and the IFC. The new section addresses the issue that it is not appropriate to allow testing of high density polyethylene (HDPE) and polypropylene (PP) materials used as interior finish in accordance with ASTM E84 or UL 723, because the test results are misleading. Such materials must be tested to NFPA 286, as shown in the new section R302.9.1.

What is needed is some testing requirement for thin materials used as veneers but adhered to wood products, either as manufactured panels brought into the building or as veneers applied on site. They are being addressed in R302.9.6 and R302.9.7. It has been shown that applying veneers over a wood product will have a significant effect (typically negative) on the fire performance of the product. A specific mounting practice for this has been developed both for ASTM E84 (namely ASTM E2404) and a specific section of NFPA 286 was developed for the purpose also. When a veneer is installed on site over a wood substrate, details are needed for fire testing the veneer. It needs to be tested over a substrate that is consistent with the substrate to be used in the application. If the veneer is to be applied over wood it should be tested over wood but if it is to be applied over gypsum board or a noncombustible substrate, it should be tested over that substrate. If the substrate is combustible testing over a wood substrate is an acceptable alternative. Section R302.9.7 addresses the case when manufacturers produce wood panels that have the veneer already applied before being introduced into the building. For that case, a specific mounting practice for ASTM E84 and a specific mounting method for NFPA 286 have been developed. In both cases the requirements involve testing the commercial panel and not the veneer. This language in both sections is consistent with language in the IBC and IRC, except that the requirements are for a Class C in ASTM E84, consistent with the charging paragraph.

Textile wall covering materials and expanded vinyl wall covering materials (Section R302.9.8) are permitted by the IBC and the IFC to be fire tested by three methods (they are the only type of product that have that option). They can be tested to ASTM E84 or UL 723, NFPA 286 and NFPA 265. If they are tested to ASTM E84 or UL 723 they need to use a special mounting method, namely ASTM E2404. Both the IBC and the IFC recognize a specific testing method that applies only to textile wall covering materials and expanded vinyl covering materials, namely NFPA 265. Therefore, commercial materials exist that have been tested to NFPA 265 and there is no reason that they should not be allowed into the IRC without further testing. The proposal contains the criteria from the IBC and IFC for testing to NFPA 265. This proposal does not require the materials to be tested to NFPA 265 or to NFPA 286 but allows materials already tested to NFPA 265 or to NFPA 286 to be used in the IRC. The NFPA 265 test is a room-corner test similar to NFPA 286, except for a few aspects: (a) the burner flame is less severe (150 kW instead of 160 kW), (b) the location of the burner is different (it is not placed flush against the corner) and (c) the material is not placed on the ceiling. Therefore the burner flame never reaches the ceiling, which makes the test unsuitable for ceiling materials.

Textile ceiling covering materials and expanded vinyl ceiling covering materials (Section R302.9.9) are permitted by the IBC and the IFC to be tested to NFPA 286 or to be tested to ASTM E84 or UL 723. However, when they are tested to ASTM E84 they need to use a special mounting method, namely ASTM E2404. They are not permitted to be tested to NFPA 265 because the flame in the test does not reach the ceiling.

Cost Impact: The code change proposal will increase the cost of construction

This proposal provides more testing options for some materials and clarifies the testing requirements that apply to some materials that should not be tested to ASTM E84.

Staff Analysis: The referenced standards, ASTM E 2579, ASTM E 2404 and NFPA 265, are currently referenced in other 2018 I-codes.

Proposal # 4469

RB72-19

RB73-19

IRC®: R302.9.6 (New), ASTM Chapter 44 (New)

Proponent: Marcelo Hirschler, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Add new text as follows:

R302.9.6 Facings or wood veneers intended to be applied on site over a wood substrate. Facings or veneers intended to be applied on site over a wood substrate shall comply with one of the following:

1. The facing or veneer shall meet the criteria of Section R302.9.4 where tested in accordance with NFPA 286 using the product mounting system, including adhesive, as described in Section 5.9 of NFPA 286.
2. The facing or veneer shall exhibit a Class C flame spread index and smoke-developed index where tested in accordance with ASTM E84 or UL 723. Test specimen preparation and mounting shall be in accordance with ASTM E2404.

Add new standard(s) as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428

E2404-17: Standard Practice for Specimen Preparation and Mounting of Textile, Paper or Polymeric (Including Vinyl) and Wood Wall or Ceiling Coverings, Facings and Veneers, to Assess Surface Burning Characteristics

Reason: It has been shown that applying veneers over a wood product will have a significant effect (typically negative) on the fire performance of the product. A specific mounting practice for this has been developed both for ASTM E84 (namely ASTM E2404) and a specific section of NFPA 286 was developed for the purpose also. When a veneer is installed on site over a wood substrate, details are needed for fire testing the veneer. It needs to be tested over a substrate that is consistent with the substrate to be used in the application. If the veneer is to be applied over wood it should be tested over wood but if it is to be applied over gypsum board or a noncombustible substrate, it should be tested over that substrate. If the substrate is combustible testing over a wood substrate is an acceptable alternative.

An alternate proposal addresses the case when manufacturers produce wood panels that have the veneer already applied before being introduced into the building. For that case, a specific mounting practice for ASTM E84 and a specific mounting method for NFPA 286 have been developed. In both cases the requirements involve testing the commercial panel and not the veneer.

This language is consistent with language in the IBC and IRC, except that the requirements are for a Class C in ASTM E84, consistent with the charging paragraph.

This proposal refers to the existing section R302.9.4 but an alternate proposal reorganizes the section and makes that section into R302.9.1.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. ASTM E84 explains that this is the way that veneers to be applied on site are to be tested.

Staff Analysis: The referenced standard, ASTM E 2402, is currently referenced in other 2018 I-codes.

RB74-19

IRC®: R302.9.7 (New), ASTM Chapter 44 (New)

Proponent: Marcelo M Hirschler, GBH International, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Add new text as follows:

R302.9.7 Laminated products factory produced with a wood substrate.

1. Laminated products factory produced with a wood substrate shall comply with one of the following: The laminated product shall meet the criteria of Section R309.2.4 where tested in accordance with NFPA 286 using the product-mounting system, including adhesive, as described in Section 5.8 of NFPA 286.
2. The laminated product shall have a Class C flame spread index and smoke-developed index where tested in accordance with ASTM E84 or UL 723. Test specimen preparation and mounting shall be in accordance with ASTM E2579.

Add new standard(s) as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428

E2579-15: Standard Practice for Specimen Preparation and Mounting of Wood Products to Assess Surface Burning Characteristics

Reason: It has been shown that applying veneers over a wood product will have a significant effect (typically negative) on the fire performance of the product. When manufacturers produce wood panels that have the veneer already applied before being introduced into the building, a specific mounting practice for ASTM E84 and a specific mounting method for NFPA 286 have been developed. In both cases the requirements involve testing the commercial panel and not the veneer. This language is consistent with language in the IBC and IRC, except that the requirements are for a Class C in ASTM E84, consistent with the charging paragraph. An alternate proposal addresses veneers that are installed on site and not as part of factory produced panels.

This proposal refers to the existing section R302.9.4 but an alternate proposal reorganizes the section and makes that section into R302.9.1.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposed mounting method is the required one contained in ASTM E84.

Staff Analysis: The referenced standard, ASTM E 2579, is currently referenced in other 2018 I-codes.

Proposal # 4473

RB74-19

RB75-19

IRC®: R302.9.8 (New), R302.9.8.1 (New), R302.9.8.2 (New), R302.9.8.3 (New), ASTM Chapter 44 (New), NFPA Chapter 44 (New)

Proponent: Marcelo M Hirschler, GBH International, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Add new text as follows:

R302.9.8 Textile and expanded vinyl wall covering materials. Where textile wall covering materials or expanded vinyl wall covering materials are used as interior finish materials they shall be tested for fire performance in accordance with Sections R302.9.8.1, R302.9.8.2 or R302.9.8.3.

R302.9.8.1 NFPA 286. Textile wall covering materials and expanded vinyl wall covering materials shall be tested in the manner intended for use in accordance with NFPA 286 using the product-mounting system, including adhesive, and comply with the requirements of Section R302.9.4.

R302.9.8.2 ASTM E84 or UL 723. Textile wall covering materials or expanded vinyl wall covering materials shall exhibit a flame spread index not exceeding 200 and a smoke-developed index not exceeding 450 (Class C) where tested in accordance with ASTM E84 or UL 723. Test specimen preparation and mounting shall be in accordance with ASTM E2404.

R302.9.8.3 NFPA 265. Textile wall covering materials and expanded vinyl wall covering materials shall be tested in the manner intended for use in accordance with the Method B protocol of NFPA 265 using the product-mounting system, including adhesive. The wall coverings shall comply with the following:

1. During the 40 kW exposure, flames shall not spread to the ceiling.
2. The flame shall not spread to the outer extremities of the samples on the 8-foot by 12-foot (203 by 305 mm) walls.
3. Flashover, as defined in NFPA 265, shall not occur.
4. The total smoke released throughout the test shall not exceed 1,000 m².

Add new standard(s) as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428

ASTM E2404: Standard Practice for Specimen Preparation and Mounting of Textile, Paper or Polymeric (Including Vinyl) and Wood Wall or Ceiling Coverings, Facings and Veneers, to Assess Surface Burning Characteristics (2017)

NFPA

National Fire Protection
Association
1 Batterymarch Park
Quincy MA 02169-7471

NFPA 265: Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile Wall Coverings on Full Height Panels and Walls (2019)

Reason: Textile wall covering materials and expanded vinyl wall covering materials are permitted by the IBC

and the IFC to be fire tested by three methods (they are the only type of product that have that option). They can be tested to ASTM E84 or UL 723, NFPA 286 and NFPA 265. If they are tested to ASTM E84 or UL 723 they need to use a special mounting method, namely ASTM E2404.

Both the IBC and the IFC recognize a specific testing method that applies only to textile wall covering materials and expanded vinyl covering materials, namely NFPA 265. Therefore, commercial materials exist that have been tested to NFPA 265 and there is no reason that they should not be allowed into the IRC without further testing. The proposal contains the criteria from the IBC and IFC for testing to NFPA 265.

This proposal does not require the materials to be tested to NFPA 265 or to NFPA 286 but allows materials already tested to NFPA 265 or to NFPA 286 to be used in the IRC.

The NFPA 265 test is a room-corner test similar to NFPA 286, except for a few aspects: (a) the burner flame is less severe (150 kW instead of 160 kW), (b) the location of the burner is different (it is not placed flush against the corner) and (c) the material is not placed on the ceiling. Therefore the burner flame never reaches the ceiling, which makes the test unsuitable for ceiling materials.

An alternate proposal reorganizes the section and renumbers section R302.9.4 as R302.9.1.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The methods proposed here are alternate options but do not affect testing in accordance with the present code. The mounting method for ASTM E84 is contained in the standard.

Staff Analysis: The referenced standards, ASTM E 2404-2017 and NFPA 265-2019, are currently referenced in other 2018 I-codes.

Proposal # 4476

RB75-19

RB76-19

IRC®: R302.9.9 (New), ASTM Chapter 44 (New)

Proponent: Marcelo M Hirschler, GBH International, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Add new text as follows:

R302.9.9 Textile and expanded vinyl ceiling covering materials. Textile ceiling covering materials or expanded vinyl ceiling covering materials shall be fire tested in accordance with ASTM E84 or UL 723, with the acceptance criteria of Sections R302.9.1 and R302.9.2, or in accordance with NFPA 286, with the acceptance criteria of Section R302.9.4. Where tested in accordance with ASTM E84 or UL 723, specimen preparation and mounting shall be in accordance with ASTM E2404.

Add new standard(s) as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428

E2404: Practice for Specimen Preparation and Mounting of Textile, Paper or Polymeric (Including Vinyl) and Wood Wall or Ceiling Coverings, Facing and Veneers to Assess Surface Burning Characteristics (2017)

Reason: Textile ceiling covering materials and expanded vinyl ceiling covering materials are permitted by the IBC and the IFC to be tested to NFPA 286 or to be tested to ASTM E84 or UL 723. However, when they are tested to ASTM E84 they need to use a special mounting method, namely ASTM E2404. They are not permitted to be tested to NFPA 265 because the flame in the test does not reach the ceiling.

Note that this does not require testing to NFPA 286 but it is simply an option, especially for materials that have already been approved by testing that way. This is just being more explicit with regard to what is in the code.

An alternate proposal combines existing sections R302.9.1, R302.9.2 and R302.9.3 into a section R302.9.2 and also converts existing section R302.9.4 into section R302.9.1.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The revision makes the code more explicit without adding any requirements.

Staff Analysis: The referenced standard, ASTM E 2404-2017, is currently referenced in other 2018 I-codes.

Proposal # 4508

RB76-19

RB77-19

IRC®: R302.15 (New), R302.15.1 (New), R302.15.2 (New), R302.15.3 (New), R802.1.5, R802.1.5.1, R802.1.5.2, R802.1.5.3, R802.1.5.4, R802.1.5.5, R802.1.5.6, R802.1.5.7, R802.1.5.8, R802.1.5.9, R802.1.5.10

Proponent: Marcelo Hirschler, GBH International, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Add new text as follows:

R302.15 Fire retardant treated wood Fire-retardant treated wood (FRTW) is any wood product that: is impregnated with chemicals by a pressure process or other means during manufacture; that has a listed flame spread index of 25 or less when tested in accordance with ASTM E84 or UL 723, and that does not show evidence of significant progressive combustion when the test is continued for an additional 20-minute period. In addition, the flame front shall not progress more than 10.5 feet (3200 mm) beyond the center line of the burners at any time during the test.

R302.15.1 Pressure process For wood products impregnated with chemicals by a pressure process, the process shall be performed in closed vessels under pressures not less than 50 pounds per square inch gauge (psig) (344.7 kPa).

R302.15.2 Other means during manufacture For wood products produced by other means during manufacture, the treatment shall be an integral part of the manufacturing process of the wood product. The treatment shall provide permanent protection to all surfaces of the wood product.

R302.15.3 Testing For wood products produced by means other than a pressure process during manufacture, all sides of the wood product shall be tested in accordance with and produce the results required in Section R302.15. For structural panels, only the front and back faces shall be required to be tested.

Revise as follows:

~~**R802.1.5 Fire-retardant-treated wood.** Fire-retardant-treated wood (FRTW) is any wood product that, when impregnated with chemicals by a pressure process or other means during manufacture, shall have, when tested in accordance with ASTM E84 or UL 723, a listed flame spread index of 25 or less and does not show evidence of significant progressive combustion where the test is continued for an additional 20-minute period. In addition, the flame front shall not progress more than 10.5 feet (3200 mm) beyond the center line of the burners at any time during the test. shall comply with Section R302.15.~~

Delete without substitution:

~~**R802.1.5.1 Pressure process.** For wood products impregnated with chemicals by a pressure process, the process shall be performed in closed vessels under pressures not less than 50 pounds per square inch gauge (psig) (344.7 kPa).~~

~~**R802.1.5.2 Other means during manufacture.** For wood products produced by other means during manufacture the treatment shall be an integral part of the manufacturing process of the wood product. The treatment shall provide permanent protection to all surfaces of the wood product.~~

~~**R802.1.5.3 Testing.** For wood products produced by other means during manufacture, other than a pressure process, all sides of the wood product shall be tested in accordance with and produce the results required in Section R802.1.5. Testing of only the front and back faces of wood structural panels shall be permitted.~~

Revise as follows:

~~R802.1.5.4~~ **R802.1.5.1 Labeling.** In addition to the labels required by Section 802.1.1 for sawn lumber and Section 803.2.1 for wood structural panels, each piece of *fire-retardant-treated* lumber and wood structural panel shall be labeled. The label shall contain:

1. The identification *mark* of an *approved agency* in accordance with Section 1703.5 of the International Building Code.
2. Identification of the treating manufacturer.
3. The name of the fire-retardant treatment.
4. The species of wood treated.
5. Flame spread index and smoke-developed index.
6. Method of drying after treatment.
7. Conformance to applicable standards in accordance with Sections ~~R802.1.5.5~~ R802.1.5.2 through ~~R802.1.5.10~~ R802.1.5.7.
8. For FRTW exposed to weather, or a damp or wet location, the words “No increase in the listed classification when subjected to the Standard Rain Test” (ASTM D2898).

~~R802.1.5.5~~ **R802.1.5.2 Strength adjustments.** Design values for untreated lumber and wood structural panels as specified in Section R802.1 shall be adjusted for fire-retardant-treated wood. Adjustments to design values shall be based on an *approved* method of investigation that takes into consideration the effects of the anticipated temperature and humidity to which the fire-retardant-treated wood will be subjected, the type of treatment and redrying procedures.

~~R802.1.5.6~~ **R802.1.5.3 Wood structural panels.** The effect of treatment and the method of redrying after treatment, and exposure to high temperatures and high humidities on the flexure properties of fire-retardant-treated softwood plywood shall be determined in accordance with ASTM D5516. The test data developed by ASTM D5516 shall be used to develop adjustment factors, maximum loads and spans, or both for untreated plywood design values in accordance with ASTM D6305. Each manufacturer shall publish the allowable maximum loads and spans for service as floor and roof sheathing for their treatment.

~~R802.1.5.7~~ **R802.1.5.4 Lumber.** For each species of wood treated, the effect of the treatment and the method of redrying after treatment and exposure to high temperatures and high humidities on the allowable design properties of fire-retardant-treated lumber shall be determined in accordance with ASTM D5664. The test data developed by ASTM D5664 shall be used to develop modification factors for use at or near room temperature and at elevated temperatures and humidity in accordance with ASTM D6841. Each manufacturer shall publish the modification factors for service at temperatures of not less than 80°F (27°C) and for roof framing. The roof framing modification factors shall take into consideration the climatological location.

~~R802.1.5.8~~ **R802.1.5.5 Exposure to weather.** Where fire-retardant-treated wood is exposed to weather or damp or wet locations, it shall be identified as “Exterior” to indicate there is not an increase in the listed flame spread index as ~~defined~~ required by the testing specified in Section ~~R802.1.5~~ R302.15 when subjected to ASTM D2898.

~~R802.1.5.9~~ **R802.1.5.6 Interior applications.** Interior fire-retardant-treated wood shall have a moisture content of not over 28 percent when tested in accordance with ASTM D3201 procedures at 92-percent relative humidity. Interior fire-retardant-treated wood shall be tested in accordance with Section ~~R802.1.5.6~~ R802.1.5.3 or ~~R802.1.5.7~~ R802.1.5.4. Interior fire-retardant-treated wood designated as Type A shall be tested in accordance with the provisions of this section.

~~R802.1.5.10~~ **R802.1.5.7 Moisture content.** Fire-retardant-treated wood shall be dried to a moisture content of 19 percent or less for lumber and 15 percent or less for wood structural panels before use. For wood kiln dried after treatment (KDAT) the kiln temperatures shall not exceed those used in kiln drying the lumber and ~~plywood~~ the wood structural panels submitted for the tests described in Section ~~R802.1.5.6~~ R802.1.5.3 for ~~plywood~~ wood

structural panels and ~~R802.1.5.7~~ R802.1.5.4 for lumber.

Reason: This proposal simply moves fire retardant treated wood (much of which is used indoors or for applications that do not involve roofing) away from the roofing section (in Chapter 8) and places it in chapter 3 (section 302) where all the products with improved fire performance are. It does not make any change to requirements and uses the same code language but in a more appropriate chapter of the code. A pointer sends the user from the section the information used to be (in chapter 8) to the new location.

Section R302 contains information on all the materials associated with "fire resistant construction", including wall and ceiling finishes, insulation and foam plastics. This is where the information on fire retardant treated wood belongs. Chapter 8 is on roof construction and, as stated above, many uses of fire retardant treated wood are for applications that are not roofs. The proposal keeps in chapter 8 the requirements for the wood products themselves, namely lumber and structural panels, to be consistent with cross-laminated timber and engineered rim wood board and so on. It just moves the requirements specific to fire retardant treated wood.

The changes in this proposal do not alter requirements but just move the sections for logical positioning. The only change in language is in relocated section R802.1.5.10 where the word plywood is replaced by wood structural panel, the title of relocated section R802.1.5.6, which is what is being referred to.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal simply relocates the FRTW sections from the roofing section to a new location, dealing with other fire safety issues, without changing requirements.

Proposal # 5084

RB77-19

RB78-19

IRC@: R303.3

Proponent: Kevin Gore, Borough of West Chester, representing Borough of West Chester (kgore@westchester.com)

2018 International Residential Code

Revise as follows:

R303.3 Bathrooms. Bathrooms, water closet compartments and other similar rooms shall be provided with aggregate glazing area in windows of not less than 3 square feet (0.3 m²), one half of which shall be openable.

Exception: The glazed areas shall not be required where artificial light and a local exhaust

~~system are provided.~~

system. The minimum local exhaust rates shall be determined in accordance with Section M1505. Exhaust air from the space shall be exhausted directly to the outdoors.

Reason: Typically, during winter and summer months or when inclement weather occurs, occupants fail to utilize windows in bathroom spaces to provide for proper ventilation to control moisture and humidity levels. The failure to utilize natural ventilation and the lack of mechanical ventilation in these spaces leads to mold and/or mildew conditions which can ultimately create unsanitary conditions and cause health problems for the occupants. According to the Centers for Disease Control and Prevention (2017), "In 2004 the Institute of Medicine (IOM) found there was sufficient evidence to link indoor exposure to mold with upper respiratory tract symptoms, cough, and wheeze in otherwise healthy people". Additionally, as we continue to improve the International Energy Conservation Code and enhance the energy efficiency of structures, we defeat the purpose of increased energy efficiency by requiring a window to be open in a space which is being heated or cooled.

Bibliography: Centers for Disease Control and Prevention. 2017. *Facts about mold and dampness*. Retrieved from https://www.cdc.gov/mold/dampness_facts.htm

Cost Impact: The code change proposal will increase the cost of construction. The cost to supply and install a mechanical exhaust fan is approximately \$300.00.

Proposal # 3974

RB78-19

RB79-19

IRC@: R303.4

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com); Joseph Lstiburek, representing self (joe@buildingscience.com); Mike Moore, representing Broan-NuTone (mmoore@newportventures.net)

2018 International Residential Code

Revise as follows:

R303.4 Mechanical ventilation. ~~Where the air infiltration rate of a *dwelling unit* is 5 air changes per hour or less where tested with a blower door at a pressure of 0.2 inch w.c (50 Pa) in accordance with Section N1102.4.1.2, the *dwelling unit*~~ Dwelling units shall be provided with whole-house mechanical ventilation in accordance with Section M1505.4.

Exception: Dwelling units in the tropical climate zone complying with Section N1101.13.1.

Reason: To address this issue, two companion code changes have been submitted. RE90-19 addresses Section R403.6 of the IECC residential provisions. This change addresses the same issue in the IRC. Air changes per hour (ACH) is a volumetric metric that is useful for air quality measurements in buildings but is not the correct expression of air leakage from an energy or building durability perspective. This proposal introduces the ability to use an alternative cubic foot per minute (CFM) per square foot (ft²) of dwelling unit enclosure area metric for measuring air leakage in a building. In this way, the air leakage measured at 50 Pascals divided by the building surface area is used to assess the airtightness of the construction and building envelope. Unlike ACH, a CFM/ ft² of dwelling unit enclosure area metric normalizes the building air leakage per unit of building envelope surface area; the actual location where air is infiltrating or exfiltrating the building. To this end, the proposal also defines “Dwelling Unit Enclosure Area” as the sum of the area of ceiling, floors, and walls separating a dwelling unit’s conditioned space from the exterior or from adjacent conditioned or unconditioned spaces. In addition, the definition offers guidance to further understand the measurement that must take place to calculate the dwelling unit enclosure area. This guidance states that the wall height shall be measured from the finished floor of the dwelling unit to the underside of the floor above. Lastly, the proposal ensures that the intent of the code, to ensure that the structure is built tight and ventilated correctly with mechanical ventilation, is maintained. If an additional option is adopted into the code, as proposed, then ventilation must also be ensured regardless of how air tightness of the structure is expressed.

Since 1980, The Energy Conservatory, has not only been a leader in air leakage science, but also one of the prominent manufacturers of the blower door air measurement tool. In their article, “Which Is A Better Metric For Measuring Airtightness: ACH @ 50 Pa Or CFM/ Ft² Of Surface Area @ 50 Pa?”, which is adapted and added to in this reason statement, we get the basis of the argument for the introduction of a new metric into the International Energy Conservation Code for the measurement of air leakage.

To paraphrase, when measuring the airtightness of a building the objective is to learn how much leakage is occurring across the building’s enclosure area. It is analogous to moisture permeability or the measurement of moisture across the building’s enclosure area and thermal transmittance, the rate at which heat is transferred across the building enclosure area. The rate of air leakage or tightness does not depend on the volume of the structure as defined by the building’s enclosure area but does depend on the holes associated with the surface area of the structure. Air permeability of a material is typically measured as the flow per area at a given pressure difference across the material. U value measurements are similar. If we want a metric to use to measure the airtightness quality of construction of the exterior enclosure of buildings it makes sense to use a metric that equates flow to the size and number of holes in the building’s thermal enclosure.

The article continues with an example to help demonstrate how volume is not proportional to surface area:

Comparison between ACH50 and CFM50/ft² for a 2000 ft² home at 3 ACH50

House Is 50 X 40 X 8

Volume = 16,000 ft³

Surface Area = 50 X 40 X 2 + 180 X 8 = 5440 ft²

CFM50 = (3 X 16000)/60 = 800 CFM

CFM50/ft² = 800/5440 = 0.147 CFM50/ft²

Increase height to 2 story at 3 ACH50

House Is 50 X 40 X 16 Volume = 32,000 ft³

Surface area = 50 X 40 X 2 + 180 X 16 = 6880 ft²

CFM50 = (3 X 32000)/60 = 1600 cfm

CFM50/ft² = 1600/6880 = 0.233 CFM50/ft²

In this example, when the volume is doubled, the surface area increased by 26%. And when the ACH50 stays the same, the CFM/ ft² of surface area increased by 58%. I have attached an Excel spreadsheet calculator that further defines the disconnect between ACH and CFM/ ft² of surface area to further elaborate the issue. In the attached calculator you can change the ratio of width and length of the building to see the effect on the resulting expressions of air leakage. An independent yet similar calculator can be found at this Residential Energy Dynamic link <http://www.residentialenergydynamics.com/REDCalcFree/Tools/AirLeakageMetrics>

The primary purpose of this code change proposal is to introduce the CFM/ft² of surface area metric into the code. Deciding on where to set the minimum allowable leakage rate is difficult largely due to the earlier volume and surface area discussion. Both tests are performed at a pressure differential of 0.2 inch water gauge (50 Pa), which is a the traditional residential testing pressure so an attempt was made to align the introduction of a CFM/ft² of surface area metric with the existing ACH50 metric of 3 and 5 air changes per hour. ACH being a volumetric measurement penalized small volume dwelling units so a decision was made to concentrate on a size range of dwellings between 2500 and 5500 square feet. By doing this and using the attached conditioned floor space to shell area calculator we were able to see that little variation occurred between ACH and CFM/ft² of surface area metric when changing the size ratio of the modeled house within this house size range. By rounding up, the proposal is using .17 CFM/ft² of surface area metric to align with 3 ACH and .28 CFM/ft² of surface area metric to align with 5 ACH. By using these numbers, small volume homes, while not having a volumetric penalty, are allowed to be a little more leaky and large volume homes must achieve just about the same level of tightness if not a slight bit more. As the average home size in the United States is approximately just less than 2500 square feet this code change proposals purpose of introducing a better measurement metric without removing the codes traditional measurement methodology, provid additional flexibility while maintaining

similar stringency.

The Energy Conservatory suggests that the use of Air Changes per Hour at 50 Pa (ACH50) started approximately 60 years ago by researchers who were interested in ways to predict the natural infiltration rate of buildings, which at the time was most commonly measured in Air Changes per Hour. At the time air quality in buildings was being studied and the metric made sense. If a pollutant is released in a building, the time for the concentration to decay by a certain percentage depends on the infiltration measured in air changes per hour. The analysis of a tracer gas decay test gives a result in air changes per hour. So, when they started measuring airtightness, for use in estimating natural infiltration in air changes per hour, it made sense to use ACH50 as the metric.

However, as discussed earlier, two homes with the same volume can have very different surface areas and holes associated with the building enclosure area.

Value is gained by including a surface area-based metric in that air-sealing varies directly with the amount of surface area not the amount of volume in the dwelling. Two buildings can have surface areas that differs by 15%, but have the same volume and the current metric offers the same leakage allowance. Therefore, if the purpose of measuring air leakage is to determine something about the construction quality, air leakage rate, energy efficiency and building durability the metric should be associated with the flow of air through holes in the enclosure. To quantify these things ACH is the wrong metric. It does not tell you anything about the quantity and air leakage through holes in the building. Conversely, the CFM/ ft² of surface area metric concretely expresses the quantity of air leakage through the building's exterior enclosure. When an enclosure is tight more energy is conserved as well as allowing better control and predictability of air flow, thermal flow, and moisture flow.

Many standards are now using square foot of enclosure area instead of ACH. Examples include EnergyStar, US Army Corp of Engineers, LEED, US Passive House and ASHRAE 62.2. This proposal is the first step to bring this better expression of air leakage into the code. It has been created in such a way that options are maintained allowing jurisdictions and building professionals flexibility in defining air leakage requirements.

Link to Energy Conservatory article from which portions of this reason statement have been added:

<https://support.energyconservatory.com/hc/en-us/articles/204176240-Which-is-a-better-metric-for-measuring-airtightness-ACH-50-Pa-or-CFM-ft-of-surface-area-50-Pa->

Why the change to R403.6?

It was pointed out in the last code cycle, that this metric could have an unintended loophole since it is not used in the IRC. To avoid that, the section was edited to to ensure whole house mechanical ventilation continues to be required and installed

Why The change to IRC 303.4?

It was pointed out in the last code cycle, that this metric could have an unintended loophole since it is not used in the IRC. To avoid that, the section was edited to ensure whole house mechanical ventilation continues to be required and installed

Cost Impact: The code change proposal will not increase or decrease the cost of construction There should be no cost implication associated with the adoption of this proposed language. Dwellings will continue to need to be tested and testing prices will not change due to an additional option for how to express

the results of the test.

Proposal # 5697

RB79-19

RB80-19

IRC@: R305.1

Proponent: Felix Zemel, representing ICC Region 6 -- North East Regional Coalition (felix@pracademicsolutions.com); Peter Zvingilas, Representing ICC Region 6- North East Regional Coalition, Town of Groton and Voluntown, CT, representing Representing ICC Region 6- North East Regional Coalition (pzvingilas@voluntown.gov)

2018 International Residential Code

Revise as follows:

R305.1 Minimum height. *Habitable space*, hallways and portions of *basements* containing these spaces shall have a ceiling height of not less than 7 feet (2134 mm).

Bathrooms, toilet rooms and laundry rooms shall have a ceiling height of not less than 6 feet 8 inches (2032 mm).

Exceptions:

1. For rooms with sloped ceilings, the required floor area of the room shall have a ceiling height of not less than 5 feet (1524 mm) and not less than 50 percent of the required floor area shall have a ceiling height of not less than 7 feet (2134 mm).
2. The ceiling height above bathroom and toilet room fixtures shall be such that the fixture is capable of being used for its intended purpose. A shower or tub equipped with a showerhead shall have a ceiling height of not less than 6 feet 8 inches (2032 mm) above an area of not less than 30 inches (762 mm) by 30 inches (762 mm) at the showerhead.
3. Beams, girders, ducts or other obstructions in *basements* containing *habitable space* shall be permitted to project to within 6 feet 4 inches (1931 mm) of the finished floor.
4. Beams and girders spaced not less than 4 feet (1219 mm) on-center shall project not more than 6 inches (152 mm) below the required ceiling height.

Reason: The proposed language was removed in the 2009 IRC because the argument was made that a 4-foot space between beams could not be regulated due to no definitive beam size. We are suggesting 5-1/2" width for a beam to allow a 2x6 wall to be utilized for beam support. The original intent of this section was to allow supportive exposed beams between rooms to be lower than 7 feet. With the engineered lumber and spans larger than normal in homes, beams are larger than traditional nominal lumber.

The removal of this language has left the ceiling height unattainable in many situations. If the current code is to be followed, no beams are allowed to fall below 7 feet in any home, except for basements, which we have defined in Section 305.1 exception 3.

By adding relief to the current code will allow the use of engineered lumber for many situations that are not legal under current code. In practice, this section is either ignored by the code official, or they may need to issue a lot of variances. In section R311.2, we allow a minimum of 78 inches (1981 mm) in height for an egress door. By that logic, we should allow 78 inches (1981 mm) for any transitional opening between rooms. By defining this, we can minimize the confusion of what is allowable height on a beam on any floor other than basements.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Adding relief to the current code will allow the use of engineered lumber for many situations that are not legal under current code.

RB81-19

IRC@: SECTION R307, R307.1, R307.2, R301.3 (New), R307.3.1 (New), R307.3.2 (New), R307.3.3 (New), R307.3.4. (New), R307.3.5. (New)

Proponent: Jake Pauls, representing self (bldguse@aol.com)

2018 International Residential Code

Revise as follows:

SECTION R307 TOILET, BATH AND SHOWER SPACES, INCLUDING GRAB BAR PROVISION

R307.1 Space required. Fixtures shall be spaced in accordance with Figure R307.1, and in accordance with the requirements of Section P2705.1.

R307.2 Bathtub and shower spaces. Bathtub and shower floors and walls above bathtubs with installed shower heads and in shower compartments shall be finished with a nonabsorbent surface. Such wall surfaces shall extend to a height of not less than 6 feet (1829 mm) above the floor.

Add new text as follows:

R301.3 Grab bars. Grab bars shall be in accordance with Sections R303.3.1 through R303.3.7.

R307.3.1 Grab Bar Provision. New bathtubs and showers shall be provided with grab bars complying with Section R307.3. Positioning of the grab bars, including stanchion type grab bars in addition to conventional wall mounted grab bars, shall be such that they are within reach of bathtub and shower users where such users are standing within the bathtub or shower and standing within the clearance spaces required by R307.2 as illustrated in Figure R307.1.

R307.3.2 Shower grab bar. A vertical grab bar shall be provided with a length of at least 24 inches (610 mm) positioned with its lower end not higher than 39 inches (990 mm) above the finished floor, its upper end not lower than 60 inches (1525 mm) above the finished floor, and located either inside or outside the shower enclosure and usable by a person entering and exiting the shower enclosure to occupy the clear floor area required by R307.2.

R307.3.3 Vertical bar for bathtub. A vertical grab bar with a minimum length of 36 inches (915 mm) shall be provided at the unobstructed entrance for the end wall of the bathtub, adjacent to the clear floor area required by R307.2 and positioned with its lower end not higher than 27 inches (685 mm) above the finished floor and its upper end not less than 60 inches (1525 mm) above the finished floor. If wall-mounted, the grab bar shall be between 9 inches (230 mm) and 12 inches (305 mm), measured horizontally, from the exterior plane of the bathtub. If provided as a stanchion extending from the ceiling to the floor or bathtub rim, the vertical bar shall be not more than 6 inches (150 mm) horizontally of the outer edge of the bathtub and not more than 30 inches (760 mm), measured horizontally, from the control end wall or from the water delivery spout in the absence of a control end wall.

R307.3.4. Horizontal or diagonal grab bar for bathtub. At the non-access side of the bathtub there shall be a diagonal or horizontal grab bar with a length of at least 24 inches (610 mm) placed not higher than 10 inches (255 mm) above the rim of the bathtub. If horizontally oriented the bar shall be positioned not higher than 10 inches above the rim of the bathtub and one end no more than 12 inches (305 mm), measured horizontally, from the control end or the water spout location if there is no control wall end. If diagonally oriented, the higher

end shall be not more than 12 inches (305 mm) measured horizontally from the control end wall and between 25 inches and 27 inches (685 mm) above the rim of the bathtub.

R307.3.5. Grab bar details. Grab bars shall be circular in cross section with a minimum diameter of 1.25 inches (30mm) and a maximum diameter of 2 inches (50 mm). There shall be a clearance, for hand grasp, of not less than 1.5 inches (40 mm) between the bar and any surface. Grab bars shall be designed and constructed to withstand a load, in any direction, of 250 pounds minimum. Grab bars shall be designed and constructed with their fixings resistant to corrosion from water and to deterioration, from water, of surfaces and structure to which they are attached.

Reason: Reason Statement for IRC R307, new grab bar requirements in the IRC

General Introduction

Grab bars are what are, more generally, called “points of control” which help us maintain our posture and facilitate movement via our bodily contacts with surfaces underfoot and graspable fixed objects for our hands. For example, stair use requires—for minimum safety—one foot taking our body weight on a step (while the other foot moves between steps) and one hand on a handrail if we need lateral support of our upright bodies and/or some pulling assistance for the stair climb.

Thus, from a code point of view, it is widely accepted that stairs require at least one handrail to assure that at almost all times we have two points of control available when using stairs. The same ergonomic or biomechanical standard has not been generally applied to another dangerous act in buildings, entering and exiting a bathing or showering facility. In a home these facilities will typically require stepping over a bathtub wall or a low dam preventing water from draining onto the floor from a shower pan. This step-over behavior is complicated by the quality of the underfoot surfaces, some wet with water and others insecure due to other conditions (such as a dry towel or mat on a dry but very smooth tile surface) that are precursors to a slip. With this brief, fundamental consideration of the problem and its solution in mind, see Figure 1, a matrix which relates points of control to simplified regulatory strategies, namely how many points of control are enough.

Right now, for bathing/showering on wet, slippery surfaces the point of control at our feet is very dubious and unreliable. And, currently, home bathrooms very, very seldom have any grab bars. The effective level of points of control in most home bathrooms is less than one. As already noted, stairs even in homes provide about two points of control (although, with undersized tread depths and dysfunctional decorative railings instead of function handrails, that figure of two might be closer to one). See Figure 1 for a hierarchy of points of control and situations where bathtubs/showers exist currently with very substandard availability of points of control combined with dangerous, hard surfaces to fall against and, thus, exacerbate injuries.

Grab Bar Equity with Stair Handrails

Number of Points of Control Via Hands or Feet	≤1	1	2	3	3-4
Standard walker for older adult with altered gait.					✓
Occupational settings with risk of worker falls from heights. Also, stairs where users can use two handrails simultaneously, one on each side.				✓	
<u>Stairs where users have only a single handrail.</u> <i>Grab bar(s) usable for bathtub/shower entry/egress.</i>			✓ ★		
Bathtubs/showers with slip resistant underfoot surfaces when wet.		✓			
Bathtubs/showers without slip resistant underfoot surfaces when wet, the common condition currently.	✓				

Figure 1. Hierarchy of Points of Control

and Proposed Grab Bar Equity with Stair Handrails

Therefore, in recent years, there has been an international move to providing one or more new points of control for bathtubs and showers, largely to aid in two types of transfer for bathtubs—transfers in a standing position over the tub wall (for all tub uses) and transferring from a standing position to sitting or lying and later transferring from a lying or sitting position to standing. These bathtub transfers require two different points of control in relation to where the hand(s) are needed for the two types of transfers. Thus for all bathtub transfers two upper body points of control are needed either sequentially or simultaneously—the latter being increasingly important as one ages and loses lower body strength and has greater issues with balance generally. Especially as we get older, we rely more and more on bilateral support on stairs with handrails on both sides and bathtubs where there are points of control on both sides of the tub if we have a bath as opposed to showering.

The most basic package of grab bar requirements for transfers by ambulatory means is a single vertical grab bar reachable from the entrance area of a bathtub or a dedicated shower. If a bath is desired in a tub, then a diagonally oriented or horizontal bar on the non-access side of the tub is needed where there is often a wall on which to attach a conventional grab bar. An option is to use a horizontal stanchion (a bar or tube that is attached between surfaces rather than cantilevered from a surface) attached *between* end walls of a tub enclosure. See the installation photograph at the end of this Reason Statement; the horizontal stanchion is held in place by two large tiles through which the stanchion tube is passed with the tube ends butted against the wall tile with no hole made in the wall tile so there is no chance of water entry behind the wall tile due to this installation. High-grade adhesive is used to hold the assembly in place meeting the 250-pound load criterion easily.

The foregoing was the rationale used to develop the first set of mainstreamed grab bar requirements in a model building code as well as in a companion, safety standard—specifically NFPA 5000 and NFPA 101 in their 2018

editions and retained in the upcoming 2021 editions. The basic set of criteria that were adopted with very little fuss within the NFPA process has now been used to develop a proposal for the IRC, specifically Section R307 which deals with toilet, bath and shower spaces. This was where some people in ICC, during 2018 hearings for Group A code requirements, recommended a new mainstreamed grab bar requirement should be situated. Their advice has been followed in the proposal now submitted for Group B code requirements. (When the proponent started down this road of trying to get grab bar requirements into the I-codes, he was unaware there were various options on where such requirements might best fit. The consensus on this in last year's Group hearings was "not here" and, for dwelling units, the logical place to be addressed in Group B was the Planning chapter of the IRC, specifically Section R307 on spaces in bathrooms. Hence, proposed here is the basic, minimum or entry level proposal to mainstreamed grab bars for dwelling units, the most likely context for injuries related to bathtubs and showers.

The Problem of Injuries Associated with Bathtubs and Showers

How Bathtub and Shower-related Injuries Compare to Other Injury Sources. Figure 1 provides a quickly appreciated comparison of the relative size of three problems in buildings: fires, stairs and baths/showers.

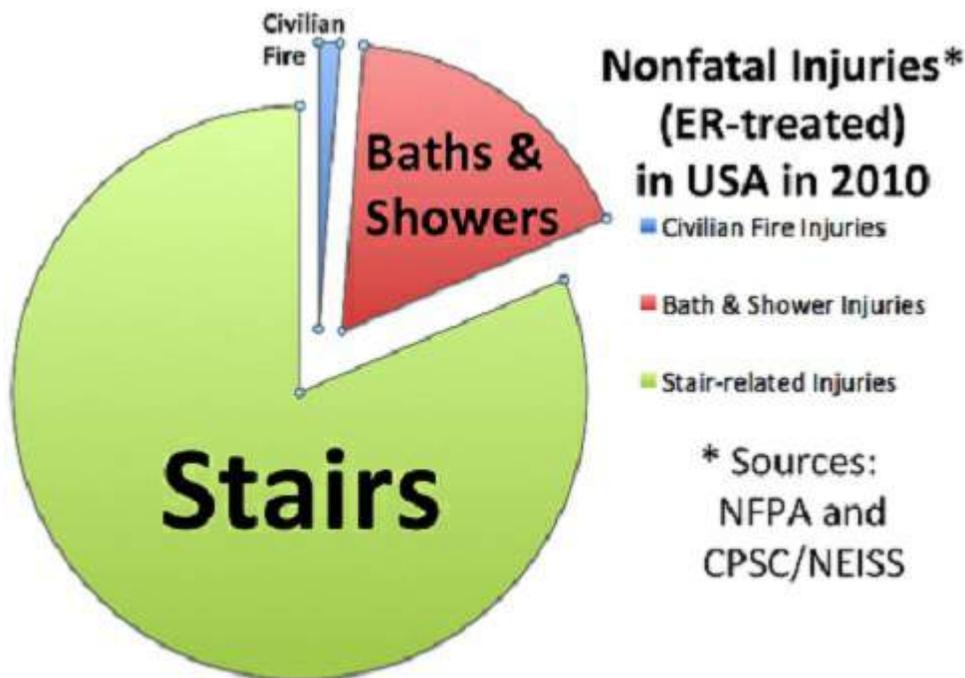


Figure 1. Chart of Approximate Relative Occurrence of Serious Injuries

Associated with Three Common Dangers in Homes and Other Buildings

One can quickly see that injuries related to baths/showers greatly outnumber those from fire and that baths/showers are in the same league as stairs in terms of injuries. However, note that when exposure is taken into account, baths/showers are more dangerous. (Exposure will also be addressed in the following section where the other major safety culprit in home bathrooms is briefly noted.)

The central and most important point of this code change proposal is to respond to the relatively high risk of injurious falls when entering and exiting a bathing/showering facility. An organization, PIRE (Pacific Institute for Research and Evaluation), in Maryland is the best available source of some very insightful data collections that have been prepared by likely the finest minds on injury data in the world. PIRE has provided the proponent with data sets that have their origins in the US CPSC National Electronic Injury Surveillance System (NEISS) but have been subjected to intelligent analysis and presentation which are shared here, where they can do a lot of good.

First let us examine data on where (occupancy or building context) bathtub and shower injuries occur in the USA in the years 2010-2014. Table 1(a) provides this data set from PIRE along with a related data set, in 1(b) Table for toilets, the third relatively dangerous facility in home bathrooms.

Bathtubs & showers

	Locale of accident	Frequency	Percent
0	Not recorded	209,935.6	21.02
1	Home	754,831.6	75.57
2	Farm/ranch	25.3	0.00
4	Street/highway	756.9	0.08
5	Other public property	29,838.6	2.99
6	Mobile/manuf home	75.2	0.01
8	School	1,092.9	0.11
9	Place of rec/sports	2,293.3	0.23
	Total	998,849.3	100.00

Toilets

	Locale of accident	Frequency	Percent
0	Not recorded	56,454.2	19.09
1	Home	203,471.0	68.79
4	Street/highway	165.6	0.06
5	Other public property	33,400.8	11.29
8	School	1,541.3	0.52
9	Place of rec/sports	760.4	0.26
	Total	295,793.3	100.00

Tables 1(a) Bathtubs & Showers plus 1(b) Toilets:

Injuries by Locale in the US

Some important preliminary lessons from these tables: first homes are, by far, the most common locale for bathroom-related injuries. People can avoid using showers anywhere, but they need to use toilets everywhere.

Next, let us examine data on rates of injuries by age group and the context of professional treatment for those injuries. Again we compare two tables addressing (a) bathing/showering and (b) toileting.

Bathtubs & showers			Hospital admitted		Total
Age	Doc/DUp	ED	via ED	Direct	
00-09	92.0	107.1	5.3	1.8	204.0
10-19	84.6	54.7	2.3	0.5	211.2
20-29	159.5	81.7	3.1	1.3	245.4
30-39	223.7	90.8	3.7	1.3	308.9
40-49	302.5	88.6	5.5	1.7	397.2
50-59	383.8	87.6	8.8	3.3	483.2
60-69	322.2	77.4	25.6	5.2	320.2
70-79	384.3	105.9	33.3	20.4	433.8
80-89	429.0	202.0	90.4	24.7	745.2
Total	225.2	890	20.3	1.2	318.2

Toilets			Hospital admitted		Total
Age	Doc/DUp	ED	via ED	Direct	
00-09	20.2	19.2	0.6	0.2	40.1
10-19	7.1	6.0	0.2	0.3	13.4
20-29	17.5	12.2	0.6	0.3	30.0
30-39	37.7	14.7	1.2	0.3	53.5
40-49	46.0	16.3	2.6	1.0	65.8
50-59	81.7	21.6	5.1	1.8	90.0
60-69	93.3	32.6	22.8	4.6	213.2
70-79	154.7	59.7	32.8	20.4	257.0
80-89	275.0	179.0	112.8	80.1	496.9
Total	57.6	23.3	8.7	2.6	94.2

Tables 2(a) Bathtubs & Showers plus 2(b) Toilets:

Injury Rates by Age & Treatment Context

Some important preliminary lessons from these tables: First, note the heightened vulnerability of older adults to injuries—at rates ten to a hundred times higher than for younger and middle-age adults. Second, note for the very oldest people, toilets are especially dangerous because their use—or avoidance of use—is not by choice as is the case for showers and baths. Third, note for the oldest people, injuries tend to be very serious as the rate for minor treatment is close to the rate for hospital admission.

Next, let us examine data on incidence (estimated number) of injuries by age group and the context of professional treatment for those injuries. Again we compare two tables addressing (a) bathing/showering and (b) toileting.

Bathtubs & showers			Hospital-admitted		Total
Age	Doc/Outp	ED	via ED	Direct	
00-09	37,209.4	43,339.8	1,331.7	666.4	82,547.3
10-19	35,633.2	23,065.4	550.0	193.0	59,441.6
20-29	69,977.6	35,853.2	1,362.6	482.8	107,676.2
30-39	111,103.0	36,699.4	1,497.8	444.1	149,744.3
40-49	128,478.0	37,743.3	2,339.7	706.7	169,267.6
50-59	122,562.0	37,817.5	3,806.7	1,332.2	165,518.4
60-69	70,334.1	24,507.2	4,954.2	1,648.5	101,444.0
70-79	50,248.3	18,727.5	5,880.1	1,832.0	76,687.9
>=80	49,813.7	23,342.6	10,501.9	2,864.2	86,522.4
Total	675,359.0	281,096.0	32,224.6	10,169.9	998,849.5

Toilets			Hospital-admitted		Total
Age	Doc/Outp	ED	via ED	Direct	
00-09	8,162.7	7,752.4	235.8	90.6	16,241.5
10-19	2,997.7	2,507.3	109.4	31.9	5,646.3
20-29	7,660.3	5,348.3	275.1	139.9	13,423.6
30-39	15,285.7	5,965.9	481.2	132.8	21,865.5
40-49	19,586.3	6,929.6	1,121.8	414.5	28,052.1
50-59	26,660.4	9,330.3	2,190.4	707.6	38,888.7
60-69	29,557.7	10,315.4	4,054.4	1,383.1	45,310.7
70-79	27,339.4	10,463.1	5,791.4	1,838.0	45,431.9
>=80	43,548.8	20,879.0	13,006.3	3,498.9	80,933.0
Total	180,799.0	79,491.3	27,265.8	8,237.2	295,793.3

Tables 3(a) Bathtubs & Showers plus 3(b) Toilets:

Injury Incidence by Age & Treatment Context

Some important preliminary lessons from these tables: Note that there are many injuries occurring to younger people so their greater preference for frequent bathing/showering is not reduced by the dangers; they still fall due to factors that go beyond frailty and/or balance issues that increase with older people. Their injuries might be less severe but they are still highly vulnerable to incidents with balance or footing, for example, from which they are less likely to be hurt very badly. In other words, there are problems to be addressed across the life span with bathing/showering.

The societal cost of these injuries was (for 2010) about 20 billion dollars for US bathtubs plus showers and about 93 billion dollars for US stairs with the greatest risk for both being in homes, where bathing/showering is a near daily activity for most people in the US (Data source: Lawrence, B., Spicer, R., Miller, T. A fresh look at the costs of non-fatal consumer product injuries. *Injury Prevention*, digital publication, August 2014, paper journal publication, 2015:21:23-29.)

Source of the Text of the Proposed New Requirements for IRC Section R307.3

The source of the proposed new requirements is a few sources, first the proponent's proposals of last year for Group A changes to the IBC (first Means of Egress, Ch. 10 and later Interior Environment, Ch. 12) and the IRC (plumbing). A Comment was submitted only for the IBC knowing already that there were numerous suggestions

that the best place in the IRC was not for a section in Group A; it was the Planning Chapter in Group B.

Other sources include activity in Canada on two separately submitted proposals, from 2007 and 2015, for mainstreamed grab bars, first only in homes and later in all occupancy contexts.

The best source was the proposals that have actually been incorporated in a major set of documents, NFPA 5000 and NFPA 101. The latter, in addition to adopting a package of requirements for mainstreamed grab bars in virtually every non-healthcare occupancy, adopted a new scoping provision (1.1.6): “Injuries from Falls. The Code also addresses reducing injury to occupants from falls.” (NFPA 5000 already had such an expanded scope from its inception.) The proponent for both the successful mainstreamed grab requirements and the new scope statement was the current proponent of the two proposals to the I-Codes in Group A in 2018 and is the proponent of this proposal in Group B during 2019.

To be specific, for a few reasons the proponent elected to pattern the now-proposed requirements, for an expansion of IRC R307.3, on what NFPA has adopted and will soon include in its next code editions, the 2021 editions of NFPA 5000 and NFPA 101. This is not done out of loyalty to NFPA but, more fundamentally, because with all the discussions that have been going on internationally over the last two decades on improved bathroom safety, there is a consensus emerging on what a package of mainstreamed grab bar proposals should contain. So, bottom line, the ICC has a widely considered proposal in Group B for the IRC during 2019. They have had much discussion and, as noted in last year’s proposals, the proponent is a devoted documenter of bathrooms in hotels in many countries due to, first, his attention to detail and, second, the need to document bathroom facilities to near-forensic standards for his 130 nights of travel using a variety of hotels, with rooms in a wide range of price categories, each year.

Finally, the proponent practices what he preaches; see Figure 2 for the bathroom in his dwelling unit; it would readily comply with the proposed IRC requirements.



**Figure 2. Bathroom Retrofitted (in a rental apartment)
with Mainstreamed Grab Bar Set That Would Comply
with the Proposed IRC Requirements for R307.3**

Bibliography: An extensive bibliography of about 50 items was provided with all the Group A proposals on grab bars. That can be obtained from cdpAccess archives as well as from the proponent. There was only one citation to the literature in this Group B proposal and all the usual bibliographic information was included in the Reason Statement text.

Cost Impact: The code change proposal will increase the cost of construction. From careful analysis on related code change proposals in Canada (where an Impact Analysis is being required for many proposed changes to the National Building Code of Canada. The bottom line is that the payback period for the few hundred dollars of materials and labour to install two grab bars per shower-bathtub combination in a dwelling, even for two bathrooms in such a dwelling, is on the order of several years. After that, the grab bars just keep preventing and mitigating falls for decades, given the large cost of bathing/showering-related injuries as discussed in the Reason Statement.

Proposal # 5619

RB81-19

RB82-19

IRC@: R308.4.5 (New)

Proponent: Lucas Pump, representing Self (l.pump@cedar-rapids.org)

2018 International Residential Code

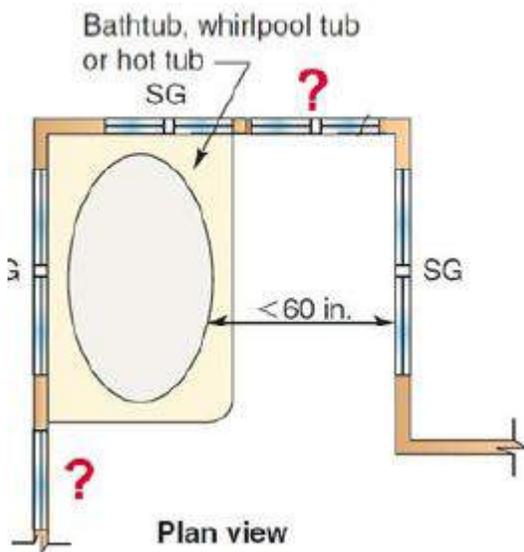
Revise as follows:

R308.4.5 Glazing and wet surfaces. Glazing in walls, enclosures or fences containing, facing or facing adjacent to hot tubs, spas, whirlpools, saunas, steam rooms, bathtubs, showers and indoor or outdoor swimming pools where the bottom exposed edge of the glazing is less than 60 inches (1524 mm) measured vertically above any standing or walking surface shall be considered to be a hazardous location. This shall apply to single glazing and each pane in multiple glazing.

Exception: Glazing that is more than 60 inches (1524 mm), measured horizontally and in a straight line, from the water's edge of a bathtub, hot tub, spa, whirlpool or swimming pool or from the edge of a shower, sauna or steam room.

Reason: This code change proposal provides clarification on where safety glazing is required when adjacent to wet surfaces. This section has come up a number of times in our jurisdiction and there is always confusion on whether the adjacent wall next to a tub/shower needs safety glazing, or just the wall "facing" the tub/shower as specifically stated in the code. We believe the intent is similar to that of a landing at the bottom of the stairs, which requires any glazing within a 60 inch arc to be safety glazing. If you step out of a tub/shower, you are just as likely to slip and fall to the side as you are to fall forward. For this reason we believe simply adding the words "adjacent to" will make this more clear. This proposal adds language that would support safety glazing in a window next to a bathtub on the wall adjacent to a bathtub/shower.

Wet Surfaces



Cost Impact: The code change proposal will not increase or decrease the cost of construction. I believe that this wouldn't increase the cost of construction, because most inspectors and contractors are interpreting this area as being required to be safety glazing already.

Proposal # 3815

RB83-19

IRC@: R308.6.3, R308.6.4, R308.6.5, R308.6.7

Proponent: Jennifer Hatfield, representing American Architectural Manufacturers Association
(jen@jhatfieldandassociates.com)

2018 International Residential Code

Revise as follows:

R308.6.3 Screens, general. For fully tempered or heat-strengthened glass, a ~~retaining~~broken glass retention screen meeting the requirements of Section R308.6.7 shall be installed below the full area of the glass, except for fully tempered glass that meets ~~either condition 1 or 2~~ listed in Section R308.6.5.

R308.6.4 Screens with multiple glazing. Where the inboard pane is fully tempered, heat-strengthened or wired glass, a ~~retaining~~broken glass retention screen meeting the requirements of Section R308.6.7 shall be installed below the full area of the glass, except for ~~either condition 1 or 2~~ listed in Section R308.6.5. Other panes in the multiple glazing shall be of any type listed in Section R308.6.2.

R308.6.5 Screens not required. Screens shall not be required where laminated glass complying with item 1 of Section R308.6.2 is used as single glazing or the inboard pane in multiple glazing.
Screens shall not be required where fully tempered glass is used as single glazing or the inboard pane in multiple glazing and either of the following conditions are met:

1. The glass area is 16 square feet (1.49 m²) or less; the highest point of glass is not more than 12 feet (3658 mm) above a walking surface; the nominal glass thickness is not more than ³/₁₆ inch (4.8 mm); and ~~(, for multiple glazing only),~~ the other pane or panes are fully tempered, laminated or wired glass.
2. The glass area is greater than 16 square feet (1.49 m²); the glass is sloped 30 degrees (0.52 rad) or less from vertical; and the highest point of glass is not more than 10 feet (3048 mm) above a walking surface.

R308.6.7 Screen characteristics. The screen and its fastenings shall ~~be~~ capable of supporting twice the weight of the glazing; ~~be~~ firmly and substantially fastened to the framing members; ~~be~~ installed within 4 inches (102mm) of the glass; and have a mesh opening of not ~~more~~greater than 1 inch by 1 inch (25 mm by 25 mm).

Reason: The current language that states when screens are required below unit skylights glazing has frequently been difficult to interpret by jurisdictions, causing consumers and others concern when they are incorrectly told they need to install a glass retention screen below conforming laminated glass. Skylight manufacturers are asked to intervene far too frequently to ensure that unsightly, unnecessary screens are not installed in these instances. Furthermore, it is believed that many times an optional skylight installation is removed from submitted plans due to misinterpretation at the plan check stage, where the supplier may never know that the issue was raised because the permit applicant chooses to surrender rather than appeal. The current code language addresses qualifying laminated glass by simple omission from the sections dealing with screens. It is this omission that seems to create the confusion within the industry. The proposed additional sentence in Section R308.6.5 states directly that permitted laminated glass does not require screens. This should reduce the frequency of misinterpretations that have been experienced.

Adding the modifier, "broken glass retention" fully describes the screen's purpose. This is to ensure readers do not confuse them with insect screens or fall protection screens, which are physically different and will not serve

as effective retention screens.

Section R308.6.7 is further clarified to be consistent with the language in IBC Section 2405.3.

None of the proposed changes affect the long-standing requirements; rather, the only expected outcomes are simply better clarity that will then provide more consistent enforcement.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal should have a nominal effect on the cost of construction as the changes presented are not meant to alter the current requirements but simply meant to provide better clarity and more consistent enforcement.

Proposal # 5259

RB83-19

RB84-19

IRC@: R310.1

Proponent: Matt Archer, representing City of Lone Tree (Matt.archer@cityoflonetree.com)

2018 International Residential Code

Revise as follows:

R310.1 Emergency escape and rescue opening required. *Basements, habitable attics* and every sleeping room shall have not less than one operable emergency escape and rescue opening. Where *basements* contain one or more sleeping rooms, an emergency escape and rescue opening shall be required in each sleeping room. Emergency escape and rescue openings shall open directly into a public way, or to a *yard* or court that opens to a public way.

Exceptions ~~Exception:~~

1. Storm shelters and *basements* used only to house mechanical *equipment* not exceeding a total floor area of 200 square feet (18.58 m²).
2. ~~Where the *dwelling* or *townhouse* is equipped with an automatic sprinkler system installed in accordance with Section P2904, sleeping rooms in basements shall not be required to have emergency escape and rescue openings provided that the basement has one of the following:~~
 - 2.1. ~~One means of egress complying with Section R311 and one emergency escape and rescue opening.~~
 - 3.2. ~~Two means of egress complying with Section R311.~~

Reason: This exception was introduced to the 2018 IRC to encourage the installation of fire suppression systems. Egress windows should not be removed from a sleeping area or room. Bedrooms in a basement are unique in the fact they are in a concrete bunker essentially. Should a fire event happen at or near the door you will have no option to self-evacuate if you do not have an egress window. I have heard basements described by fire crews as a large oven as they contain and radiate the heat in a confined space. Putting all the egress expectations on a system with an effective design time of possibly 6 minutes versus an opening which will always be available is a no brainer. Egress windows are also used for rescue and ingress for fire crews to attack the event. Last, unlike the IBC and IFC, IRC systems are not required to be inspected annually and maintenance is dependent on the owner who could remove the head, modify the head or paint over the head effectively hampering or removing this system as an egress option. And, now they have no window either...

Cost Impact: The code change proposal will increase the cost of construction. This change could increase the cost of construction if you were to install a suppression system.

Proposal # 5607

RB84-19

RB85-19

IRC®: R310.1

Proponent: Jeffrey Shapiro, P.E., representing Self (jeff.shapiro@intlcodeconsultants.com)

2018 International Residential Code

Revise as follows:

R310.1 Emergency escape and rescue opening required. *Basements, habitable attics* and every sleeping room shall have not less than one operable emergency escape and rescue opening. Where *basements* contain one or more sleeping rooms, an emergency escape and rescue opening shall be required in each sleeping room. Emergency escape and rescue openings shall open directly into a public way, or to a *yard* or court that opens to a public way.

Exceptions:

1. Storm shelters and *basements* used only to house mechanical *equipment* not exceeding a total floor area of 200 square feet (18.58 m²).
2. Where the *dwelling* or *townhouse* is equipped with an automatic sprinkler system installed in accordance with Section P2904, sleeping rooms ~~in basements~~ shall not be required to have emergency escape and rescue openings provided that the *basement, story, habitable attic or mezzanine in which the sleeping room is located* has one of the following:
 - 2.1. One means of egress complying with Section R311 and one emergency escape and rescue opening.
 - 2.2. Two means of egress complying with Section R311.

Reason: This proposal suggests an extension of the means of escape window allowance, added last cycle by RB89-16 (which duplicates an IBC exception added by E145-15). The current application, which is limited to basements of sprinklered dwelling units, would be applicable to all levels, provided that each level using the exception has at least one escape window or door in addition to a code-compliant means of egress, such as an interior stair or a door to the outside. It is important to remember that means of escape openings are in the code due to fire concerns and are sized based on a firefighter in full turnout gear going through the opening. Where sprinklers and hard-wired interconnected smoke alarms are present there is minimal prospect of a firefighter having to make entry through or an occupant having to escape via a window opening.

Precedent for extending this exception is well established by the NFPA 101 - Life Safety Code, which allows eliminating ALL required means of escape openings from sprinklered one- and two-family dwellings [24.2.2.1.2(2)], hotels, motels, apartments and similar uses. In addition, the states of New Hampshire and Virginia have both amended R310.1 of their statewide code adoptions by eliminating ALL requirement for means of escape openings when sprinklers are provided. This proposal is more conservative by retaining a requirement for at least one means of escape plus the means of egress from each level.

This proposal offers significant value to builders, architects, homeowners and firefighters. For builders, architects and homeowners, the proposal offers significant design flexibility and choice of where and how to locate windows when a dwelling unit is equipped with a fire sprinkler system. There is particularly beneficial for cases where it is difficult, or perhaps impossible, to provide a complete path from a sleeping room means of escape to a public way due to pathway obstructions created by fences isolating townhouse yards, rooftop solar arrays or other obstacles. For firefighters, it is far safer to respond to a sprinklers home than a non-sprinklered home, and reasonable and appropriate incentives, such as this one, encourage and recognize the value of residential sprinkler installations.

Disclosure: although I am a consultant to the National Fire Sprinkler Association, this proposal is submitted on my own behalf and was not reviewed or endorsed by NFSA prior to submittal.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal adds an option to the code. There is no requirement to utilize this option; however, if it is used, the cost of construction may decrease.

Proposal # 4703

RB85-19

RB86-19

IRC@: R310.1

Proponent: Thomas Barrs, City of Scottsdale, representing Self (tbarrs@scottsdaleaz.gov)

2018 International Residential Code

Revise as follows:

R310.1 Emergency escape and rescue opening required. *Basements, habitable attics* and every sleeping room shall have not less than one operable emergency escape and rescue opening. Where *basements* contain one or more sleeping rooms, an emergency escape and rescue opening shall be required in each sleeping room. Emergency escape and rescue openings shall open directly into a public way, or to a minimum 36" wide yard or court that opens to a public way.

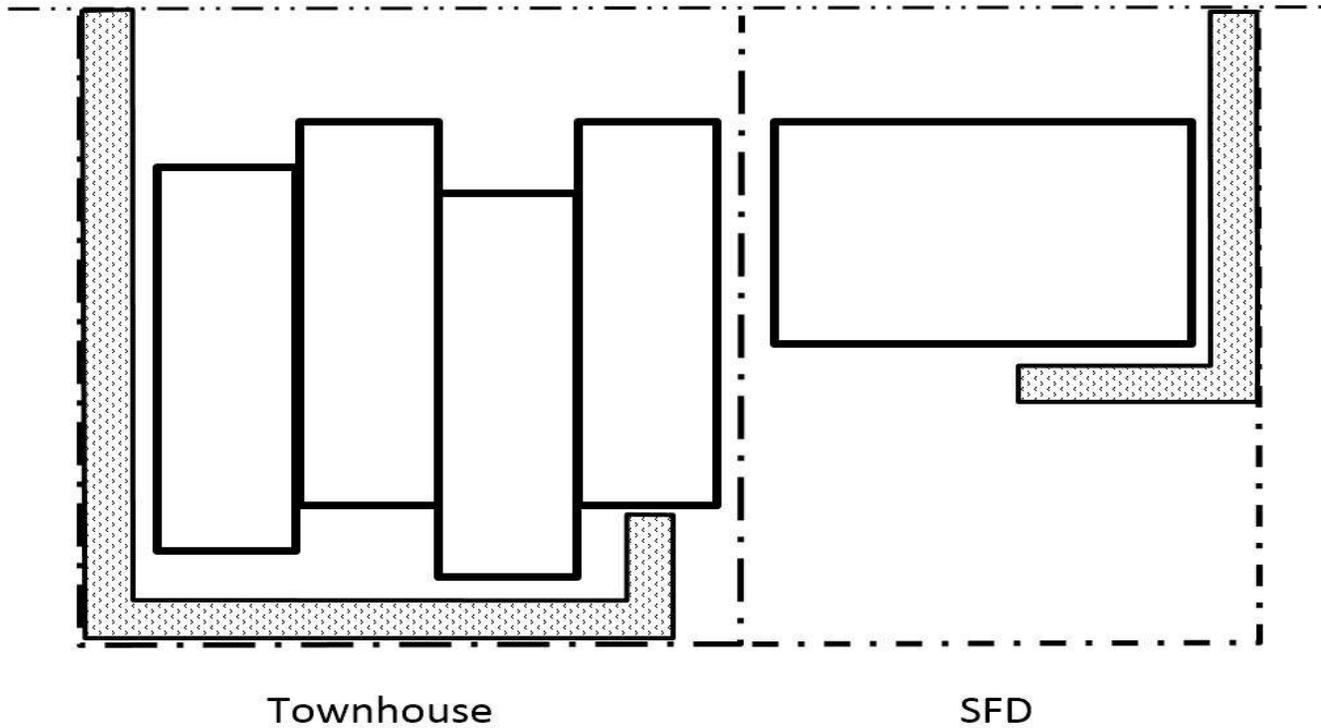
Exceptions:

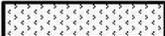
1. Storm shelters and *basements* used only to house mechanical *equipment* not exceeding a total floor area of 200 square feet (18.58 m²).
2. Where the *dwelling* or *townhouse* is equipped with an automatic sprinkler system installed in accordance with Section P2904, sleeping rooms in basements shall not be required to have emergency escape and rescue openings provided that the basement has one of the following:
 - 2.1. One means of egress complying with Section R311 and one emergency escape and rescue opening.
 - 2.2. Two means of egress complying with Section R311.

- Reason:**
1. The current requirement for yards and courts to “open directly into a public way” or “opens to a public way” does not specify a minimum width.
 2. Both the IRC and IBC use the defined terms ‘yards’ and ‘courts’, however only the IBC in Section 1028 for Exit Discharge provides specific language for minimum width of a court as “Egress courts serving Group R-3 and U occupancies shall be not less than 36 inches.” This code change provides uniformity with the IBC, and a minimum level of safety by including a width for both emergency egress and fire department access.
 3. Without this code change, developers, designers, and code officials are provided with no width criteria for yards or courts that must be provided as links to the public way from emergency escape and rescue openings.

Note: The graphic is intended to depict a general example of townhouse and a single family dwelling where the 36" width portion of the yard or court may link from a rear yard or court, to a side yard, then link to a public way. Emergency Escape and Rescue Openings may be from various locations, on various stories, from sleeping rooms, basements, etc., which are not depicted here, but are presently required to "open to a public way", or from "yards" or "courts" to a public way.

Public Way



 Minimum 36" yard or court to public way

 Property line

Cost Impact: The code change proposal will not increase or decrease the cost of construction. By providing a uniform width requirement, jurisdictions which allowed lesser widths may see an increase in costs, however other jurisdictions that required a larger width due to lack of a specified width, may see a reduction in costs.

Proposal # 5559

RB86-19

RB87-19

IRC@: R310.1

Proponent: Cesar Lujan, representing National Association of Home Builders (clujan@nahb.org); Gary Ehrlich (gehrlich@nahb.org)

2018 International Residential Code

Revise as follows:

R310.1 Emergency escape and rescue opening required. *Basements, habitable attics* and every sleeping room shall have not less than one operable emergency escape and rescue opening. Where *basements* contain one or more sleeping rooms, an emergency escape and rescue opening shall be required in each sleeping room. Emergency escape and rescue openings shall open directly into a public way, or to a *yard* or court that opens to a public way.

Exceptions:

1. Storm shelters and *basements* used only to house mechanical *equipment* not exceeding a total floor area of 200 square feet (18.58 m²).
2. Where the *dwelling* or *townhouse* is equipped with an automatic sprinkler system installed in accordance with Section P2904, sleeping rooms in basements shall not be required to have emergency escape and rescue openings provided that the basement has one of the following:
 - 2.1. One means of egress complying with Section R311 and one emergency escape and rescue opening.
 - 2.2. Two means of egress complying with Section R311 *approved* detection devices.
3. A yard shall not be required to open directly into a public way where the yard opens to an unobstructed path from the yard to the public way. Such path shall have a width of not less than 36 in. (914 mm).

Reason: The purpose of this code change is to allow an EERO to discharge into a fenced yard that does not directly open onto a public way if a minimum 36" wide path can be provided from the fenced yard to the public way. In many cities, new townhouses are being constructed on infill lots with tight space limitations. Locating an EERO while also wanting to provide fenced yards is becoming tricky. In some cases, a builder may want to construct two rows of townhouses that are tight up to the street but that have fenced backyards for each unit. Under the current code, the builder would either have to construct a window well in the sidewalk to access a basement EERO or in the backyard and forgo the private fenced yards as there will likely not be enough space to provide a 10 foot wide "public way". The problems with placing an EERO in the front to allow a fenced yard in the back include coordinating the location with entry doors and front steps, coordinating the location with utilities, and providing a cover over the window well that prevents passers-by from dropping trash into the window well or getting high heels stuck in the openings of a grate. The problem with forgoing fenced yards is obviously the loss of privacy.

While a 10-foot wide path between back-to-back fenced yards is almost certainly not feasible, a 3-foot path may be in many cases. The new exception would allow such a path, that occupants could use to get out of their yard after escaping through an EERO or that firefighters could use to access the fenced yard for firefighting and rescue operations without having to bash through or climb over a series of fences. The assumption is that the yard opens via a gate with access to the public way.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code change does not change the requirement to provide an EERO for sleeping rooms and for basements.

(including each sleeping room in a basement). Thus, there should be no increase in cost as a result of this proposal. There may be a modest savings from the added ability to locate a basement EERO in the rear of the home, where covers may not be required and coordination with utilities is easier.

Proposal # 4734

RB87-19

RB88-19

IRC@: R310.1

Proponent: Cesar Lujan, representing National Association of Home Builders (clujan@nahb.org); Gary Ehrlich, representing National Association of Home Builders (gehrlich@nahb.org)

2018 International Residential Code

Revise as follows:

R310.1 Emergency escape and rescue opening required. *Basements, habitable attics* and every sleeping room shall have not less than one operable emergency escape and rescue opening. Where *basements* contain one or more sleeping rooms, an emergency escape and rescue opening shall be required in each sleeping room. Emergency escape and rescue openings shall open directly into a public way, or to a *yard* or court that opens to a public way.

Exceptions:

1. Storm shelters and *basements* used only to house mechanical *equipment* not exceeding a total floor area of 200 square feet (18.58 m²).
2. Where the *dwelling* or *townhouse* is equipped with an automatic sprinkler system installed in accordance with Section P2904, sleeping rooms in basements shall not be required to have emergency escape and rescue openings provided that the basement has one of the following:
 - 2.1. One means of egress complying with Section R311 and one emergency escape and rescue opening.
 - 2.2. Two means of egress complying with Section R311.
3. A yard shall not be required to open directly into a public way where an infill property is located next to adjoining neighboring properties without rescue openings that do not open directly into a public way.

Reason: The purpose of this code change is to address the condition where infill lots, and single lot new residential construction (i.e. townhomes/rowhouses), do not have the capacity for rescue openings to open directly into a public way. An infill project may not have the ability to comply with the rescue opening requirements by having access to a public way because the front yard may be non-existent, utility lines, steps and other constraints prevent placing an area well in the sidewalk, the side yards are non-existent due to party walls, and the rear yard may already be delineated without access to a public way due to the neighboring conditions, existing historic design of the neighborhood, or landlocked properties. This occurs in particular where fenced-in yards already exist for the neighboring properties.

The problem is that since an infill project is considered new construction, compliance with zoning laws and ordinances, and for some projects historic design criteria, has led to denials of building permits. The code provisions have created a conflict between trying to maintain the architectural character of the neighborhood and meeting what the building code requires for new construction.

If a rear yard is required to open to a public way, and is next to adjoining existing neighboring properties with yards not opening to a public way, the code will affect the viability of the new infill project and where bedrooms can be located within the residence. With no public access in the rear yard or side yards, due to party walls or existing fences, all bedrooms will have to be located at the front of residence as that may be the only unobstructed path to a public way since sleeping areas require an emergency escape rescue opening. Basements may have to be left unfinished or used only for storage and utilities. This potentially reduces the market value of the new infill property relative to its neighbors since the adjoining properties do not have to

follow the EERO requirements for new construction.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code change will not increase or decrease the cost of construction since the new infill construction design intent is to match the neighboring existing properties also without rescue openings not opening directly into a public way.

Proposal # 5075

RB88-19

RB89-19

IRC: R301.1 (New), R310.1

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

SECTION R310 EMERGENCY ESCAPE AND RESCUE OPENINGS

Add new text as follows:

R310.1 General. Emergency escape and rescue openings shall comply with the requirements of this section.

Revise as follows:

~~R310.1~~ R310.2 Emergency escape and rescue opening Where required. Basements, habitable attics and every sleeping room shall have ~~not less~~ not fewer than one ~~operable~~ emergency escape and rescue opening. ~~Where basements contain opening in accordance with this section.~~ Where basements contain one or more sleeping rooms, an emergency escape and rescue opening shall be required in each sleeping room, but shall not be required in adjoining areas of the basement. ~~Emergency escape and rescue~~ Such openings shall open directly into a public way, or to a *yard* or court that opens to a public way.

Exceptions:

1. Basements with a ceiling height of less than 80 inches (2032 mm) shall not be required to have emergency escape and rescue openings.
2. Emergency escape and rescue openings are not required from basements or sleeping rooms that have an exit door or exit access door that opens directly into a public way or to a yard, court or exterior egress balcony that opens to a public way.
- ~~1-3.~~ Storm shelters and basements Basements used only to house mechanical equipment and not exceeding a total floor area of 200 square feet (18.58 m²) shall not be required to have emergency escape and rescue openings.
4. Storm shelters are not required to comply with this section where the shelter is constructed in accordance with ICC 500.
- ~~2-5.~~ Where the dwelling or townhouse is equipped with an automatic sprinkler system installed in accordance with Section P2904, sleeping rooms in basements shall not be required to have emergency escape and rescue openings provided that the basement has one of the following:
 - ~~2-1-5.1~~ 2-1-5.1 One means of egress complying with Section R311 and one emergency escape and rescue opening.
 - ~~2-2-5.2~~ 2-2-5.2 Two means of egress complying with Section R311.

Reason: The intent of this proposal is to coordinate with the approved changes to INC (E107-18 AMPC1) and clarify the exceptions.

Adding Section R310.1 is to coordinate with the format modification made by the public comment to E107-18.

There are revisions to the exceptions for where emergency escape and rescue openings are required.

Exceptions 1 and 2 are current exceptions for EEROs in the IBC. New exception 1 is for basements with ceiling so low that they would not typically include normally occupied spaces. New exception 2 is to allow for the option of a door. The current exception 1 has been divided into new exceptions 3 and 4. New exception 3 clarifies that the 200 sq.ft. limit was for basements that only house mechanical equipment. The new exception 4 separates out storm shelters and adds a specific reference for ICC 500 (currently referenced in ICC R323). The current exception 2 is renumbered only.

This is one of a series of proposal to coordinate the requirements for emergency escape and rescue openings in the IBC and IRC. While independent issues, if all the proposals are approved, the IRC section would appear as indicated in the reason for the proposal to revise the definition – emergency escape and rescue openings.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is a coordination item for exceptions for EEROs already permitted between the codes.

Proposal # 4143

RB89-19

RB90-19

IRC@: R310.1.1

Proponent: Samuel Steele, representing Seattle Department of Construction and Inspection (SDCI)
(samuel.steele@seattle.gov)

2018 International Residential Code

Revise as follows:

R310.1.1 Operational constraints and opening control devices. Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys, tools or special knowledge. Window opening control devices on windows serving as a required emergency escape and rescue opening shall be not more than 70" (177.8 cm) above the finished floor and shall comply with ASTM F2090.

Reason: The 70" (177.8 cm) is the sum of the dimensions in the attached example of a single hung egress window having a maximum 44" sill height with a 24" operable leaf. Added to this is 2" to reach the latch to unlock the window which is set at 70". Similarly on a casement window, the lock should also be no higher than 70" (177.8 cm) .

Unlike the dimensions for clear area, sill height, and minimum openings, a height has never been determined for the location of window controls for emergency and escape openings. This would make it very clear for all users of the code.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This merely indicates the height of where the control should be. It would not add any cost to the manufacturing and installation.

Proposal # 5526

RB90-19

RB91-19

IRC@: R310.1.1

Proponent: Jeff Inks, representing Window and Door Manufacturers Association (jinks@wdma.com); Jennifer Hatfield, representing American Architectural Manufacturers Association (jen@jhatfieldandassociates.com)

2018 International Residential Code

Revise as follows:

R310.1.1 Operational constraints and opening control devices. Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys, tools or special knowledge. Window opening control devices complying with ASTM F2090 shall be permitted for use on windows serving as a required emergency escape and rescue opening ~~shall comply with ASTM F2090.~~

Reason: This revision makes the operational and opening control devices provisions in the IRC consistent with the same provisions in the IBC. The proposed language above was approved for the IBC during the last cycle because further clarity regarding the permitted installation of window opening control devices (wocd's) compliant with ASTM F2090 on EERO windows was determined to be helpful. While allowing the use of F2090 WOCD's on EERO windows is implied and intended by this section and Section R312.2, and in addition, the purpose of F2090 is specifically for WOCD's with emergency release mechanisms for use on EERO windows, providing more express language under Section 310.1 will provide further clarification that the installation of F2090 compliant devices is permitted on EERO windows, and again will make this provision consistent with the same in the IBC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. However, it will avoid potential misinterpretation in the field that could be problematic.

Proposal # 5397

RB91-19

RB92-19

IRC@: R310.1.1

Proponent: Jeff Inks, representing Window and Door Manufacturers Association (jinks@wdma.com); Jennifer Hatfield, representing American Architectural Manufacturers Association (jen@jhatfieldandassociates.com)

2018 International Residential Code

Revise as follows:

R310.1.1 Operational constraints and opening control devices. Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys ~~, or tools or special knowledge.~~ Window opening control devices on windows serving as a required emergency escape and rescue opening shall comply with ASTM F2090.

Reason: This proposal removes the term “special knowledge” to be consistent with the same operational constraint provision in the IBC. The term is undefined and ambiguous and is not necessary.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal is intended to make the IRC consistent with the IBC.

Proposal # 5251

RB92-19

RB93-19

IRC: R310.1.1

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

~~R310.1.1~~ **R310.2.1 Operational constraints and opening control devices.** Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys or , tools or special knowledge. Window opening control devices and fall prevention devices complying with ASTM F2090 shall be permitted for use on windows serving as a required emergency escape and rescue opening shall comply with ASTM F2090.

Reason: The term "special knowledge" was removed from IBC because the phrase "special knowledge" is too open for interpretations.

The revision to the last sentence could not require opening control devices or fall prevention devices. This section would just allow for them to be on windows that were also serving as emergency escape and rescue openings. ASTM F2090, *Specification for Window Fall Prevention Devices with Emergency Escape (Egress Release Mechanisms)*, includes criteria for window fall prevention devices and window opening control devices (see Section R312.2). This standard is specifically written for window openings within 75 feet (22 860 mm) of grade and specifically allows for windows to be used for emergency escape and rescue. This standard was updated in 2008 to address window opening control devices. This control device can be released from the inside to allow the window to be fully opened in order to comply with the emergency escape provisions in IRC.

This is one of a series of proposal to coordinate the requirements for emergency escape and rescue openings in the IBC and IRC. While independent issues, if all the proposals are approved, the IRC section would appear as indicated in the reason for the proposal to revise the definition – emergency escape and rescue openings.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is a coordination item for emergency escape and rescue openings.

Proposal # 4144

RB93-19

RB94-19

IRC: R310.2, R310.2.1, R310.2.2 (New), R310.2.2, R312.2.2

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

R310.2 Emergency escape and rescue openings. Emergency escape and rescue openings shall have minimum dimensions ~~as specified in this section.~~ in accordance with Sections 310.2.1 through 310.2.3.

R310.2.1 Minimum opening area. ~~size.~~ Emergency and escape rescue openings shall have a net clear opening of not less than 5.7 square feet (0.530 m²) . ~~The net clear opening dimensions required by this section shall be obtained by the normal operation of the emergency escape and rescue opening from the inside. The net clear height of the opening shall be not less than 24 inches (610 mm) and the net clear width shall be not less than 20 inches (508 mm).~~

Exception: ~~Grade floor openings or below-grade openings shall have a net clear opening area of not less than~~ The minimum net clear opening for grade-floor emergency escape and rescue openings shall be 5 square feet (0.465 m²).

Add new text as follows:

R310.2.2 Minimum dimensions. The minimum net clear opening height dimension shall be 24 inches (610 mm). The minimum net clear opening width dimension shall be 20 inches (508 mm). The net clear opening dimensions shall be the result of normal operation of the opening.

Revise as follows:

~~R310.2.2 R310.2.3 Window sill height. Maximum height from floor.~~ Where a window is provided as the emergency ~~Emergency escape and rescue opening openings,~~ it shall have a sill height of not more than ~~the bottom of the clear opening not greater than~~ 44 inches (1118 mm) above the floor; ~~where the sill height is below grade,~~ it shall be provided with a window well in accordance with Section ~~R310.2.3.~~

R312.2.2 Window opening control devices. Window opening control devices shall comply with ASTM F2090. The window opening control device, after operation to release the control device allowing the window to fully open, shall not reduce the net clear opening area of the window unit to less than the area required by Section R310.2.1 and R310.2.2.

Reason: The intent of this proposal is to clarify minimum size, dimensions and height for emergency escape and rescue openings.

R310.2.1 and R310.2.2 - The requirements for size and dimensions have been split into two sections. The exception does not need to say 'below grade' as this could be considered a conflict with the definition (i.e., 44" above or below finished grade).

R310.2.3 - The revision clarifies that the 44" is to the bottom of the opening. The sill can be interpreted a lot of different ways. Window well requirements are in a new section - a reference from here is redundant and not needed.

The change to R312.2.2 is correlation only.

This is one of a series of proposal to coordinate the requirements for emergency escape and rescue openings in the IBC and IRC. While independent issues, if all the proposals are approved, the IRC section would appear as indicated in the reason for the proposal to revise the definition – emergency escape and rescue openings.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is a coordination item for requirements for EEROs already permitted between the codes.

Proposal # 4147

RB94-19

RB95-19

IRC@: R310.2.2

Proponent: donald sivigny, State of MN, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Residential Code

Revise as follows:

R310.2.2 Window ~~sill~~ clear opening height. Where a window is provided as the emergency escape and rescue opening, ~~it the bottom of the clear opening shall have a sill height of not more than 44 inches (1118 mm) above the floor; where the sill height the bottom of the clear opening is below grade, it shall be provided with a window well in accordance with Section R310.2.3.~~

Reason: Remove the word “sill” with respect to windows and rather use the terminology “clear opening” as this is the critical portion of the window from which to measure, to ensure access to, or when requiring fall protection. This change will provide greater consistency within the text since R310 and R312 reference “clear opening” to describe the requirements of the allowable size of a window.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This Code Change will not affect the cost of construction

Proposal # 5053

RB95-19

RB96-19

IRC@: R310.2.2

Proponent: Timothy Pate, Colorado Chapter Code Change Committee, representing City and County of Broomfield (tpate@broomfield.org)

2018 International Residential Code

Revise as follows:

R310.2.2 Window sill-opening height. Where a window is provided as the emergency escape and rescue opening, ~~it shall have a sill height of the bottom of the clear opening shall be not more than 44 inches (1118 mm) above the floor; where the sill height the bottom of the clear opening is below grade,~~ it shall be provided with a window well in accordance with Section R310.2.3.

Reason: This proposal is to change the existing language back to what was changed in 2012. It was changed to the current language in 2015 (and stayed the same in 2018) with no apparent reason since it was a part of a larger change. This same language was changed for the 2012 (RB41-09/10) to measure to bottom of opening since it is confusing to what a sill is (no definition) and sills can be much lower than the bottom of opening especially with the heights of the window tracks on a lot of current vinyl windows. I am proposing to change this language back to what was in the 2012. This would also match the current language in IBC section 1030.3.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal will not increase or decrease the cost of construction. It will only clarify what the intent of the code is.

Proposal # 4519

RB96-19

RB97-19

IRC@: R310.2.3, R310.2.3.1, R310.2.3.2 (New)

Proponent: Donald Masters, Master Home and Building Inspections, LLC, representing Self
(mhbinspections@gmail.com)

2018 International Residential Code

Revise as follows:

R310.2.3 Window wells. The horizontal area of the window well shall be not less than 9 square feet (0.9 m²), with a horizontal projection and width of not less than 36 inches (914 mm). The area of the window well shall allow the emergency escape and rescue opening to be fully ~~opened~~, opened, and installed safety grates or covers to be fully opened, and remain open without physical assistance to keep them open. ~~The height of the well shall not exceed one (1) foot above the surrounding soil level except as approved.~~

Exception: The ladder or steps required by Section R310.2.3.1 shall be permitted to encroach not more than 6 inches (152 mm) into the required dimensions of the window well.

R310.2.3.1 Ladder and steps. Window wells with a vertical depth greater than 44 inches (1118 mm) shall be equipped with a permanently affixed ladder or steps usable with the window in the fully open position. Ladders or steps required by this section shall not be required to comply with Section R311.7. Ladders or rungs shall have an inside width of not less than 12 inches (305 mm), shall project not less than 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center vertically for the full height of the window well.

Add new text as follows:

R310.2.3.2 Window Well Coverings. Window well covers, grates, and similar structures shall meet the following requirements:

1. Safety or security grates or structures and protective covers shall not exceed 25 lbs in total;
2. Grates or structures shall be hinged or otherwise attached such that they will remain open without human support while exiting the well;
3. Locks or other deterrent mechanisms shall not be installed without the ability to release them from inside the well.

Reason: Purpose for Requested Change:

As a home inspector, I see many creative design installations for items required by locally approved ICC new construction building codes. Tying the reason for a code to the design and implementation of the requirement, and then to the effective design functionality of the product created, in this instance leaves me with much concern for the safety of children or adults of limited physical means needing to use the installed escape route through a below grade window or below grade door and up through a well and grate covering.

Assumptions:

- 1) The minimum age for which the egress opening shall be intuitively functional is age four (4). In other words individuals of age four or greater shall be able to exit the window or door, structure, and well without any training or prior experience;
- 2) Any occupant in the structure who meets three components of physical capability (agility, balance, and muscular strength) shall be able to exit the window or door, and climb the well, open any grate and cover and escape to safety.
- 3) Occupants with physical limitations that limit the following abilities - agility, balance, and muscular strength -

may not be able to exit these emergency egress windows and wells, and are cause for further discussion.

Changes Requested to current installations:

- 1) Limit the height of the well above the surrounding grade
- 2) Limit the combined weight of any installed safety grate and other covering components (i.e. rain protective coverings)
- 3) Require that if a safety grate is installed, the grate shall be mounted such that it cannot be removed without tools (hinges or other mechanical balance system)
- 4) Require that any grate or covering material shall not be locked or secured such that it cannot be opened from the interior of the well by an average person
- 5) Require that any grate or covering shall be able to be pushed to and remain in a safe open position
- 6) Require that stairs be secured such that they remain secure while initially grabbing and while climbing, and cannot be removed from the well (already in the code but not being implemented)
- 7) Safety railings can be used in place of a horizontal grate to protect against injury from falling into a well.

Reasons and Examples for the Changes:

- 1) Weight - Current typical weight of the steel grates are upwards of 40 lbs.
- 2) Height - Some installed wells are built such that reaching the top of the well would require steps on the exterior of the well to fully escape for some people.
- 3) Windows & locks - Can the windows be successfully unlocked and opened by a child? Many installed sash or slider windows are installed tight, bind, and are difficult for a fully functional adult to open and climb the 44 inches over the interior ledge.
- 4) Grates - In areas that are prevalent to break-ins, the grates may have a locking mechanism installed, which would require a key or other way to unlock or unlatch the grate cover.
- 5) Stairs - Although in the current code, many stairs are found to be hanging loose, are removable, or are dangerously unstable when climbing.

Cost Impact: The code change proposal will increase the cost of construction

The requested code changes may impact construction costs for companies that are not following the current code or are minimally designing and constructing egress wells, but may be negligible for companies currently dedicated to constructing safe egress wells. So costs would vary based on design implementations.

Proposal # 4666

RB97-19

RB98-19

IRC@: R310.2.4

Proponent: Timothy Swanson, representing Colorado Chapter of the ICC (tim.swanson@greeleygov.com)

2018 International Residential Code

Revise as follows:

R310.2.4 Emergency escape and rescue openings under decks, ~~porches~~ and ~~porches-cantilevers~~.

Emergency escape and rescue openings installed under decks, ~~porches~~ and ~~porches-cantilevers~~ shall be fully openable and provide a path not less than 36 inches (914 mm) in height to a *yard* or court.

Reason: As with decks and porches, the potential also exists for cantilevers to be located directly over EERO's.

Bibliography: None

Cost Impact: The code change proposal will not increase or decrease the cost of construction
When openings for potential EERO's are detailed for a basement in the planning/design stage, they can be located anywhere at that time. There would be no additional cost at that stage to properly locate the opening away from a cantilever.

Proposal # 4534

RB98-19

RB99-19

IRC@: R310.2.4

Proponent: Matt Archer, City of Lone Tree, representing City of Lone Tree (matt.archer@cityoflonetree.com)

2018 International Residential Code

Revise as follows:

R310.2.4 ~~Emergency escape and rescue openings under decks and porches.~~ Access to a yard or court.
Emergency escape and rescue openings installed under decks and porches shall be fully openable and provide ~~a~~ an unobstructed path not less than 36 inches (914 mm) in height and 36 inches (914 mm) in width to a yard or court.

Reason: This proposal simplifies the existing code language by eliminating a potential list of items and provides a performance parameter for a clear path to a court or yard to meet egress and ingress requirements. I maintained the minimum height requirement of 36 in and added a minimum width requirement of 36 inches. The code was previously silent on width. I have no technical justification for a 36" minimum width. It just made sense to have a consistent width if you had to crawl any distance with full fire gear and hose or while trying to extract someone who may not be conscious.

I know Titles are not code but felt necessary to change the title to give the reader a brief detail of what this section is about

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This code change will not increase or decrease the cost of construction.

Proposal # 5592

RB99-19

RB100-19

IRC@: R310.4 (New), R310.2.3 (New), R310.2.3.1 (New), R310.4.2.1 (New), R310.2.3.2 (New), R310.3 (New), R310.3.1 (New), R310.3.2 (New), R310.3.2.1 (New), R310.3.2.2 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Add new text as follows:

R310.4 Area wells. An emergency escape and rescue opening where the bottom of the clear opening is below the adjacent grade shall be provided with an area well in accordance with Sections R310.4.1 through R310.4.4.

Revise as follows:

~~**R310.2.3 R310.4.1 Window wells. Minimum size.** The horizontal area of the window area well shall be not less than 9 square feet (0.9 m²), with a horizontal projection and width of not less than 36 inches (914 mm). The area size of the window area well shall allow the emergency escape and rescue opening to be fully opened.~~

Exception: The ladder or steps required by Section R310.2.3.1 shall be permitted to encroach not more than 6 inches (152 mm) into the required dimensions of the window area well.

~~**R310.2.3.1 R310.2.4.2 Ladder and steps.** Window Area wells with a vertical depth greater than 44 inches (1118 mm) shall be equipped with an approved permanently affixed ladder or steps. The ladder or steps usable with shall not be obstructed by the emergency escape and rescue opening where the window or door is in the fully open position. Ladders or steps required by this section shall not be required to comply with Section R311.7. Ladders or rungs shall have an inside width of not less than 12 inches (305 mm), shall project not less than 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center vertically for the full height of the window well.~~

Add new text as follows:

R310.4.2.1 Ladders. Ladders and rungs shall have an inside width of not less than 12 inches (305 mm), shall project not less than 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center vertically for the full height of the area well.

Revise as follows:

~~**R310.2.3.2 R310.2.4.3 Drainage.** Window Area wells shall be designed for proper drainage by connecting to the building's foundation drainage system required by Section R405.1 or by an approved alternative method: R405.1.~~

Exception: A drainage system for window area wells is not required where the foundation is on well-drained soil or sand-gravel mixture soils in accordance with the United Soil Classification System, Group I Soils, as detailed in Table R405.1. R405.1.

~~**R310.4 R310.4.4 Bars, grilles, covers and screens.** Where bars, grilles, covers, screens or similar devices are placed over emergency escape and rescue openings, area wells bulkhead enclosures, or window area wells that serve such openings, the minimum net clear opening size shall comply with Sections R310.2.1 R310.2 through R310.2.3, R310.2.2 and such R310.4.1. Such devices shall be releasable or removable from the inside without the use of a key, or tool, special knowledge or force greater than that required for the normal operation of the escape and rescue opening.~~

R310.3 Emergency escape and rescue doors. Where a door is provided as the required emergency escape and rescue opening, it shall be a side-hinged door or a ~~slider. Where the opening is below the adjacent grade, it shall be provided with an area well.~~ sliding door.

Delete without substitution:

~~**R310.3.1 Minimum door opening size.** The minimum net clear height opening for any door that serves as an emergency and escape rescue opening shall be in accordance with Section R310.2.1.~~

~~**R310.3.2 Area wells.** Area wells shall have a width of not less than 36 inches (914 mm). The area well shall be sized to allow the emergency escape and rescue door to be fully opened.~~

~~**R310.3.2.1 Ladder and steps.** Area wells with a vertical depth greater than 44 inches (1118 mm) shall be equipped with a permanently affixed ladder or steps usable with the door in the fully open position. Ladders or steps required by this section shall not be required to comply with Section R311.7. Ladders or rungs shall have an inside width of not less than 12 inches (305 mm), shall project not less than 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center vertically for the full height of the exterior stairwell.~~

~~**R310.3.2.2 Drainage.** Area wells shall be designed for proper drainage by connecting to the building's foundation drainage system required by Section R405.1 or by an *approved* alternative method.~~

~~Exception: A drainage system for area wells is not required where the foundation is on well-drained soil or sand-gravel mixture soils in accordance with the United Soil Classification System, Group I Soils, as detailed in Table R405.1.~~

Reason: This is one of a series of proposal to coordinate the requirements for emergency escape and rescue openings in the IBC and IRC. While independent issues, if all the proposals are approved, the IRC section would appear as indicated in the reason for the proposal to revise the definition – emergency escape and rescue openings.

The intent of this proposal to clarify and coordinate the requirements for area wells at emergency escape and rescue openings (EERO) that are below grade (current R310.2.3 and R310.3.2). This does NOT delete doors as an option. This recognizes that windows and doors are both types of emergency escape and rescue openings. The term 'area well' will apply for both windows or doors. The IBC correlating change was E111-18(AS)

- IRC R310.4 - This general paragraph clarifies that the bottom of the EERO sets the requirements for the area well.
- IRC R310.4.1 - Revisions for consistent terminology.
- IRC 1030.4.2 - The sentence about the window not obstruction the steps or ladder is a safety feature. The requirements for ladders has moved into a separate section-R310.4.2.1. Requirements for steps are addressed in another proposal since they are new.
- IRC R1030.4.3 - Since the code always allows alternative means, the last phrase is not needed.
- IRC R310.4.4 - Revisions for coordination. The reference to emergency and escape opening size and minimum area well size. The term “special knowledge is removed to be consistent with IBC and IRC R310.1.1 – the term allows for too broad of an interpretation.
- IRC R310.3 - The last sentence in R310.3 is deleted as redundant since the criteria for area wells is specifically addressed later in Section 310.4.
- IRC Section R310.3.2, R310.3.2.1 and R310.3.2.2 – delete the separate area well requirements for doors.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the

ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is a coordination item for requirements for EEROs already permitted between the codes.

Proposal # 4153

RB100-19

RB101-19

IRC®: R310.4.2.2 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Add new text as follows:

R310.4.2.2 Steps. Steps shall have an inside width of at least 12 inches (305 mm), a minimum tread depth of 5 inches (127 mm) and a maximum riser height of 18 inches (457 mm) for the full height of the area well.

Reason:

The overall plan is to have area wells address in a comprehensive manner. Following the graphics for this proposal is how this option of steps will fit in with this group of changes. Area wells less than less than a 44" depth will NOT have to comply with the step provisions. Area wells with a depth of 44" or greater will continue to have the option of a ladder. If a designer chooses to use steps, it is important safety feature to make sure that the occupants would be able to use those steps to evacuate from the window well.

The current provisions says ladders and steps don't have to comply with the standard stairway provisions, however, while specific provisions are provided for ladders, no limits are provided for steps. The option here it the same width and distance between steps are permitted for ladders. The tread depth is the minimum width from alternating tread devices and ships ladders.

Following are examples of stepped configurations that are used today.

The Figure 1 and 2 are examples of stepped area wells that would comply with the proposed language.



Figure 1



Figure 2

Figure 3 and 4 are examples of stepped area wells that would **NOT** comply with the proposed language. The large changes in elevation would be difficult for a child or elderly person to negotiate on their own.



Figure 3



Figure 4

The following is the proposed language for areas wells associated with emergency escape and rescue openings.

R310.5 Area wells. An emergency escape and rescue opening with the bottom of the clear opening below the adjacent grade shall be provided with an area well in accordance with Sections R310.5.1 through R310.5.4.

R310.5.1 Minimum size. The horizontal area of the area well shall be not less than 9 square feet (0.9 m), with a horizontal projection and width of not less than 36 inches (914 mm). The area well shall allow the emergency escape and rescue opening to be fully opened.

Exception: The ladder or steps required by Section R310.5.2.1 shall be permitted to encroach not more than 6 inches (152 mm) into the required dimensions of the area well.

R310.5.2 Ladder and steps. Area wells with a vertical depth greater than 44 inches (1118 mm) shall be equipped with a an approved permanently affixed ladder or steps. The ladder or steps shall not be obstructed by the emergency escape and rescue opening when the window or door is in the open position. Ladders or steps required by this section shall not be required to comply with Section R311.7.

R310.5.2.1 Ladders. Ladders or rungs shall have an inside width of at least 12 inches (305 mm), shall project at least 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center (o.c.) vertically for the full height of the area well.

R310.5.2.2 Steps. Steps shall have an inside width of at least 12 inches (305 mm), shall have minimum treads depth of 5 inches (127 mm) and a maximum riser height of 18 inches (457 mm) for the full height of the area well.

R310.5.3 Drainage. Area wells shall be designed for proper drainage by connecting to the building's foundation drainage system required by Section R405.1.

Exception: A drainage system for area wells is not required where the foundation is on well-drained soil or sand gravel mixture soils in accordance with the United Soil Classification System, Group I Soils, as detailed in Table R405.1.

R310.5.4 Bars, grilles, covers and screens. Where bars, grilles, covers, screens or similar devices are placed over emergency escape and rescue openings, bulkhead enclosures, or area wells that serve such openings, the minimum net clear opening size shall comply with Sections R310.2 through R310.2.2 and R310.4.1. Such devices shall be releasable or removable from the inside without the use of a key or tool or force greater than that required for the normal operation of the escape and rescue opening.

This is one of a series of proposal to coordinate the requirements for emergency escape and rescue openings in the IBC and IRC. While independent issues, if all the proposals are approved, the IRC section would appear as indicated in the reason for the proposal to revise the definition – emergency escape and rescue openings. The IBC portion was E112-18(AS).

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is a design option for window wells that want to use steps instead of ladders.

Proposal # 4156

RB101-19

RB102-19

IRC@: R310.6

Proponent: Jeffrey Hinderliter, New York State Department of State, representing New York State Department of State (Jeffrey.Hinderliter@dos.ny.gov); Gerard Hathaway, New York State Department of State, representing New York State Department of State (gerard.hathaway@dos.ny.gov)

2018 International Residential Code

Revise as follows:

R310.6 Alterations or repairs of existing basements. An emergency escape and rescue opening is not required where existing *basements* undergo alterations or repairs.

Exception: New ~~sleeping rooms~~ habitable spaces created in an existing *basement* shall be provided with emergency escape and rescue openings in accordance with Section R310.1.

Reason: This exception emphasizes the importance of providing an emergency escape and rescue opening (EERO) when sleeping rooms are added to existing basements. However, when a basement is altered to create habitable space, such as a living room or recreational room, many of the same risks will be encountered in an emergency. In addition, when a basement is reconfigured to create multiple rooms, those rooms may not remain for non-sleeping purposes. For example, if a basement office is later converted to a bedroom, owners will rarely seek a permit.

The intention of this code change is to increase the safety of basements when they are converted to habitable space and not just sleeping rooms. This code change would cause an owner to install an EERO when the alteration of a basement causes a basement to become habitable, which would include spaces used for living, sleeping, eating or cooking.

Cost Impact: The code change proposal will increase the cost of construction

This code change could increase the cost of construction due to EEROs being installed in habitable spaces rather than just sleeping rooms. If a basement was undergoing an alteration to create a habitable space other than a sleeping room, an EERO would now be required.

Proposal # 5298

RB102-19

RB103-19

IRC@: SECTION R311, R311.1

Proponent: Jon Sutherland, representing Self (Jon.Sutherland@minneapolismn.gov)

2018 International Residential Code

SECTION R311 MEANS OF EGRESS

Revise as follows:

R311.1 Means of egress. *Dwellings* shall be provided with a means of egress in accordance with this section. The means of egress shall provide a continuous and unobstructed path of vertical and horizontal egress travel from all portions of the *dwelling* to the ~~required egress door~~ public way without requiring travel through a garage. The required egress door shall open directly into a public way or to a *yard* or court that opens to a public way.

Reason: It is important to provide code compliance to the public way. This change provides consistency with the IBC and previous code editions which required compliance to the public way for residential uses.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Any fixture required to be constructed to the public way for example a stairway down a hill would already be needed.

Proposal # 5686

RB103-19

RB104-19

IRC@: R311.3.2

Proponent: Michael Eutsey, King & Queen County, representing VBCOA (meutsey@kingandqueenco.net); Jason Laws, representing VBCOA (lawsj@chesterfield.gov)

2018 International Residential Code

Revise as follows:

R311.3.2 Floor elevations at other exterior doors. Doors, other than the required egress door, including doors required in Section R302.5.1, shall be provided with landings or floors not more than $7\frac{3}{4}$ inches (196 mm) below the top of the threshold.

Exception: A top landing is not required where a stairway of not more than two risers is located on the exterior side of the door, provided that the door does not swing over the stairway.

Reason: Doors that are required to be installed per Section R302.5.1 often times have a threshold. Some builders feel that they are not required to measure their floor or landing to the top of the threshold because Section R311.3.2 is used for "other exterior doors". Since the doors are part of the building thermal envelope they would be considered exterior doors. This change would eliminate the confusion of this door meeting the requirements of Section R311.3.2.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code requires a floor, landing, or stairs on each side of a door. This change addresses a location where doors that are used have a threshold the majority of the time. This section addresses how the rise of a floor, landing or stair is to be measured when the door has a threshold. By adding this in the code it would cut down on the cost of rebuilding any landings or stairs that were constructed and the top of the threshold was not figured into the rise of the landing or stair.

Proposal # 4686

RB104-19

RB105-19

IRC@: [RB] 202, R311.4

Proponent: Shaunna Mozingo, City of Westminster, representing Self (smozingo@cityofwestminster.us)

2018 International Residential Code

Revise as follows:

[RB] STAIRWAY. One or more flights of stairs, either interior or exterior, with the necessary landings and connecting platforms to form a continuous and uninterrupted passage from one level to another ~~within or attached to a building, porch or deck.~~

R311.4 Vertical egress. Egress from habitable levels including habitable attics and *basements*, and from one level to another within or attached to a building, porch or deck, that are not provided with an egress door in accordance with Section R311.2 shall be by a ramp in accordance with Section R311.8 or a stairway in accordance with Section R311.7.

Reason: Does a stair from a deck have to comply with any code requirements? that depends on who you talk to.

R311 talks about residential means of egress and requires one means of egress from a dwelling unit. With stairway provisions included under MOE in 311, does that mean that only stairs for the required egress have to comply and all others do not? 1/3 of those questioned believe this.

The definition of a stairway was changed to include some scoping to show that it includes levels attached to or within the building or porch or deck. Since the definition includes that wording, 1/3 of the people polled believe that all stairs that attach to the building or are within the building must comply.

R311.4 Vertical egress specifically mentions vertical egress being required from habitable spaces and doesn't mention decks and porches so the last third believe that the requirement is only for stairs of habitable spaces that must comply.

This proposal takes the scoping language out of the IRC definition so that the definition now matches the IBC definition and we added the scoping into the vertical egress section so that the intent of the definition is actually realized in code language.

We would also ask that the word "stairway" be italicized throughout R311 to clear up some of this. We were initially going to just suggest this as the fix but many agreed that the scoping wording in the IRC definition needed to come out and be placed in the body of the code.

Cost Impact: The code change proposal will increase the cost of construction

Some people will say it increases cost because stairs that were not from habitable space never had to comply. some will say that it will not increase cost because all stairs within or attached to the building had to always comply.

Proposal # 5583

RB105-19

RB106-19

IRC@: R311.5, R311.5.1 (New), R311.5.2 (New), R311.5.3 (New), TABLE R311.5.3 (New), R311.5.4 (New), TABLE R311.5.4 (New)

Proponent: John Davis, Miami County, Kansas, representing Self (mdavis@miamicountyks.org)

2018 International Residential Code

Revise as follows:

R311.5 Landing, deck, balcony and stair construction and attachment. construction. Exterior landings, Landing, decks, deck, balconies, stairs and similar facilities shall be positively anchored to the primary structure to resist both vertical and lateral forces or shall be designed to be self-supporting. Attachment shall not be accomplished by use of toenails or nails subject to withdrawal. balcony and stair construction shall be in accordance with Sections R311.5.1, R311.5.2 and R311.5.3.

Add new text as follows:

R311.5.1 Attachment. Landings, decks, balconies, stairs and similar facilities shall be positively anchored to the primary structure to resist both vertical and lateral forces or shall be designed to be self-supporting. Attachment shall not be accomplished by use of toenails or nails subject to withdrawal.

R311.5.2 Stair stringer support. Stair stringers shall be provided with bearing at the upper level for the full cut depth of the stringer against a header or the floor framing and shall be supported with a minimum 2X8 ledger nailed to each stud with 3-8d nails or an approved hanger installed in accordance with the manufacturer's installation instructions.
Stair stringers shall be provided with support of the full cut depth of the stringer on the lower floor platform or other solid surface at the lower level of the stringer. The toe of the stringer shall be notched and a minimum 2X4 toe board shall be installed at the toe of the stringer in accordance with Figure R311.5.2. The stringer toe board shall be attached to the floor framing or solid blocking with a minimum of eight 16d nails or to a concrete surface with three 1/2 inch X 3 inch long anchor bolts.

R311.5.3 Stair stringer cutting and notching. A stringer that is cut or notched to form the stair treads and risers shall have a remaining uncut or notched throat depth not less than shown in Table R311.5.3.

**TABLE R311.5.3
MINIMUM STAIR STRINGER THROAT DEPTH**

Stringer Dimensions	Minimum Throat Depth
2 X 10	3 3/8 inches
2 x 12	5 3/4 inches

R311.5.4 Stringer span. Maximum span and rise for stair stringers shall be in accordance with Table R311.5.4.

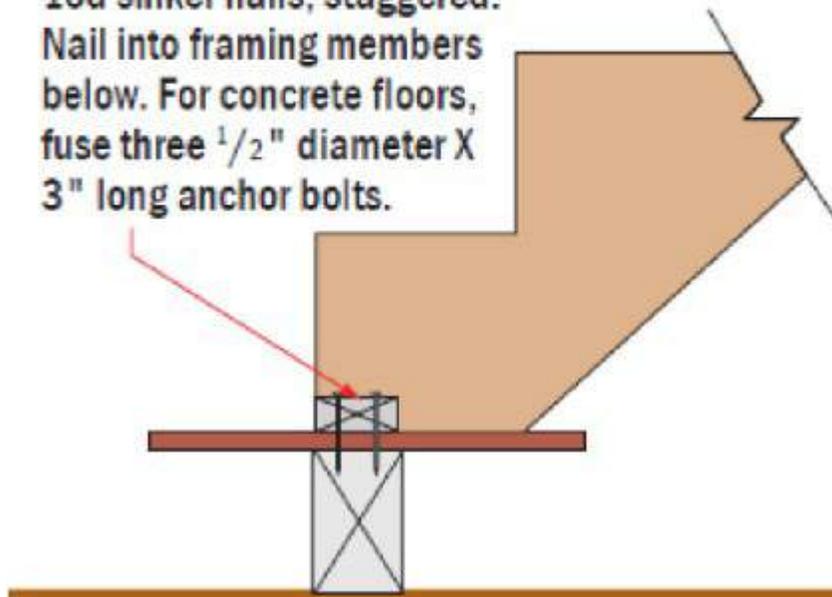
TABLE R311.5.4 ALLOWABLE STAIR STRINGER SPAN

Stringer Depth	Stairway Width									
	36 Inches		42 Inches		44 Inches		46 Inches			
2 Stringers		3 Stringers		3 Stringers		3 Stringers		3 Stringers		
Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	

Stringer Depth	Rise	Run	Rise	Run	Rise	Run	Rise	Run	Rise	
(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	
2X10	3-9	4-0	4-3	4-6	4-1	4-4	4-0	4-3	3-11	4-2
2X12	6-5	6-4	7-3	7-1	6-11	6-10	6-10	6-9	6-8	6-7

Reason: The International Residential Code has lack any minimum specifications for stairway construction. The proposed new code subsections removes the application of R311.5 from exterior locations only and adds some very basic construction guidelines to establish minimum requirements for attachment, support, cutting and notching and maximum spans of stairway stringers.

Let-in 2x nailer. Use eight 16d sinker nails, staggered. Nail into framing members below. For concrete floors, fuse three 1/2" diameter X 3" long anchor bolts.



Cost Impact: The code change proposal will not increase or decrease the cost of construction. There should be little impact to the cost of construction as the proposed subsections only codify what are basic construction methodology.

Proposal # 5553

RB106-19

RB107-19

IRC@: [RB] 202, R311.7, R311.8

Proponent: Shaunna Mozingo, City of Westminster, representing Self (smozingo@cityofwestminster.us)

2018 International Residential Code

Revise as follows:

[RB] STAIRWAY. One or more flights of stairs, either interior or exterior, with the necessary landings and connecting platforms to form a continuous and uninterrupted passage from one level to another ~~within or attached to a building, porch or deck.~~

R311.7 Stairways. Where provided or required by this code, stairways shall comply with this section.

Exception: stairways not within or attached to a building, porch or deck

R311.8 Ramps. Where provided or required by this code, ramps shall comply with this section.

Exception: Ramps not within or attached to a building, porch or deck

Reason: Does a stair from a deck have to comply with any code requirements? That depends on who you talk to.

R311 talks about residential means of egress and requires one means of egress from a dwelling unit. With stairway provisions included under MOE in 311, does that mean that only stairs for the required egress have to comply and all others do not? 1/3 of those questioned believe this.

The definition of a stairway was changed to include some scoping to show that it includes levels attached to or within the building or porch or deck. Since the definition includes that wording, 1/3 of the people polled believe that all stairs that attach to the building or are within the building must comply.

R311.4 Vertical egress specifically mentions vertical egress being required from habitable spaces and doesn't mention decks and porches so the last third believe that the requirement is only for stairs of habitable spaces that must comply.

This proposal takes the scoping language out of the IRC definition so that the definition now matches the IBC definition and has added the scoping into the stairway and ramp sections so that the intent of the definition is actually realized in code language.

In CDP Access, R311.7 and 8 are put in as sections instead of subsections so it wouldn't let us edit as you can a subsection so we hope you get the idea that the intent is to read as follows:

R311.7 Stairways. When provided or required by this code, stairways shall comply with this section.

Exception: stairways not within or attached to a building, porch or deck

All remaining subsections of 311.7 unchanged. the same would work for ramps under r311.8.

We would also ask that the word "stairway" be italicized throughout R311 to clear up some of this. we were initially going to just suggest this as the fix but many agreed that the scoping wording in the IRC definition needed to come out and be placed in the body of the code.

Cost Impact: The code change proposal will increase the cost of construction
Some people will say it increases cost because stairs that were not from habitable space never had to comply. some will say that it will not increase cost because all stairs within or attached to the building had to always comply.

Proposal # 5597

RB107-19

RB108-19

IRC®: R311.7.1

Proponent: David Cooper, Stair Manufacturing and Design Consultants, representing Stairbuilders and Manufacturers Association (coderep@stairways.org)

2018 International Residential Code

Revise as follows:

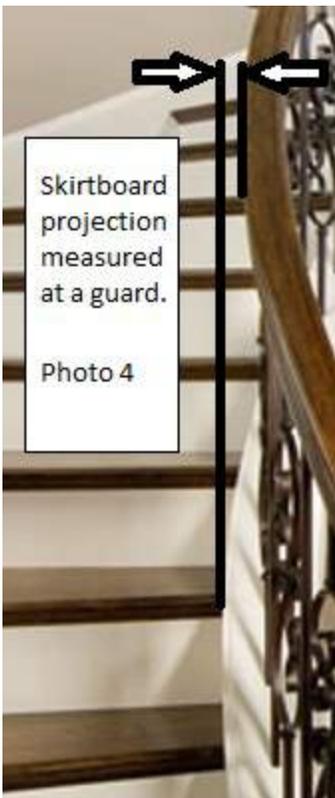
R311.7.1 Width. Stairways shall be not less than 36 inches (914 mm) in clear width at all points above the permitted handrail height and below the required headroom height. The clear width of stairways at and below the handrail height, including treads and landings, shall be not less than 31¹/₂ inches (787 mm) where a handrail is installed on one side and 27 inches (698 mm) where handrails are installed on both sides. Baseboards and skirtboards shall not project into the clear width of the stairway, as measured above the handrails, more than 4¹/₂ inches (114 mm) on either side of the stairway. At the sides of stairs with guards that are open above the handrail height the projection shall be measured horizontally from the inside edge of the top of the guard.

Exception: The width of spiral stairways shall be in accordance with Section R311.7.10.1.

Reason: The allowed projection of trim into the width of a stairway is not clearly addressed in the code. Although discussed in the commentary, certain accepted practices that are prevalent in residential stairways are not clarified and often inconsistently interpreted. Further issues arise from the fact that the *maximum* projection of trim components is not defined in the code.

1. This code change specifically addresses only baseboard at landings and skirtboards at the side of flights.
2. The proposal defines a maximum projection of 4.5 inches that matches that allowed for handrails in **R311.7.8.2 Handrail projection**
3. This code change does not change any of the current minimum stairway widths.
4. The projection of baseboard and skirtboards is measured related to the stairway width as determined at the location "above the handrails". This prevents reduction of the minimum widths currently stated "at and below the handrails" by the baseboards and skirtboards.
5. Where the open side of a stairway has a guard and there is no surface to establish a width above the handrails, the projection of the baseboard and skirtboard are measured from the inside edge of the top of the guard. This is important to allow consistent enforcement of what is the most common, cost-effective style of guards used in one and two family homes. Please see Photos 1 - 3 illustrating this style of guard and the necessary projection of the skirtboard. Note how the balusters terminate in the top of the wall and the skirtboard projects into the stairway. This type of guard system is highly utilized because it is easily adapted to low cost carpeted stairways.
6. Please see photo 4 illustrating the measurement of the projection at a guard.





Cost Impact: The code change proposal will not increase or decrease the cost of construction. Although more pervasive use of carpeted stairs with "curb" or "wall cap" guard systems would reduce costs over

finished hardwood stairs and guards it is not possible to estimate.

Proposal # 5216

RB108-19

RB109-19

IRC@: R311.4

Proponent: Mike Fischer, Kellen Company, representing Self (mfischer@kellencompany.com)

2018 International Residential Code

R311.4 Vertical egress. Egress from habitable levels including habitable attics and *basements* that are not provided with an egress door in accordance with Section R311.2 shall be by a ramp in accordance with Section R311.8 or a stairway in accordance with Section R311.7. Stairways serving attics that do not contain habitable space are not required to meet the requirements of Section R311.7.

Reason: The IRC Contains some Means of Egress requirements, but does not address some constructions that fall outside of exit and egress. The code requires stairways to comply with a series of requirements for landings, stair tread and rise, handrailes, headroom etc. Attics that are not habitable spaces and are thus unoccupiable should be exempt from stairway requirements.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The proposal is consistent with current practice.

Proposal # 5684

RB109-19

RB110-19

IRC@: R311.7.3

Proponent: Jenifer Gilliland, representing Department of Construction and Inspections
(jenifer.gilliland@seattle.gov)

2018 International Residential Code

Revise as follows:

R311.7.3 Vertical rise. A flight of stairs shall not have a vertical rise ~~larger~~ greater than 151-12 feet 7 inches (3835 mm) between floor levels or landings.

Reason: The notation in the code change uses feet and inches to describe the vertical rise of a flight of stairs rather than just inches. This change aligns the format of this section of code with other portions of the code (see section 305 requirements) and is easier for readers to apply.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is just a change in the formatting of feet and inches in this section of the code.

Proposal # 4419

RB110-19

RB111-19

IRC®: R311.7.5.1

Proponent: David Cooper, representing Stairbuilders and Manufacturers Association (coderep@stairways.org)

2018 International Residential Code

Revise as follows:

R311.7.5.1 Risers. The riser height shall be not more than $7\frac{3}{4}$ inches (196 mm). The riser height shall be measured vertically between leading edges of the adjacent treads. The greatest riser height within any flight of stairs shall not exceed the smallest by more than $\frac{3}{8}$ inch (9.5 mm). Risers shall be vertical or sloped from the underside of the nosing of the tread ~~above at an angle not more than 30 degrees (0.51 rad) from the vertical.~~ above. At open risers, openings located more than 30 inches (762 mm), as measured vertically, to the floor or grade below shall not permit the passage of a 4-inch-diameter (102 mm) sphere.

Exceptions:

1. The opening between adjacent treads is not limited on spiral stairways.
2. The riser height of spiral stairways shall be in accordance with Section R311.7.10.1.

Reason: -

Riser or Riser Height:

It is necessary to insert the word height in the second sentence to more clearly state what is being measured. In most cases the riser or more accurately the face of the riser terminates under the tread above and is not the subject of the measurement described. The dimension of the "riser" would be less than the "riser height". There are also instances where there is "no riser" but there is still a riser height, referred to in this section as "open risers". This change would add help to explain that *riser* a defined term in the IRC is different than "riser height" and aid in the correct application of the code.

Deletion of the Maximum Angle Reference:

The entire phrase - "at an angle not more than 30 degrees (0.51 rad) from the vertical" has been deleted. It is simply unnecessary and only creates confusion.

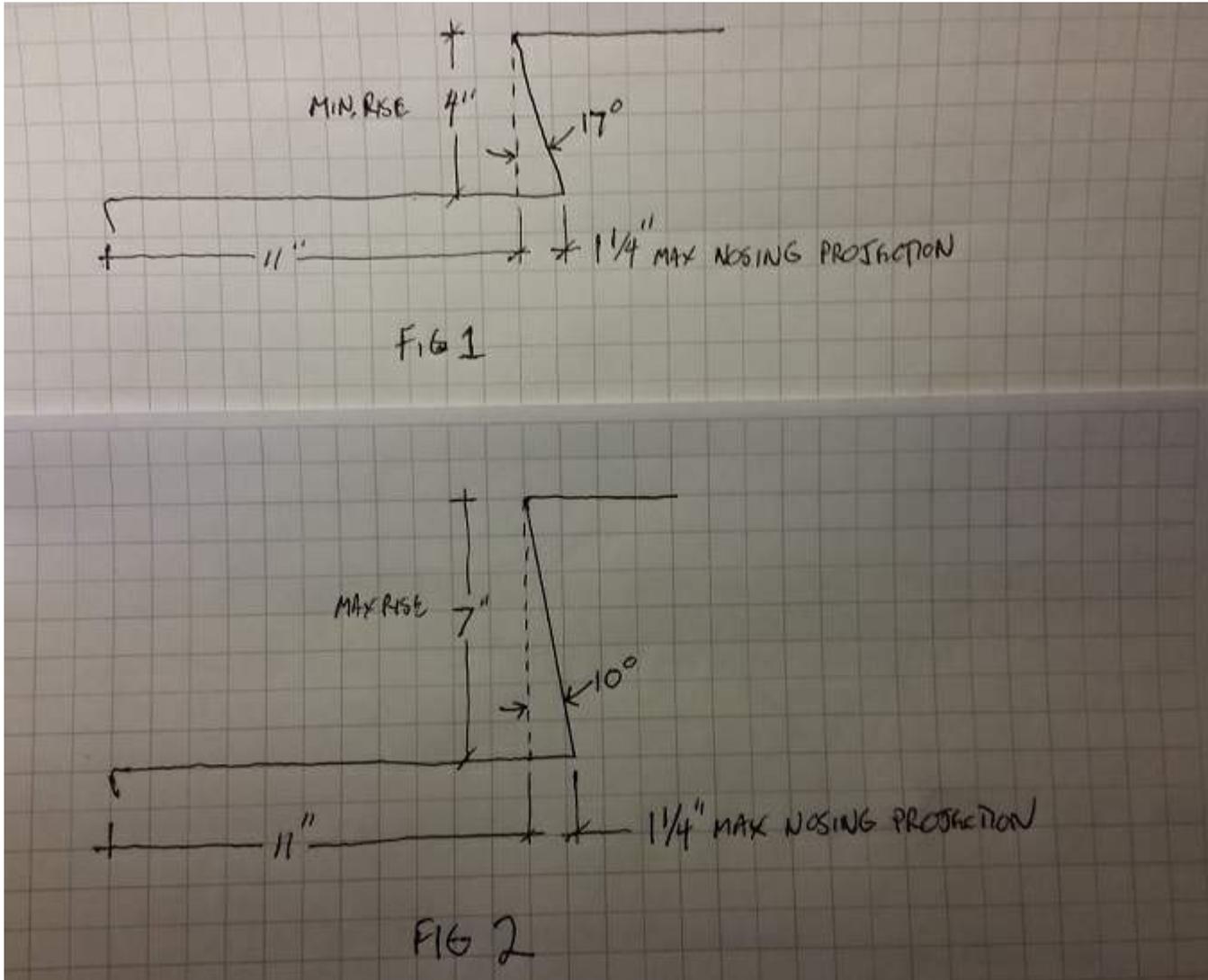
It is unnecessary to have a maximum angle limit because the maximum nosing projection of 1.25 inches as stated in R311.7.5.3 limits the maximum angle of the riser. See figures 1 and 2 illustrating the angle of the riser slope of typical "slant riser" stairs with the maximum nosing projection.

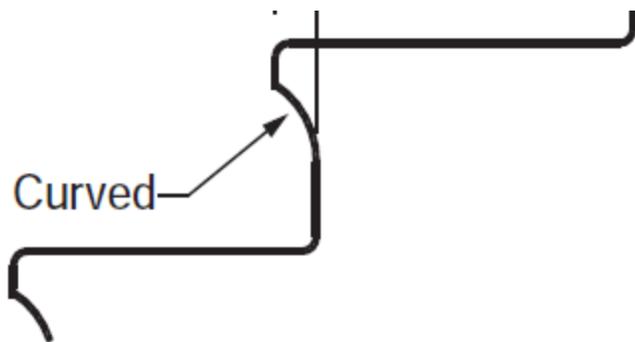
1. Figure 1 illustrates that the maximum angle of 17 degrees can be obtained in one plane with a 4 inch riser height
2. Figure 2 illustrates that the maximum angle of 10 degrees can be obtained in one plane with a 7 inch riser height

From these two illustrations it is easy to see both the taller riser heights and shorter nosing projections allowed will produce even lower angles. The illustrations prove that the angle of the riser is controlled by the projection of the tread nosing. I have not illustrated shorter riser heights but the angle would not exceed 30 degrees until you approached the implausible riser height of 2 inches.

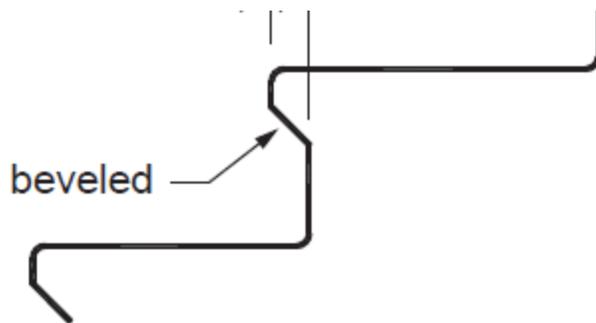
A similar change was introduced to the IBC in this cycle. There was great confusion over what is a riser and what is a tread nosing. There was concern that eliminating the maximum angle reference would restrict the use of curves or multiple slopes as shown in the **A117.1-2017 NOSING Figures, Fig. 504.5B and Fig. 504.5C**. That is not the case in the IRC. In the IRC, riser is defined as, **Riser**. 1. The vertical component of a step or stair., and tread and landing nosings are regulated in **R311.7.5.3 Nosings**.

Neither the A117.1 nosing profiles shown here nor those commonly used nosing details as regulated by **R311.7.5.3 Nosings** will be affected by this change. Only a clarity of the regulation, and a better understanding of the design options currently allowed in the code will result.





**FIGURE 504.5(B)
STAIR NOSINGS - VERTICAL RISER
CURVED NOSING**



**FIGURE 504.5(C)
STAIR NOSINGS - VERTICAL RISER
BEVELED NOSING**

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This change does not effect the methods or materials and only offers clarification of the code.

Proposal # 5261

RB111-19

RB112-19

IRC@: R311.7.5.1, R311.7.5.2, R311.7.5.2.1

Proponent: Jake Pauls, representing self (bldguse@aol.com)

2018 International Residential Code

Revise as follows:

R311.7.5.1 Risers. The riser height shall be not more than $7\frac{3}{4}$ inches (~~196~~180 mm). The riser shall be measured vertically between leading edges of the adjacent treads. The greatest riser height within any flight of stairs shall not exceed the smallest by more than $\frac{3}{8}$ inch (9.5 mm). Risers shall be vertical or sloped from the underside of the nosing of the tread above at an angle not more than 30 degrees (0.51 rad) from the vertical. At open risers, openings located more than 30 inches (762 mm), as measured vertically, to the floor or grade below shall not permit the passage of a 4-inch-diameter (102 mm) sphere.

Exceptions:

1. The opening between adjacent treads is not limited on spiral stairways.
2. The riser height of spiral stairways shall be in accordance with Section R311.7.10.1.

R311.7.5.2 Treads. The tread depth shall be not less than ~~10 inches~~11 inches (~~254~~280 mm). The tread depth shall be measured horizontally between the vertical planes of the foremost projection of adjacent treads and at a right angle to the tread's leading edge. The greatest tread depth within any flight of stairs shall not exceed the smallest by more than $\frac{3}{8}$ inch (9.5 mm).

R311.7.5.2.1 Winder treads. Winder treads shall have a tread depth of not less than ~~10~~11 inches (~~254~~280 mm) measured between the vertical planes of the foremost projection of adjacent treads at the intersections with the walkline. Winder treads shall have a tread depth of not less than 6 inches (152 mm) at any point within the clear width of the stair. Within any flight of stairs, the largest winder tread depth at the walkline shall not exceed the smallest winder tread by more than $\frac{3}{8}$ inch (9.5 mm). Consistently shaped winders at the walkline shall be allowed within the same flight of stairs as rectangular treads and shall not be required to be within $\frac{3}{8}$ inch (9.5 mm) of the rectangular tread depth.

Exception: The tread depth at spiral stairways shall be in accordance with Section R311.7.10.1.

Reason: This proposal shares the Reason Statement for Proposal 5467, which includes the changes proposed on the step rise and tread depth — changing 7.75 inches for the maximum rise to 7 inches and changing the minimum tread depth from 10 inches to 11 inches in Sections R311.7.5.1, R311.7.5.2 and R311.7.5.2.1. Proposal 5467 accomplishes the same change indirectly by deleting almost all the requirements of R311.7 and requiring that stairs comply with NFPA 101-2018 which has the "7-11" requirement applying to dwelling unit stairs (with an exception for certain spiral stairs for which more options are provided in NFPA 101 than in the IRC). Those interested in this proposal should refer to the Reason Statement for Proposal 5467 dealing with all of R311.7. The bottom line is that if the "7-11" rule is applied (as it has for two decades for all other stairs in the IBC) and the dangers of injuries on stairways are mostly in homes, that is where the "7-11" should also be required. The Reason Statement provides very extensive technical and other information that directly confirms the much better performance of the "7-11" geometry relative to the several times more dangerous step dimensions — including the 7.75 - 10 geometry — that have been used in homes where about 90 percent of the stair-related falls occur in the US at a huge cost to everybody — currently on the order of \$100 billion dollars annually in societal injury costs in the USA.

Bibliography: A few publication are cited in the Reason Statement for my Proposal # 5467 and nothing beyond

those is needed for this more-limited proposal.

Cost Impact: The code change proposal will increase the cost of construction. While cost of construction will increase, that increase (as shown also in the first proposal on this same topic in a 2003 proposal on stairways in the IRC) pales in comparison to the benefits of the "7-11" step geometry for dwelling unit stairs.

From the Reason Statement (which is the Reason Statement for Proposal 5467) covering all of R311, not just rise and tread depth changes, comes the following updated detail on cost impact in relation to step dimensions.

"If we assume, as an approximation, there were about 120 million US households in 2012 (the midpoint in the periods discussed above) and further assume an average of one flight of stairs for each household (with some homes having several flights of stairs and many having none), the average cost of home stairway-related injuries is roughly \$700 per stair flight (or household) per year. This average injury cost greatly exceeds the annual cost (e.g., over a 50-year service life) of a stair flight in a home. As currently allowed by the IRC and built into new homes, stairways with such high annual injury costs are an extremely poor investment in terms of costs to society, families and individuals."

Proposal # 5412

RB112-19

RB113-19

IRC@: R311.7.7

Proponent: Dan Buuck, National Association of Home Builders, representing National Association of Home Builders (dbuuck@nahb.org)

2018 International Residential Code

Revise as follows:

R311.7.7 Stairway walking surface. The walking surface of treads and landings of stairways shall be sloped not steeper than one unit vertical in 48 ~~inches~~ units horizontal (2-percent slope).

Exception: Where the surface of a landing is required elsewhere in the code to drain surface water, the walking surface of the landing shall be sloped not steeper than 1 unit vertical in 20 units horizontal (5-percent slope) in the direction of travel.

Reason: Landings have been required in more places since the 2009 IRC defined a single riser as a “stair.” This causes difficulties where the MAXIMUM landing slope requirements of R311.7.7 conflict with the MINIMUM drainage slope requirements in the exception of R401.3 (reprinted below).

The picture below shows an example of such a landing. If one or more risers lead from the raised walkway to the paved driveway the landing provision would require a MAX slope of 2 percent in either direction. But the drainage provision in R401.3 would require a MIN slope of 2 percent away from the building. These dueling requirements create a condition that is not exactly a conflict, but it is just as impossible to satisfy them both. The 5-percent slope in the exception was chosen to correlate with the maximum running slope allowed for an accessible route.

Additionally, the word “inches” was changed to “units” for consistency. (See definition of *ramp*, Section R311.3, R311.8, etc.)



R401.3 Drainage. Surface drainage shall be diverted to a storm sewer conveyance or other *approved* point of collection that does not create a hazard. *Lots* shall be graded to drain surface water away from foundation walls. The *grade* shall fall not fewer than 6 inches (152 mm) within the first 10 feet (3048 mm).

Exception: Where *lot lines*, walls, slopes or other physical barriers prohibit 6 inches (152 mm) of fall within 10 feet (3048 mm), drains or swales shall be constructed to ensure drainage away from the structure. Impervious surfaces within 10 feet (3048 mm) of the building foundation shall be sloped not less than 2 percent away from the building.

R309.1 Floor surface. Garage floor surfaces shall be of *approved* noncombustible material. The area of floor used for parking of automobiles or other vehicles shall be sloped to facilitate the movement of liquids to a drain or toward the main vehicle entry doorway.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposed change removes the impossible-to-meet requirements for drainage and slope when they both apply to a landing. If anything it would decrease the cost of construction due to failed inspections.

Proposal # 4392

RB113-19

RB114-19

IRC@: R311.7.8.4 (New)

Proponent: Lucas Pump, City of Cedar Rapids, representing Self (l.pump@cedar-rapids.org)

2018 International Residential Code

Revise as follows:

R311.7.8.4 Continuity. Handrails shall be continuous for the full length of the flight, from a point directly above the top riser of the flight to a point directly above the lowest riser of the flight. Handrail ends shall be returned or shall terminate in newel posts or safety terminals.

Exceptions:

1. Handrail continuity shall be permitted to be interrupted by a newel post at a turn in a flight with winders, at a landing, or over the lowest tread.
2. A volute, turnout or starting easing shall be allowed to terminate over the lowest tread.
3. Offsets or interruptions of six inches or less in total length shall be considered to be continuous.

Reason: This proposal would allow a handrail to terminate at a newel post or a wall section, then start back up. Also, this would allow for more aesthetically pleasing handrail designs, in a residential stairway were wall sections are off-set and would allow for a newel post within the handrail.





Cost Impact: The code change proposal will decrease the cost of construction
This proposal would decrease the cost of construction because the contractor could eliminate the need for some of the handrail offset fittings and elbows.

Proposal # 3881

RB114-19

RB115-19

IRC@: R311.7.8.4

Proponent: Stephen Thomas, Colorado Code Consulting, LLC, representing Himself
(stthomas@coloradocode.net)

2018 International Residential Code

Revise as follows:

R311.7.8.4 Continuity. Handrails shall be continuous for the full length of the flight, from a point directly above the top riser of the flight to a point directly above the lowest riser of the flight. Handrail ends shall be returned or shall terminate in newel posts ~~or safety terminals.~~

Exceptions:

1. Handrail continuity shall be permitted to be interrupted by a newel post at a turn in a flight with winders, at a landing, or over the lowest tread.
2. A volute, turnout or starting easing shall be allowed to terminate over the lowest tread.

Reason: Ther term saftety terminal is for commercial handrails that need to comply with the projecting elements requirements for the means of egress and accessibility. It is also not a defined term in the IRC. Many people don't know what a safety terminal is. Therefore, the language is not needed in the IRC and should be deleted.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal will have not an impact on the construction. It is deleting language that is not needed in the IRC.

Proposal # 5497

RB115-19

RB116-19

IRC@: R311.7, R311.7.1, R311.7.2, R311.7.3, R311.7.4, R311.7.5, R311.7.5.1, R311.7.5.2, R311.7.5.2.1, R311.7.5.3, R311.7.5.4, R311.7.6, R311.7.7, R311.7.8, R311.7.8.1, R311.7.8.2, R311.7.8.3, R311.7.8.4, R311.7.8.5, R311.7.8.6, R311.7.9, R311.7.10, R311.7.10.1, R311.7.10.2, R311.7.11, R311.7.11.1, R311.7.11.2, R311.7.12, R311.7.12.1, R311.7.12.2

Proponent: Jake Pauls, Jake Pauls Consulting Services, representing self (bldguse@aol.com)

2018 International Residential Code

R311.7 Stairways.

Revise as follows:

R311.7.1 Width. ~~Stairways.~~ Stairways shall be not less than 36 inches (914 mm) in clear width at all points above the permitted handrail height and below the required headroom height. ~~The clear width of stairways at and below the handrail height, including treads and landings, shall be not less than 31⁺₂ inches (787 mm) where a handrail is installed on one side and 27 inches (698 mm) where handrails are installed on both sides.~~
Exception: ~~The width of spiral stairways shall be in accordance with Section R311.7.10.1. comply with NFPA 101-2018 Section 24.2.5.~~

Delete without substitution:

R311.7.2 Headroom. ~~The headroom in stairways shall be not less than 6 feet 8 inches (2032 mm) measured vertically from the sloped line adjoining the tread nosing or from the floor surface of the landing or platform on that portion of the stairway.~~

Exceptions:

1. ~~Where the nosings of treads at the side of a flight extend under the edge of a floor opening through which the stair passes, the floor opening shall not project horizontally into the required headroom more than 4³/₄ inches (121 mm).~~
2. ~~The headroom for spiral stairways shall be in accordance with Section R311.7.10.1.~~

R311.7.3 Vertical rise. ~~A flight of stairs shall not have a vertical rise larger than 151 inches (3835 mm) between floor levels or landings.~~

R311.7.4 Walkline. ~~The walkline across winder treads and landings shall be concentric to the turn and parallel to the direction of travel entering and exiting the turn. The walkline shall be located 12 inches (305 mm) from the inside of the turn. The 12-inch (305 mm) dimension shall be measured from the widest point of the clear stair width at the walking surface. Where winders are adjacent within a flight, the point of the widest clear stair width of the adjacent winders shall be used.~~

R311.7.5 Stair treads and risers. ~~Stair treads and risers shall meet the requirements of this section. For the purposes of this section, dimensions and dimensioned surfaces shall be exclusive of carpets, rugs or runners.~~

R311.7.5.1 Risers. ~~The riser height shall be not more than 7³/₄ inches (196 mm). The riser shall be measured vertically between leading edges of the adjacent treads. The greatest riser height within any flight of stairs shall not exceed the smallest by more than ³/₈ inch (9.5 mm). Risers shall be vertical or sloped from the underside of the nosing of the tread above at an angle not more than 30 degrees (0.51 rad) from the vertical. At open risers,~~

openings located more than 30 inches (762 mm), as measured vertically, to the floor or grade below shall not permit the passage of a 4-inch-diameter (102 mm) sphere.

Exceptions:

1. The opening between adjacent treads is not limited on spiral stairways.
2. The riser height of spiral stairways shall be in accordance with Section R311.7.10.1.

R311.7.5.2 Treads. The tread depth shall be not less than 10 inches (254 mm). The tread depth shall be measured horizontally between the vertical planes of the foremost projection of adjacent treads and at a right angle to the tread's leading edge. The greatest tread depth within any flight of stairs shall not exceed the smallest by more than $\frac{3}{8}$ inch (9.5 mm).

R311.7.5.2.1 Winder treads. Winder treads shall have a tread depth of not less than 10 inches (254 mm) measured between the vertical planes of the foremost projection of adjacent treads at the intersections with the walkline. Winder treads shall have a tread depth of not less than 6 inches (152 mm) at any point within the clear width of the stair. Within any flight of stairs, the largest winder tread depth at the walkline shall not exceed the smallest winder tread by more than $\frac{3}{8}$ inch (9.5 mm). Consistently shaped winders at the walkline shall be allowed within the same flight of stairs as rectangular treads and shall not be required to be within $\frac{3}{8}$ inch (9.5 mm) of the rectangular tread depth.

Exception: The tread depth at spiral stairways shall be in accordance with Section R311.7.10.1.

R311.7.5.3 Nosings. Nosings at treads, landings and floors of stairways shall have a radius of curvature at the nosing not greater than $\frac{9}{16}$ inch (14 mm) or a bevel not greater than $\frac{1}{2}$ inch (12.7 mm). A nosing projection not less than $\frac{5}{4}$ inch (19 mm) and not more than $1\frac{1}{4}$ inches (32 mm) shall be provided on stairways. The greatest nosing projection shall not exceed the smallest nosing projection by more than $\frac{3}{8}$ inch (9.5 mm) within a stairway.

Exception: A nosing projection is not required where the tread depth is not less than 11 inches (279 mm).

Revise as follows:

R311.7.5.4 R311.7.2 Exterior plastic composite stair treads. Plastic composite exterior stair treads shall comply with the provisions of this section and Section R507.2.2.

Delete without substitution:

R311.7.6 Landings for stairways. There shall be a floor or landing at the top and bottom of each stairway. The width perpendicular to the direction of travel shall be not less than the width of the flight served. For landings of shapes other than square or rectangular, the depth at the walk line and the total area shall be not less than that of a quarter circle with a radius equal to the required landing width. Where the stairway has a straight run, the depth in the direction of travel shall be not less than 36 inches (914 mm).

Exception: A floor or landing is not required at the top of an interior flight of stairs, including stairs in an enclosed garage, provided that a door does not swing over the stairs.

R311.7.7 Stairway walking surface. The walking surface of treads and landings of stairways shall be sloped not steeper than one unit vertical in 48 inches horizontal (2-percent slope).

R311.7.8 Handrails. Handrails shall be provided on not less than one side of each flight of stairs with four or more risers.

R311.7.8.1 Height. Handrail height, measured vertically from the sloped plane adjoining the tread nosing, or

finish surface of ramp slope, shall be not less than 34 inches (864 mm) and not more than 38 inches (965 mm).

Exceptions:

1. The use of a volute, turnout or starting easing shall be allowed over the lowest tread.
2. Where handrail fittings or bendings are used to provide continuous transition between flights, transitions at winder treads, the transition from handrail to *guard*, or used at the start of a flight, the handrail height at the fittings or bendings shall be permitted to exceed 38 inches (956 mm).

R311.7.8.2 Handrail projection. Handrails shall not project more than $4\frac{1}{2}$ inches (114 mm) on either side of the stairway.

Exception: Where nosings of landings, floors or passing flights project into the stairway reducing the clearance at passing handrails, handrails shall project not more than $6\frac{1}{2}$ inches (165 mm) into the stairway, provided that the stair width and handrail clearance are not reduced to less than that required.

R311.7.8.3 Handrail clearance. Handrails adjacent to a wall shall have a space of not less than $1\frac{1}{2}$ inches (38 mm) between the wall and the handrails.

R311.7.8.4 Continuity. Handrails shall be continuous for the full length of the flight, from a point directly above the top riser of the flight to a point directly above the lowest riser of the flight. Handrail ends shall be returned or shall terminate in newel posts or safety terminals.

Exceptions:

1. Handrail continuity shall be permitted to be interrupted by a newel post at a turn in a flight with winders, at a landing, or over the lowest tread.
2. A volute, turnout or starting easing shall be allowed to terminate over the lowest tread.

R311.7.8.5 Grip size. Required handrails shall be of one of the following types or provide equivalent graspability:

1. Type I. Handrails with a circular cross section shall have an outside diameter of not less than $1\frac{1}{4}$ inches (32 mm) and not greater than 2 inches (51 mm). If the handrail is not circular, it shall have a perimeter of not less than 4 inches (102 mm) and not greater than $6\frac{1}{4}$ inches (160 mm) and a cross section of not more than $2\frac{1}{4}$ inches (57 mm). Edges shall have a radius of not less than 0.01 inch (0.25 mm).
2. Type II. Handrails with a perimeter greater than $6\frac{1}{4}$ inches (160 mm) shall have a graspable finger recess area on both sides of the profile. The finger recess shall begin within $\frac{3}{4}$ inch (19 mm) measured vertically from the tallest portion of the profile and have a depth of not less than $\frac{5}{16}$ inch (8 mm) within $\frac{7}{8}$ inch (22 mm) below the widest portion of the profile. This required depth shall continue for not less than $\frac{3}{8}$ inch (10 mm) to a level that is not less than $1\frac{3}{4}$ inches (45 mm) below the tallest portion of the profile. The width of the handrail above the recess shall be not less than $1\frac{1}{4}$ inches (32 mm) and not more than $2\frac{3}{4}$ inches (70 mm). Edges shall have a radius of not less than 0.01 inch (0.25 mm).

Revise as follows:

R311.7.8.6 R311.7.3 Exterior plastic composite handrails. Plastic composite exterior handrails shall comply with the requirements of Section R507.2.2.

~~R311.7.9 R311.7.4~~ Illumination. Stairways shall be provided with illumination in accordance with Sections R303.7 and R303.8. The illumination system shall be capable of providing a minimum of 10 foot-candles (110 lux), measured at the center of stairway landings and treads, when the stairway is in use.

~~R311.7.10 R311.7.5~~ Special stairways. Spiral stairways and bulkhead ~~Bulkhead~~ enclosure stairways shall comply with the requirements of Section R311.7 except as specified in Sections R311.7.10.1 and R311.7.10.2. NEPA 101-2018 Section 24.2.2.3.

Delete without substitution:

~~R311.7.10.1~~ Spiral stairways. The clear width at and below the handrails at spiral stairways shall be not less than 26 inches (660 mm) and the walkline radius shall be not greater than 24¹/₂ inches (622 mm). Each tread shall have a depth of not less than 6³/₄ inches (171 mm) at the walkline. Treads shall be identical, and the rise shall be not more than 9¹/₂ inches (241 mm). Headroom shall be not less than 6 feet 6 inches (1982 mm).

~~R311.7.10.2~~ Bulkhead enclosure stairways. Stairways serving bulkhead enclosures, not part of the required building egress, providing access from the outside *grade* level to the *basement* shall be exempt from the requirements of Sections R311.3 and R311.7 where the height from the *basement* finished floor level to *grade* adjacent to the stairway is not more than 8 feet (2438 mm) and the *grade* level opening to the stairway is covered by a bulkhead enclosure with hinged doors or other *approved* means.

Revise as follows:

~~R311.7.11~~ R311.7.6 Alternating tread devices. Alternating tread devices shall not be used as an element of a means of egress. Alternating tread devices shall be permitted provided that a required means of egress stairway or ramp serves the same space at each adjoining level or where a means of egress is not required. The clear width at and below the handrails shall be not less than 20 inches (508 mm).

Exception: Alternating tread devices are allowed to be used as an element of a means of egress for lofts, mezzanines and similar areas of 200 gross square feet (18.6 m²) or less where such devices do not provide exclusive access to a kitchen or bathroom.

~~R311.7.11.1~~ R311.7.6.1 Treads of alternating tread devices. Alternating tread devices shall have a tread depth of not less than 5 inches (127 mm), a projected tread depth of not less than 8¹/₂ inches (216 mm), a tread width of not less than 7 inches (178 mm) and a riser height of not more than 9¹/₂ inches (241 mm). The tread depth shall be measured horizontally between the vertical planes of the foremost projections of adjacent treads. The riser height shall be measured vertically between the leading edges of adjacent treads. The riser height and tread depth provided shall result in an angle of ascent from the horizontal of between 50 and 70 degrees (0.87 and 1.22 rad). The initial tread of the device shall begin at the same elevation as the platform, landing or floor surface.

~~R311.7.11.2~~ R311.7.6.2 Handrails of alternating tread devices. Handrails shall be provided on both sides of alternating tread devices and shall comply with Sections R311.7.8.2 to R311.7.8.6. Handrail height shall be uniform, not less than 30 inches (762 mm) and not more than 34 inches (864 mm).

~~R311.7.12~~ R311.7.7 Ships ladders. Ships ladders shall not be used as an element of a means of egress. Ships ladders shall be permitted provided that a required means of egress stairway or ramp serves the same space at each adjoining level or where a means of egress is not required. The clear width at and below the handrails shall be not less than 20 inches.

Exception: Ships ladders are allowed to be used as an element of a means of egress for lofts, mezzanines and similar areas of 200 gross square feet (18.6 m²) or less that do not provide exclusive access to a kitchen or bathroom.

~~R311.7.12.1~~ **R311.7.7.1 Treads of ships ladders.** Treads shall have a depth of not less than 5 inches (127 mm). The tread shall be projected such that the total of the tread depth plus the nosing projection is not less than 8¹/₂ inches (216 mm). The riser height shall be not more than 9¹/₂ inches (241 mm).

~~R311.7.12.2~~ **R311.7.7.2 Handrails of ships ladders.** Handrails shall be provided on both sides of ships ladders and shall comply with ~~Sections R311.7.8.2 to R311.7.8.6.~~ ~~Handrail height shall be uniform, not less than 30 inches (762 mm) and not more than 34 inches (864 mm).~~ Section R311.7.1.

Reason: Introduction. Over the last two decades, covering the entire history of the *International Residential Code*, subsection R311.7 on stairways—which started with some serious defects—has not improved as much as warranted by the home stair-related injury toll, especially the toll’s growth over the last two decades. This proponent sees little value in addressing, *in detail*, all of the IRC’s deficits with regards to stairways unless there are major changes in how ICC members and committees understand and address the overarching topic of home step dimensions, handrail requirements, etc., with step dimensions being the most potent set of factors impacting both home stairway usability and safety. Thus the best strategy is to propose a substitution of most of the IRC’s stairway requirements with a reference to NFPA 101’s Chapter on One and Two-Family Dwellings. The justification for this drastic proposal is technical as well as procedural, with emphasis below on the technical issues. Addressing the procedural issues would mean going into detail on the overarching role of two organizations in the development, to date, of the IRC’s stairway requirements, namely the National Association of Home Builders (NAHB) and the Stairway Manufacturers Association (SMA).

Neither of these organizations have been participating actively in all the research conducted over the last five decades in several countries, most notable of which are the USA, the UK , Japan and Canada. Such participation clearly sets the proponent of this substitution apart from the NAHB and SMA, both organizationally and in terms of any individual in these organizations (now and in the past three decades).

The proponent’s participation entails formal research (for 20 years at the National Research Council of Canada), international consulting (for four decades), ergonomics certification (since 1993, with re-certifications in 2010 and 2015), and public health involvement (as the lead, formal/voting representative for the American Public Health Association, APHA, on eight ICC and NFPA committees dating back two decades). His publications record includes about 100 publications on stairway use, safety and design. His record of formal presentations worldwide includes over 100 on stairways beginning in 1974. His record production of educational and documentary videos include over 30 videos and one documentary film, “The Stair Event” (the only such film on stairways, produced 40 years ago).

No individual, organization or any collection of these, can match the proponent’s record of scientific and technical accomplishments since 1967 which has resulted in several awards and an Honorary Doctor of Science degree. These reflect international recognition focused most intensively in three countries, the USA (his longest base of activity), Canada and the UK.

Moreover, the proponent is relatively well known by premises liability attorneys in the US and Canada who represent persons injured on stairways or, in a minority of cases, attorneys representing premises owners and operators. Some of the latter, rather than being defendants, are corporate counsel for very large organizations with multiple facilities where stairway safety has been a major concern and the organization wishes to take a pro-active approach to injury prevention. In Canada, due to the premises liability laws there, the proponent’s litigation-related work focuses much more on one- and two-family dwellings than is the case in the USA where the home stairway dangers are almost as bad as in Canada—especially in relation to stair step dimensions, but there has been less litigation focused on the comparable dangers to stairway users.

Bottom line: much has been learned over the last four decades especially that draws on multiple sources of insight on the real dangers of stairways and the need for model code organizations, adopting authorities and

enforcing officials to recognize just how devastating the home stairway-related injury **endemic** has become. Only NFPA has responded realistically to the home stairway-related endemic. ICC has had the opportunity to do so over the last 20 years but it has failed, very badly, to respond to the public health and safety situation. ***This has to change!***

Analogy connecting stairways and automobiles. For readers who are put off by technical and other details, please read the following sentences about an apt comparison. Imagine the outcry that would have occurred if, starting decades ago, the automobile industry adopted, and implemented, a policy of only providing brakes for vehicles that were only used by relatively fit, working-age adults. For everyone else—e.g., children and older adults—vehicles would not be provided with functional brakes or steering that worked reliably for people with widely varying strength abilities. Of course the automobile industry—internationally (partly following developments in the USA)—took a different path, a path to cars that were not only safer, for example with brakes and steering systems, but were much more functional. These and other systems served a wide range of drivers and occupants in ALL use conditions, not only crashes, emergency stopping and control but for normal operational usability.

Through the decades, while the automobile industry adopted more progressive policies—*partly dictated by laws and regulations*—the building industry has steadfastly avoided clear evidence that home stairway-related falls were growing faster than population growth and costs of stair-related injuries vastly exceeded the initial costs of stairway construction. Indeed the building industry operated oblivious of scientific knowledge and other evidence.

APHA Policies on Building Codes. Since the turn of the century, ICC has diverged from NFPA's far more evidence-based approach to ALL stairways, notably those in homes, as well as repeated public policies adopted by the American Public Health Association (APHA).

APHA Policy Statement 99-16, Public Health Role of Codes Regulating the Design, Construction and Use of Buildings

APHA Policy Statement 2000-19, Public Health Role of the National Fire Protection Association in Setting Codes and Standards for the Built Environment

APHA Policy Statement 200913, Building Code Development, Adoption, and Enforcement Problems Affecting Injury Prevention in, and Usability of, Homes and Other Buildings.

Here is what the last in this series, the currently active APHA policy 200913, stated:

“From ICC’s beginnings, there were indications that public health was not as high of a priority for the ICC, as was a dominating business presence in the US building regulatory field. This concern regarding the relationship between the ICC and the National Association of Home Builders (NAHB) was first addressed in APHA Policy 99-16 and reiterated in APHA Policy 2000-19. When the longer-established National Fire Protection Association (NFPA), with its very large set of widely used safety standards, decided to develop a competing model building code, APHA adopted policy statement 2000-19 to help influence NFPA in a more public health-oriented approach to model building code development. . . .

Much of what was recommended to NFPA in APHA’s policy 2000-19 was implemented in NFPA codes and standards during the next several years, including, in 2003, mainstreamed safety and usability requirements for the most dangerous element in homes, the stairways. . . .

The model code development process, especially within ICC's system of public hearings, is based on a model encouraging adversarial testimony and other formal input to the process. Certain issues typically pit advocates for public health goals (such as safety and accessibility or usability of the built environment) against certain industry representatives whose goals are to have little or no change in established, traditional practices; to experience minimal regulatory interference; and to claim often that housing affordability will be harmed. . . .

As a general rule, there is no epidemiological or etiological basis for the traditional double, lower standard for home stair step geometry or for inferior handrail provision or functional quality; this was a point made explicitly in APHA's Policy 2000-19. NFPA has taken this issue to heart in its post-2000 revisions to its leading codes; ICC has gone in the opposite direction, increasing the gulf of safety and usability levels between home stairways and those in other settings. . . .

Therefore the APHA recommends: 5. ICC and NFPA should develop and maintain model codes and standards requiring home stairways to be designed and constructed so that stairs and railings provide at least the same level of usability and safety from falls as do stairs and railings in other buildings."

Now, almost two decades after ICC published first editions of the IBC and IRC, ICC continues to ignore the evidence of stairway safety issues as well as the formally adopted policies of the American Public Health Association, APHA. Here follow highlights of that evidence, including Injury Epidemiology and Etiology.

Injury Epidemiology

Stairways. Since 2002, approximately the time that the IRC began to influence home stairway construction, medically-treated injuries in all settings—sufficient to lead to hospital emergency room visits—*increased by about 39 percent as of 2017 in the USA.* (This equates to a growth rate of about 2 percent a year over the 15-year period.) During this 15-year period, US population only increased by about 13 percent, that is with a demographic growth only about one-third that of stair-related injuries.

Also during this period there appears to have been an increase in the proportion of stairway related injuries occurring in home settings for which the location data are not as complete. For known locations, the home-based proportion has increased from about 85 percent to about 90 percent or higher over the 15-year period.

Stairs Compared to Fires. During this same 15-year period, *fire-related fatalities* in all US settings—with homes again being the most common site of fatalities—*decreased* with the approximate rate, per 100,000 population dropping from about 1.3 to about 0.98 injuries annually per 100,000 US population.

Comparison of stair-related *injuries* with fire-related *injuries* is complicated by the lack of detail about the nature of treatment needed for the fire-related injuries. For stair-related injuries, that are professionally treated, the treatment rates per 100,000 US population are displayed in Table 1 for the annual averages over the years 2010 to 2014: the average injury rate was about 1,400 per 100,000 population. At about the same time, fire-related injuries (based on 2016 figures from the US Fire Administration) had a rate of about 45 injuries per 100,000 and they were declining. (The resulting ratio of stairways to fire is about 31, a factor depicted in Figure 1.) There were some age differences for fires with rates of 55 for middle-age adults, 25 for children and 45 for older adults, all per 100,000 population. By contrast, during the period 2010-2014, *annual rates* for stair-related injuries, per 100,000 population, that resulted in professional medical care, are described in more detail in Table 1, right to left: for Doctors Offices or Outpatient Clinics, for Emergency Departments, and for Hospital Admission.

Stairs Age	Doc/Outp	ED	Hospital-admitted		Total
			via ED	Direct	
00-09	369.2	327.1	10.7	3.7	710.8
10-19	569.9	290.6	5.4	2.0	867.8
20-29	962.0	453.2	10.6	3.5	1,429.2
30-39	1,381.9	454.3	13.9	4.7	1,854.8
40-49	1,489.6	406.3	21.7	7.2	1,924.8
50-59	1,164.3	342.9	34.6	11.9	1,553.6
60-69	905.9	298.2	52.3	17.8	1,274.2
70-79	981.6	374.4	101.2	34.1	1,491.3
>=80	917.0	478.0	200.4	54.7	1,650.1
Total	980.5	374.5	31.5	10.2	1,396.7

Table 1. Annual US Injury Rates for Stairs

(per 100,000 population), by treatment and age, during 2010-2014

(Source: Pacific Institute for Research and Evaluation, Maryland)

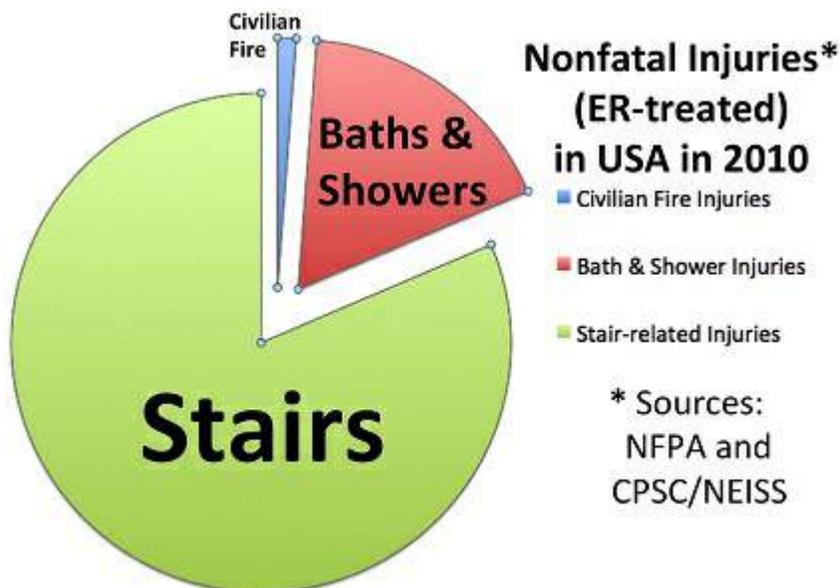


Figure 1. Chart of Approximate Relative Occurrence of Serious Injuries

Associated with Three Common Dangers in Homes and Other Buildings

Comparing these stairway-related rates, with their enhanced specificity, in Table 1, with those noted earlier for fires, we should note the much larger public safety problem posed by stairways, compared to fires. From Figure 1 we should recognize that there is great disparity of code response to injury occurrence for stairways, along

with another badly neglected topic in the IRC, fall prevention for bathtubs and showers (the subject of another set of proposed changes to the IRC).

To fully appreciate the size of the stairway safety problem in the USA, Table 2 provides estimates of incidence, annually, of injuries by treatment type and victim age.

Stairs Age	Doc/Outp	ED	Hospital-admitted		Total
			via ED	Direct	
00-09	149,389.0	132,344.0	4,313.0	1,515.8	287,561.8
10-19	240,132.0	122,449.0	2,288.5	824.6	365,694.1
20-29	422,114.0	198,838.0	4,634.7	1,533.7	627,120.4
30-39	560,978.0	184,438.0	5,628.9	1,910.3	752,955.2
40-49	634,787.0	173,156.0	9,241.0	3,050.3	820,234.3
50-59	502,896.0	148,100.0	14,928.3	5,133.4	671,057.7
60-69	286,908.0	94,429.1	16,556.9	5,644.9	403,538.9
70-79	173,515.0	66,176.8	17,891.0	6,021.7	263,604.5
>=80	106,489.0	55,507.0	23,272.4	6,356.7	191,625.1
Total	3,077,207.0	1,175,439.0	98,754.8	31,991.4	4,383,392.2

**Table 2. Annual US Injury Incidence for Stairs
by treatment and age, during 2010-2014**

(Source: Pacific Institute for Research and Evaluation, Maryland)

The overall total, of over 4 million professionally treated injuries annually in the USA (within the period, 2010-2014), related to stairways, is mind blowing as is the huge societal cost of such injuries. During 2010-2014, the average *annual* societal cost of stairway-related injuries in the USA was estimated as over \$92 billion (2009 US dollars) and the vast majority of those injuries were in homes. (Source: Lawrence, B., Spicer, R., Miller, T. A fresh look at the costs of non-fatal consumer product injuries. *Injury Prevention*, digital publication, August 2014, paper journal publication, 2015:21:23-29.0)

Some Preliminary Cost-Benefit Insights. If we assume, as an approximation, there were about 120 million US households in 2012 (the midpoint in the periods discussed above) and further assume an average of one flight of stairs for each household (with some homes having several flights of stairs and many having none), the average cost of home stairway-related injuries is roughly \$700 per stair flight (or household) *per year*. This average injury cost greatly exceeds the annual cost (e.g., over a 50-year service life) of a stair flight in a home. As currently allowed by the IRC and built into new homes, stairways with such high annual injury costs are an extremely poor investment in terms of costs to society, families and individuals. Why this is the case is discussed in the next section, on etiology, the study of causes (of bad events such as disease, injuries, etc.).

Injury Etiology for Stairways

There is widespread agreement—*about the very prominent, indeed central role of stair step dimensions (among several stairway design and construction factors)*—among all the experts on stairway safety who have researched the topic and have been lead authors of papers, book chapters, a book or producer of widely viewed, edited video programs. Many have worked at, or for, the leading building science and technology centers in Japan, Britain, Australia, Sweden, Canada and the USA during the last six decades. All of the following individuals, listed alphabetically, have addressed various aspects of stairway use, safety and design; all have published authoritatively on one or more of these topics. Most have had long-term contact with the proponent. ***All favor improvements in stairway design to reduce the toll of injuries seen internationally over the last several decades.***

- Dr. John Archea (deceased), USA
- Dr. Susan Baker (retired)
- Dr. Ben Barkow, USA and Canada
- Dr. Peter Barss, MD, Canada
- Dr. Michael Brill (deceased), USA
- Dr. Daniel Carson (deceased), USA
- Dr. Harvey Cohen, (retired) USA
- Dr. Nancy Edwards, Canada
- Dr. Nigel Ellis, USA
- Dr. Geoff Fernie, USA
- Dr. John Fruin, (retired) USA
- Dr. Tom Hay, Canada
- Dr. Charles Irvine (deceased), USA
- Dr. Daniel Johnson, USA
- Dr. Satoshi Kose, (retired) Japan
- Dr. Lennart Kvanstrom (deceased), Sweden
- Dr. Hamish MacLennan, Australia & New Zealand
- Dr. Hisao Nagata, (retired) Japan
- Dr. Alison Novak, Canada
- Dr. Marcus Ormerod, UK
- Dr. Joan Ozanne-Smith, Australia
- Dr. Jake Pauls, Canada & USA
- Mr. Mike Roys, UK
- Dr. Gary Sloan, (retired) USA
- Dr. Edward Steinfeld, USA
- Dr. Leif Svanström, Sweden
- Dr. John Templer, (retired) USA
- Dr. Keith Vidal, USA
- Dr. Michael Wright, UK

Both Sides of the “7-11” Proposal for Home Stairs Debated. There are relatively few people who have argued on the reactionary, industry side of the long-running debate about improving the design of stairways. One published example of an extended debate on the topic of improved home step dimensions dates back to 1985 (Dacquisto, D.J. and Pauls, J., 1985, The “7-11” stair: Should it be required for residential construction? *The Building Official and Code Administrator*, May-June, pp. 16-35.) David Dacquisto represented the National Association of Home Builders in this published debate. Jake Pauls represented scientific plus technical perspectives, e.g., based on research and public health evidence. The “Yes” side of published, 12-page account of the debate, in the BOCA magazine, was based on an 8,000-word position paper by Pauls.

Here follow concluding remarks in both sides’ lengthy arguments, with Pauls’ remarks selected for roughly comparable length and subject focus:

Dacquisto, for the NAHB. “What should be the standard for deciding whether to adopt a code proposal which faces opposition? Both cost and benefit estimates will always be uncertain. A suggested minimum standard is that no regulatory proposal should be finally approved over opposition unless the regulatory body finds it more likely than not that benefits of the proposal will exceed the costs, and believes there is probably no less costly way to achieve the anticipated benefits. The burden of proof should be on the proponent. By this standard, for the reasons presented in this article, the residential 7/11 stair proposal appears unwarranted at the present time.”

Pauls, for many experts and consumers “. . . Clearly, judging from the technical literature, the disagreement among apparently, "reasonable people" is certainly not great enough to give any real comfort to those trying to justify continuation of very poor step geometry standards for residential stairs. Also, despite Mr. Daquisto's apparent attempts to conceal the fact, literature produced by "reasonable people" generally calls for residential stair geometry that is similar to and sometimes better than, what is expected elsewhere. . . .”

Today, over three decades after the above debate, the evidence has grown significantly, *both from epidemiology and etiology*, for improving home step dimensions, specifically to the “7-11” standard—with maximum 7-inch rise and minimum 11-inch tread depth or run. Mr. Daquisto's criterion (for “7-11” adoption) about evidence, “that benefits of the proposal will exceed the costs,” has been repeatedly provided, including being the lead subject in Pauls' IRC proposal, *in 2003*, for the “7-11” rule—*submitted sixteen years and five editions of the IRC ago—16 years including over 40 million US stair related injuries and about \$900 billion in US stair-related, societal injury costs!*

During the 16 years, specifically 2010, Jake Pauls attempted a second set of proposals to update both the IBC and the IRC with respect to home stairway safety, specifically the step dimension rules. That led to a formal appeal to ICC after which the ICC Board refused to deliberate on the matter with the appellant and his counsel. ICC's refusal to properly address the home stairway safety issue extends right to the top of the organization.

This era of three major attempts to change the ICC codes requirements will end with the current proposal in 2019 after which the effort will be moved—painfully for ICC, the building regulatory field, the building industry, and others—increasingly into the litigation arena as has already gained some momentum in Canada where a significant portion of forensic assignments (of the proponent's, especially in Ontario) are now in home settings in relation to injuries due to defective stairs.

History within ICC — 2003. The first major public proposal in March 2003, by Jake Pauls, to ICC to change the IRC home stair step dimension requirements to the “7-11” standard was over 18,000 words in length. In addition to epidemiology and etiology aspects of the issue, the proposal dealt extensively with benefit-cost and other issues.

Here is the outline of the entire proposal.

- ICC Public Proposal Form identifying proponent, etc.
- Legislative Text of Proposed Changes (to sections similar to those now addressed).
 - R311.5.3 Stair treads and risers.
 - R311.5.3.1 Riser height.
 - R311.5.3.2 Tread depth.
 - R311.5.3.3 Profile.
- Benefit-Cost Analysis for Improved Stairs in the USA

- Injury Epidemiology
- History of Debate on Improved Step Geometry Requirements in Codes & Standards
- Benefits and Costs
- Industry's and Regulators' Reviews of Research
- Latest Research on Step Geometry from Britain

• Politically-driven Local and State Adoption Process

- Building and Marketing Improved Stairs
- The Problem of the Double Standard
- Intimidation of Building Officials
- Roles of NFPA and APHA
- Summary

Some of these topics are still as relevant today as they were in 2003 and a brief update on these is provided below. Nearly an identical proposal was submitted to NFPA in parallel with the ICC proposal during 2003. An NFPA task group was set up to advise on the issue; it strongly recommended adoption. A rule about 7-11 stairs across the board—especially in homes—was adopted. NAHB appealed and lost. Since then NAHB has given up trying to get the NFPA dwelling unit requirements to revert to what the IRC has. Rather, NAHB turned its efforts to stopping NFPA and others from improving home safety through model code adoption at state and local levels in the USA. ICC appeared to be a willing partner in this effort. Ethics apparently took a back seat as ICC continued to give NAHB a guaranteed one-third of the relevant IRC committee's 12 positions and thus needed only two votes to stop any proposal it did not like. Proponents require 7 votes. The math is clear, as is the need for legal intervention where evidence is treated in much higher regard and nobody with a pre-determined position is allowed to serve as a trier of fact, such as a judge or jury member.

NAHB's Political Opposition Spanning Over Two Decades. The 2003 proposal was not accepted by ICC, largely for what will be termed "political considerations" namely that ICC was not prepared to go against NAHB's bullying (and other forms of power-based influence) against ICC and building officials generally. Indeed, the political power of the NAHB continues, with ICC's apparent *and effective blessing*, two decades after NAHB adopted, in 1996, a policy that stated:

"NOW THEREFORE BE IT RESOLVED that the National Association of Home Builders recommends that all state and local governments who adopt the National Building Code (BOCA) and the Council of American Building Officials (CABO) model building codes, postpone the adoption of any new stair geometry,

BE IT FURTHER RESOLVED that the National Association of Home Builders recommends that all state and local governments who automatically adopt BOCA and CABO model building codes, amend the 1996 and 1995 editions respectively to continue the use of the 1993 BOCA and CABO model codes as they relate to stair geometry provisions,

BE IT FURTHER RESOLVED that the National Association of Home Builders urges all state and local affiliated Home Builders' Associations to contact state and local code authorities and persuade them to postpone the adoption of the new CABO and BOCA stair geometry standard, and

BE IT FURTHER RESOLVED that the National Association of Home Builders continue to vigorously pursue the adoption of a stair geometry standard consistent with the 1993 BOCA Code."

The 1993 *BOCA National Building Code* still permitted stairs in dwelling units to have a maximum riser height of 8.25 inches (210 mm) and a minimum tread depth of 9 inches (229 mm); this contrasted with the same Code's requirements for the "7-11"-based standard for other buildings and occupancies.

Role of Stair Step Dimensions. This topic is the most researched aspect of stairway safety and it has a history dating back centuries, indeed, a few millennia (as set out in detail in the proponents 2003 proposal to ICC. This history was described in detail in the proponents proposal in 2003 and will not be repeated here (although, if necessary, it will be part of a comment submitted during 2019 for consideration at the Public Comment Hearing this autumn). Staff can provide the appropriate code change committee with that 2003 proposal if there is a demand from committee members. (It can also be provided to ICC by the proponent if necessary as a PDF file.)

UK Research Findings. Since the turn of the century, about two decades ago, there was extensive stairway safety research in the UK at the Building Research Establishment (BRE), a UK version of US NIST or NRC Canada's former Division of Building Research (up to about 1982). It was briefly noted in the proponent's 2003 and 2010 proposals on the step dimension issue in the IRC. The charts below are based on many charts and other results produced for the BRE's sponsor the national agency in the UK responsible for its building regulations. BRE's research included (1) laboratory studies of ten different stair step run (going or tread depth) dimensions and several different rise dimensions and (2) a mail-back survey of home owners home stair dimensions combined with a survey of falls on their stairs in the preceding two years.

Figure 2 shows one of many results based on both objective measures and test subjects' responses to a multi-item questionnaire used for each combination of experimental stair rise and run.



Figure 2. Results of BRE Laboratory Testing of Combinations of Step Rise

and Run/Going, Here Assessed by the Best Subjective Measure

Figure 2 is the chart for the most valuable question or assertion for which the study team wanted to know extent of agreement by individual subjects using a scale for which the lower score is associated with a more-preferred step geometry combination. The results, shown in Figure 2, are for the statement, “I felt safe walking down the stair.” There is a streaming video of a discussion between the proponent and one of the two co-investigators, Mike Roys, posted at www.bldguse.com. The discussion, in 2017, focused on the relative importance of the two variables—rise and run—influencing the actual and perceived safety of a stair. While step run (tread depth in the IRC) is very important, there is also some notable effect of the rise. Further research, with larger samples of test subject are needed to pin this down (i.e., statistical significance which was established for the run).

The results of the laboratory studies and the field survey were very similar to what is presented in Figure 3. It shows—for run dimension only—the combined results of the BRE mail-back survey and the laboratory testing; this shows the close correspondence of both subjective and objective measures of the increasing danger of falls when the run dimension is smaller. The vertical scale of the graph in Figure 3 was the basis for estimates, below, on relative risk of falls sufficient to warrant a visit to a hospital Emergency Department in the US.

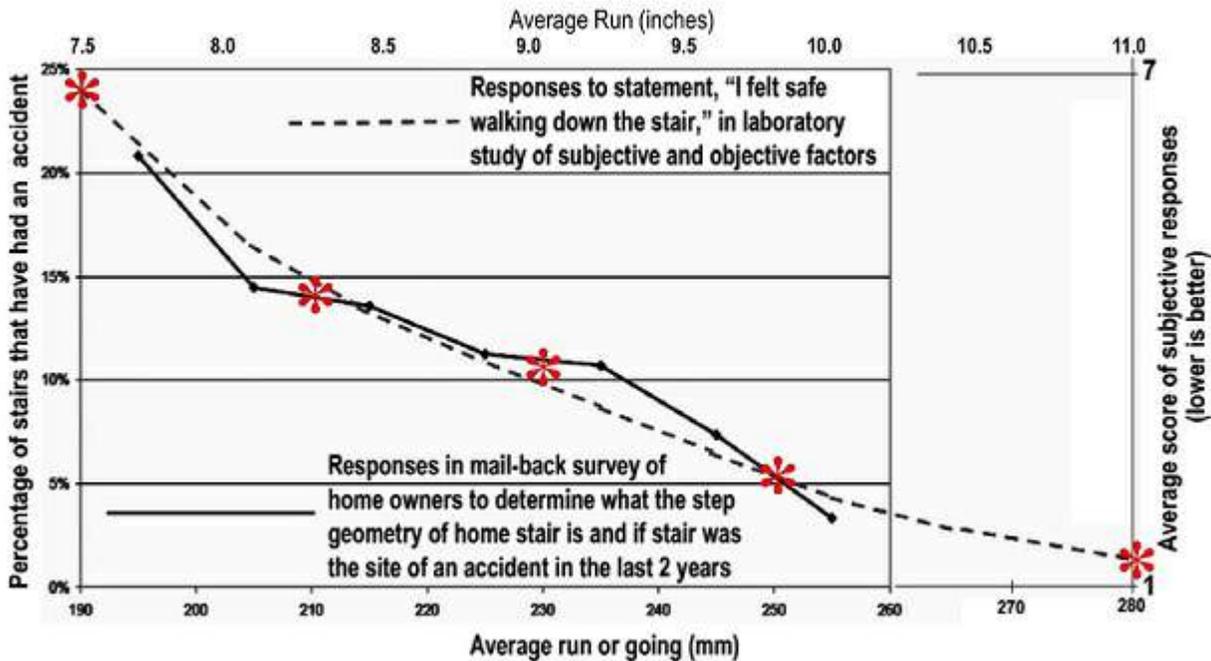


Figure 3. Combined Results of BRE Laboratory Testing of Combinations of Step Rise plus Run/Going and the Results of a Mail-back Survey about Home Stair Dimensions

The proponent, working with original reports of the UK studies as well as numerous meetings with the UK researchers, at BRE and elsewhere, prepared a table which is partly reproduced below, as Table 3, based on a 2013 publication, that described how step run or tread depth (“going” in UK terminology) affected the risk of an injurious fall sufficiently serious to warrant a visit to a hospital Emergency Department. The range of run (tread depth) dimensions in the table ranged from 190 mm (7.5 inches) to 280 mm (11 inches).

(These results and the full table partly reproduced as Table 3 are found in: Pauls, J. and Barkow, B., 2013. Combining risks from two leading factors in stair-related falls. *Proceedings of the International Conference on Fall Prevention and Protection*, Tokyo, pp. 87-92, Table 2.)

Uniformity condition: Percentage of stairs with TOFF	Annual injurious fall risk rates with various nominal tread runs				
	Risk rates shown are per 100,000 population				
	190 mm Effective run with carpet	210 mm	230 mm Favoured by US home builders	250 mm Minimum in ICC codes	280 mm Minimum in NFPA codes
0	230	140	110	50	20

Table 3. Small Portion of Published Table: Estimated relative annual risks per 100,000 population, of US hospital emergency department visits for home stair-related falls with various nominal run (going) dimensions and with various occurrences of Top of Flight Flaw (TOFF) non-uniformity

Injury Consequences of Inferior Stairs Resulting from NAHB’s Policy and ICC’s Refusal to Improve Home Stair Step Dimensions. What these and many other research findings mean today is that, across much of the USA, there is mix of inferior—*indeed dangerously inferior*—stairs in homes in their second decade (or more) of a several-decade life. Such homes with stair step tread depths or runs of only 9 inches (even an inch or more smaller effectively, with carpet coverings) are injuring home occupants at rates exceeding those achievable with “7-11” step dimensions by a factor of as much as six to eight. In standard epidemiological terms such NAHB-demanded, home stairs are associated with—*per 100,000 population*—at least 110 stair-related injuries—*annually*—leading to hospital emergency room (ER) treatment compared with 20 stair-related injuries for stairs meeting the “7-11” standard. (This relationship and the role of dimensions both nominal and with nonuniformities are discussed in detail in the Pauls-Barkow paper, from 2013, cited above in relation to Table 3.)

Injury Costs. As seen in Table 2 (near the front of this substantiation), for the entire US, in 2018, the ER-treated injury toll alone for such NAHB-demanded stairs is estimated to be on the order of 600,000 injuries. Adding other treatment consequences, i.e., doctors offices and clinics along with hospital admissions brings the annual injury toll into the millions in the US with a societal cost on the order of 100 billion dollars or approaching \$1,000 per average US household annually. Note that, societal injury costs for such injuries are composed of three components: medical care, work loss and other direct economic losses, plus pain and suffering (quality of life generally) which are, roughly, in the ratio: one : two : seven, respectively. In other words, medical care cost is the smallest of three components responsible for only about 11 percent of total, societal costs. See figure 4.

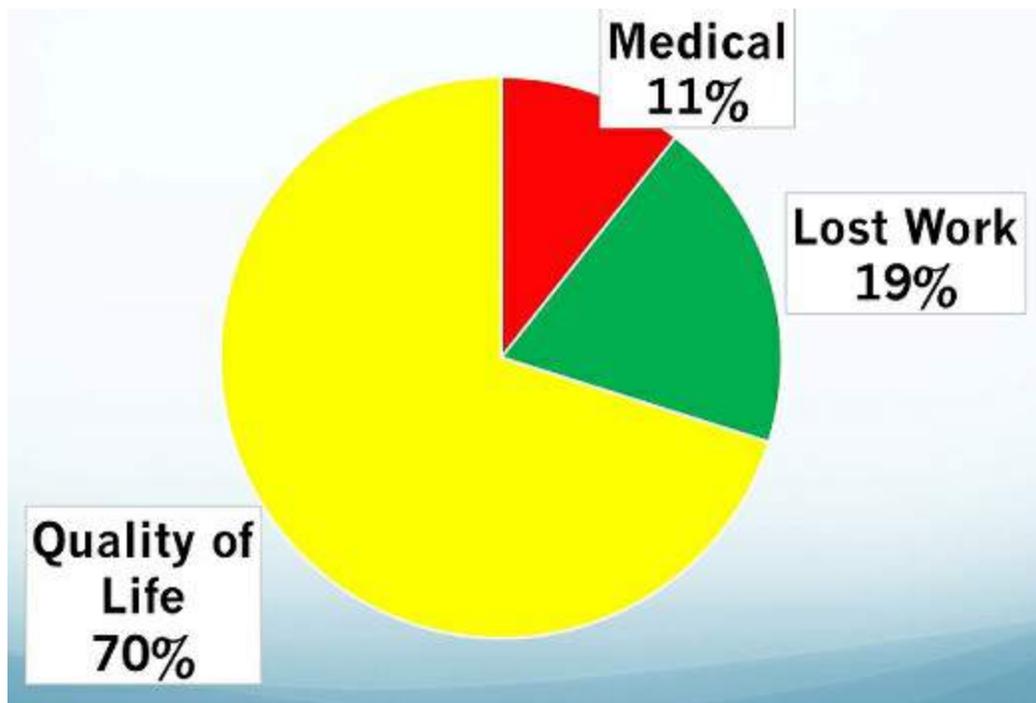


Figure 4. Components of Societal Injury Cost

Benefits of Normal Stairway Use. Moreover, during a year period, there are on the order of one-trillion stair flight uses in the USA, everyone of which has a value to the stair users. Such normal uses have a significant value that must be taken into account in any benefit-cost analysis. This will increasingly be the case as stairs become safer to use—due to design improvements—and thus such uses can be confidently recommended as a good source of exercise our increasingly sedentary populations need for better fitness. Currently, this proponent cannot endorse use of typical US (or Canadian) home stairs for exercise purposes. Exposure to predictable and preventable dangers has to be minimized and this means that a valuable, readily available place to exercise has less value over its lifetime, simply because its design and construction have been dictated largely by two organizations in the USA: NAHB and SMA, using a flawed code-development process maintained (in an otherwise laudable process for example for its openness and use of communication media) by the ICC.

Concluding Remarks

There are two tactics currently being utilized to change the IRC requirements, one uses ‘micro-surgery’ to change the smallest amount of text in IRC Section on Stairways, focused only on the step dimension issue in relation to specifying minimum tread depth (run) and maximum rise. This would change minimum tread depth from 10 inches to 11 inches and would change maximum rise from 7.75 inches to 7 inches. The other tactic takes a more-comprehensive approach, substituting almost all IRC’s requirements for stairways through a mandatory reference to NFPA 101’s requirements on home stairways, specifically for one- and two-family dwellings—the same scope as the IRC has.

In the proponent’s professional opinion, the first tactic addresses a problem largely created and maintained by the NAHB; the other adds issues for which the SMA is largely responsible due to its largely poorly justified tinkering with a wider range of stairway design issues which owe more to tradition than to technology. SMA’s approach has been marked by the attempt to keep building what has been built in the past, without adequate scientific and technical justification. It appears that SMA has fared very poorly in

attempting to do this in the NFPA process where scientific and technical justification carries more weight.

In the proponent's professional opinion, both the NAHB and SMA bear much responsibility for the sorry state of home stairway safety in facilities built to the IRC. Ultimately it is ICC that has failed, and—unless drastic actions are taken—will continue to fail us with huge injury ramifications that will last for many decades. This raises questions about the Preface to the IRC which states: (ICC) “provides an international forum for discussion and deliberation about building design, construction methods, safety, performance requirements, technological advances and innovative products.” If this were completely true, why do the requirements of the IRC differ so significantly from those adopted by NFPA?

With the “7-11” being, now, a long-established standard for stairway safety—including in the *International Building Code* for all settings except one- and two-family dwellings, why is the “7-11” not applied to the setting where it is most needed and where it would produce the largest benefit for the cost of implementation—*in homes?*

Bibliography: All citations to the published literature are embedded in the Reason Statement

Cost Impact: The code change proposal will increase the cost of construction

While cost of construction will increase, that increase (as shown also in the first proposal on this same topic in a 2003 proposal on stairways in the IRC) pales in comparison to the benefits of the “7-11” step geometry for dwelling unit stairs. (From the Reason Statement comes the following updated detail on cost impact.

“If we assume, as an approximation, there were about 120 million US households in 2012 (the midpoint in the periods discussed above) and further assume an average of one flight of stairs for each household (with some homes having several flights of stairs and many having none), the average cost of home stairway-related injuries is roughly \$700 per stair flight (or household) *per year*. This average injury cost greatly exceeds the annual cost (e.g., over a 50-year service life) of a stair flight in a home. As currently allowed by the IRC and built into new homes, stairways with such high annual injury costs are an extremely poor investment in terms of costs to society, families and individuals.”

Moreover, for all the other changes proposed for Section 311.7, there is actually a reduction of cost for handrails for example as the more functional handrails are also less costly than the ones typically provided for new home stairways. Changes such as lighting of stairways also have a minor impact on costs as, with modern lighting control systems and energy-saving sources, lighting with increased illumination levels that operates as needed, automatically, means this is not costly as in the past.

Staff Analysis: The referenced standard, NFPA 101-18, is currently referenced in other 2018 I-codes.

Proposal # 5467

RB116-19

RB117-19

IRC@: SECTION R310, R311.1, R311.2, R311.3, R311.3.1, R311.3.2, R311.3.3, R311.4, R311.6, R310.1, R310.1.1, R310.2, R310.2.1, R310.2.2, R310.2.3, R310.2.3.1, R310.2.3.2, R310.2.4, R310.2.5, R310.3, R310.3.1, R310.3.2, R310.3.2.1, R310.3.2.2, R310.4, R310.5, R310.6, SECTION R311, R311.7, R311.7.1, R311.7.2, R311.7.3, R311.7.4, R311.7.5, R311.7.5.1, R311.7.5.2, R311.7.5.2.1, R311.7.5.3, R311.7.5.4, R311.7.6, R311.7.7, R311.7.8, R311.7.8.1, R311.7.8.2, R311.7.8.3, R311.7.8.4, R311.7.8.5, R311.7.8.6, R311.7.9, R311.7.10, R311.7.10.1, R311.7.10.2, R311.7.11, R311.7.11.1, R311.7.11.2, R311.7.12, R311.7.12.1, R311.7.12.2, R311.8, R311.8.1, R311.8.2, R311.8.3, R311.8.3.1, R311.8.3.2, R311.8.3.3

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2018 International Residential Code

Revise as follows:

SECTION R310

~~EMERGENCY ESCAPE AND RESCUE OPENINGS MEANS OF EGRESS~~

~~R311.1~~ **R310.1 Means of egress.** *Dwellings* shall be provided with a means of egress in accordance with this section. The means of egress shall provide a continuous and unobstructed path of vertical and horizontal egress travel from all portions of the *dwelling* to the required egress door without requiring travel through a garage. The required means of egress door shall open directly into a public way or to a *yard* or court that opens to a public way.

~~R311.2~~ **R310.2 Egress door.** Not less than one egress door shall be provided for each *dwelling* unit. The egress door shall be side-hinged, and shall provide a clear width of not less than 32 inches (813 mm) where measured between the face of the door and the stop, with the door open 90 degrees (1.57 rad). The clear height of the door opening shall be not less than 78 inches (1981 mm) in height measured from the top of the threshold to the bottom of the stop. Other doors shall not be required to comply with these minimum dimensions. Egress doors shall be readily openable from inside the *dwelling* without the use of a key or special knowledge or effort.

~~R311.3~~ **R310.3 Floors and landings at exterior doors.** There shall be a landing or floor on each side of each exterior door. The width of each landing shall be not less than the door served. Landings shall have a dimension of not less than 36 inches (914 mm) measured in the direction of travel. The slope at exterior landings shall not exceed $\frac{1}{4}$ unit vertical in 12 units horizontal (2 percent).

Exception: Exterior balconies less than 60 square feet (5.6 m²) and only *accessed* from a door are permitted to have a landing that is less than 36 inches (914 mm) measured in the direction of travel.

~~R311.3.1~~ **R310.3.1 Floor elevations at the required egress doors.** Landings or finished floors at the required egress door shall be not more than $1\frac{1}{2}$ inches (38 mm) lower than the top of the threshold.

Exception: The landing or floor on the exterior side shall be not more than $7\frac{3}{4}$ inches (196 mm) below the top of the threshold provided that the door does not swing over the landing or floor.

Where exterior landings or floors serving the required egress door are not at *grade*, they shall be provided with access to *grade* by means of a ramp in accordance with Section R311.8 or a stairway in accordance with Section R311.7.

~~R311.3.2~~ **R310.3.2 Floor elevations at other exterior doors.** Doors other than the required egress door shall be provided with landings or floors not more than $7\frac{3}{4}$ inches (196 mm) below the top of the threshold.

Exception: A top landing is not required where a stairway of not more than two risers is located on the exterior side of the door, provided that the door does not swing over the stairway.

~~R311.3.3~~ R310.3.3 Storm and screen doors. Storm and screen doors shall be permitted to swing over exterior stairs and landings.

~~R311.4~~ R310.4 Vertical egress. Egress from habitable levels including habitable attics and *basements* that are not provided with an egress door in accordance with Section R311.2 shall be by a ramp in accordance with Section R311.8 or a stairway in accordance with Section R311.7.

~~R311.6~~ R310.5 Hallways. The width of a hallway shall be not less than 3 feet (914 mm).

~~R310.1~~ R310.6 Emergency escape and rescue opening required. *Basements, habitable attics* and every sleeping room shall have not less than one operable emergency escape and rescue opening. Where *basements* contain one or more sleeping rooms, an emergency escape and rescue opening shall be required in each sleeping room. Emergency escape and rescue openings shall open directly into a public way, or to a *yard* or court that opens to a public way.

Exceptions:

1. Storm shelters and *basements* used only to house mechanical *equipment* not exceeding a total floor area of 200 square feet (18.58 m²).
2. Where the *dwelling* or *townhouse* is equipped with an automatic sprinkler system installed in accordance with Section P2904, sleeping rooms in basements shall not be required to have emergency escape and rescue openings provided that the basement has one of the following:
 - 2.1. One means of egress complying with ~~Section R311~~ Sections R310.2 through R310.6 and one emergency escape and rescue opening.
 - 2.2. Two means of egress complying with ~~Section R311~~ Sections R310.2 through R310.6.

~~R310.1.1~~ R310.6.1 Operational constraints and opening control devices. Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys, tools or special knowledge. Window opening control devices on windows serving as a required emergency escape and rescue opening shall comply with ASTM F2090.

~~R310.2~~ R310.7 Emergency escape and rescue openings. Emergency escape and rescue openings shall have minimum dimensions as specified in this section.

~~R310.2.1~~ R310.7.1 Minimum opening area. Emergency and escape rescue openings shall have a net clear opening of not less than 5.7 square feet (0.530 m²). The net clear opening dimensions required by this section shall be obtained by the normal operation of the emergency escape and rescue opening from the inside. The net clear height of the opening shall be not less than 24 inches (610 mm) and the net clear width shall be not less than 20 inches (508 mm).

Exception: *Grade floor openings* or *below-grade openings* shall have a net clear opening area of not less than 5 square feet (0.465 m²).

~~R310.2.2~~ R310.7.2 Window sill height. Where a window is provided as the emergency escape and rescue opening, it shall have a sill height of not more than 44 inches (1118 mm) above the floor; where the sill height is below *grade*, it shall be provided with a window well in accordance with ~~Section R310.2.3~~ R310.7.3.

~~R310.2.3~~ R310.7.3 Window wells. The horizontal area of the window well shall be not less than 9 square feet

(0.9 m²), with a horizontal projection and width of not less than 36 inches (914 mm). The area of the window well shall allow the emergency escape and rescue opening to be fully opened.

Exception: The ladder or steps required by Section ~~R310.2.3.1~~ R310.7.3.1 shall be permitted to encroach not more than 6 inches (152 mm) into the required dimensions of the window well.

~~R310.2.3.1~~ R310.7.3.1 Ladder and steps. Window wells with a vertical depth greater than 44 inches (1118 mm) shall be equipped with a permanently affixed ladder or steps usable with the window in the fully open position. Ladders or steps required by this section shall not be required to comply with Section R311.7. Ladders or rungs shall have an inside width of not less than 12 inches (305 mm), shall project not less than 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center vertically for the full height of the window well.

~~R310.2.3.2~~ R310.7.3.2 Drainage. Window wells shall be designed for proper drainage by connecting to the building's foundation drainage system required by Section R405.1 or by an approved alternative method.

Exception: A drainage system for window wells is not required where the foundation is on well-drained soil or sand-gravel mixture soils in accordance with the United Soil Classification System, Group I Soils, as detailed in Table R405.1.

~~R310.2.4~~ R310.7.4 Emergency escape and rescue openings under decks and porches. Emergency escape and rescue openings installed under decks and porches shall be fully openable and provide a path not less than 36 inches (914 mm) in height to a *yard* or court.

~~R310.2.5~~ R310.7.5 Replacement windows. Replacement windows installed in buildings meeting the scope of this code shall be exempt from the maximum sill height requirements of Section ~~R310.2.2~~ R310.7.2 and the requirements of Section ~~R310.2.1~~ R310.7.1, provided that the replacement window meets the following conditions:

1. The replacement window is the manufacturer's largest standard size window that will fit within the existing frame or existing rough opening. The replacement window is of the same operating style as the existing window or a style that provides for an equal or greater window opening area than the existing window.
2. The replacement window is not part of a change of occupancy.

~~R310.3~~ R310.8 Emergency escape and rescue doors. Where a door is provided as the required emergency escape and rescue opening, it shall be a side-hinged door or a slider. Where the opening is below the adjacent grade, it shall be provided with an area well.

~~R310.3.1~~ R310.8.1 Minimum door opening size. The minimum net clear height opening for any door that serves as an emergency and escape rescue opening shall be in accordance with Section ~~R310.2.1~~ R310.7.1.

~~R310.3.2~~ R310.8.2 Area wells. Area wells shall have a width of not less than 36 inches (914 mm). The area well shall be sized to allow the emergency escape and rescue door to be fully opened.

~~R310.3.2.1~~ R310.8.2.1 Ladder and steps. Area wells with a vertical depth greater than 44 inches (1118 mm) shall be equipped with a permanently affixed ladder or steps usable with the door in the fully open position. Ladders or steps required by this section shall not be required to comply with Section R311.7. Ladders or rungs shall have an inside width of not less than 12 inches (305 mm), shall project not less than 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center vertically for the full height of the exterior stairwell.

~~R310.3.2.2~~ R310.8.2.2 Drainage. Area wells shall be designed for proper drainage by connecting to the building's foundation drainage system required by Section R405.1 or by an *approved* alternative method.

Exception: A drainage system for area wells is not required where the foundation is on well-drained soil or sand-gravel mixture soils in accordance with the United Soil Classification System, Group I Soils, as detailed in Table R405.1.

~~R310.4~~ R310.9 Bars, grilles, covers and screens. Where bars, grilles, covers, screens or similar devices are placed over emergency escape and rescue openings, area wells, or window wells, the minimum net clear opening size shall comply with Sections ~~R310.2.1~~ R310.7.1 through ~~R310.2.3~~ R310.7.3, and such devices shall be releasable or removable from the inside without the use of a key, tool, special knowledge or force greater than that required for the normal operation of the escape and rescue opening.

~~R310.5~~ R310.10 Dwelling additions. Where *dwelling additions* contain sleeping rooms, an emergency escape and rescue opening shall be provided in each new sleeping room. Where *dwelling additions* have *basements*, an emergency escape and rescue opening shall be provided in the new *basement*.

Exceptions:

1. An emergency escape and rescue opening is not required in a new *basement* that contains a sleeping room with an emergency escape and rescue opening.
2. An emergency escape and rescue opening is not required in a new *basement* where there is an emergency escape and rescue opening in an existing *basement* that is *accessed* from the new *basement*.

~~R310.6~~ R310.11 Alterations or repairs of existing basements. An emergency escape and rescue opening is not required where existing *basements* undergo alterations or repairs.

Exception: New sleeping rooms created in an existing *basement* shall be provided with emergency escape and rescue openings in accordance with Section ~~R310.1~~ R310.6.

SECTION R311

MEANS OF EGRESS STAIRWAYS AND RAMPS

Add new text as follows:

R311.1 Stairways. *Stairways* shall comply with Sections R311.1.1 through R311.12.2

Revise as follows:

~~R311.7.1~~ R311.1.1 Width. Stairways shall be not less than 36 inches (914 mm) in clear width at all points above the permitted handrail height and below the required headroom height. The clear width of stairways at and below the handrail height, including treads and landings, shall be not less than 31¹/₂ inches (787 mm) where a handrail is installed on one side and 27 inches (698 mm) where handrails are installed on both sides.

Exception: The width of spiral stairways shall be in accordance with Section ~~R311.7.10.1~~ R311.1.10.1.

~~R311.7.2~~ R311.1.2 Headroom. The headroom in stairways shall be not less than 6 feet 8 inches (2032 mm) measured vertically from the sloped line adjoining the tread nosing or from the floor surface of the landing or platform on that portion of the stairway.

Exceptions:

1. Where the nosings of treads at the side of a flight extend under the edge of a floor opening through which the stair passes, the floor opening shall not project horizontally into the

required headroom more than $4\frac{3}{4}$ inches (121 mm).

2. The headroom for spiral stairways shall be in accordance with Section ~~R311.7.10.1~~.
R311.1.10.1.

~~R311.7.3~~ R311.1.3 Vertical rise. A flight of stairs shall not have a vertical rise larger than 151 inches (3835 mm) between floor levels or landings.

~~R311.7.4~~ R311.1.4 Walkline. The walkline across winder treads and landings shall be concentric to the turn and parallel to the direction of travel entering and exiting the turn. The walkline shall be located 12 inches (305 mm) from the inside of the turn. The 12-inch (305 mm) dimension shall be measured from the widest point of the clear stair width at the walking surface. Where winders are adjacent within a flight, the point of the widest clear stair width of the adjacent winders shall be used.

~~R311.7.5~~ R311.1.5 Stair treads and risers. Stair treads and risers shall meet the requirements of this section. For the purposes of this section, dimensions and dimensioned surfaces shall be exclusive of carpets, rugs or runners.

~~R311.7.5.1~~ R311.1.5.1 Risers. The riser height shall be not more than $7\frac{3}{4}$ inches (196 mm). The riser shall be measured vertically between leading edges of the adjacent treads. The greatest riser height within any flight of stairs shall not exceed the smallest by more than $\frac{3}{8}$ inch (9.5 mm). Risers shall be vertical or sloped from the underside of the nosing of the tread above at an angle not more than 30 degrees (0.51 rad) from the vertical. At open risers, openings located more than 30 inches (762 mm), as measured vertically, to the floor or grade below shall not permit the passage of a 4-inch-diameter (102 mm) sphere.

Exceptions:

1. The opening between adjacent treads is not limited on spiral stairways.
2. The riser height of spiral stairways shall be in accordance with Section ~~R311.7.10.1~~.
R311.1.10.1.

~~R311.7.5.2~~ R311.1.5.2 Treads. The tread depth shall be not less than 10 inches (254 mm). The tread depth shall be measured horizontally between the vertical planes of the foremost projection of adjacent treads and at a right angle to the tread's leading edge. The greatest tread depth within any flight of stairs shall not exceed the smallest by more than $\frac{3}{8}$ inch (9.5 mm).

~~R311.7.5.2.1~~ R311.1.5.2.1 Winder treads. Winder treads shall have a tread depth of not less than 10 inches (254 mm) measured between the vertical planes of the foremost projection of adjacent treads at the intersections with the walkline. Winder treads shall have a tread depth of not less than 6 inches (152 mm) at any point within the clear width of the stair. Within any flight of stairs, the largest winder tread depth at the walkline shall not exceed the smallest winder tread by more than $\frac{3}{8}$ inch (9.5 mm). Consistently shaped winders at the walkline shall be allowed within the same flight of stairs as rectangular treads and shall not be required to be within $\frac{3}{8}$ inch (9.5 mm) of the rectangular tread depth.

Exception: The tread depth at spiral stairways shall be in accordance with Section ~~R311.7.10.1~~.
R311.1.10.1.

~~R311.7.5.3~~ R311.1.5.3 Nosings. Nosings at treads, landings and floors of stairways shall have a radius of curvature at the nosing not greater than $\frac{9}{16}$ inch (14 mm) or a bevel not greater than $\frac{1}{2}$ inch (12.7 mm). A nosing projection not less than $\frac{3}{4}$ inch (19 mm) and not more than $1\frac{1}{4}$ inches (32 mm) shall be provided on stairways. The greatest nosing projection shall not exceed the smallest nosing projection by more than $\frac{3}{8}$ inch (9.5 mm) within a stairway.

Exception: A nosing projection is not required where the tread depth is not less than 11 inches (279 mm).

R311.7.5.4 R311.1.5.4 Exterior plastic composite stair treads. Plastic composite exterior stair treads shall comply with the provisions of this section and Section R507.2.2.

R311.7.6 R311.1.6 Landings for stairways. There shall be a floor or landing at the top and bottom of each stairway. The width perpendicular to the direction of travel shall be not less than the width of the flight served. For landings of shapes other than square or rectangular, the depth at the walk line and the total area shall be not less than that of a quarter circle with a radius equal to the required landing width. Where the stairway has a straight run, the depth in the direction of travel shall be not less than 36 inches (914 mm).

Exception: A floor or landing is not required at the top of an interior flight of stairs, including stairs in an enclosed garage, provided that a door does not swing over the stairs.

R311.7.7 R311.1.7 Stairway walking surface. The walking surface of treads and landings of stairways shall be sloped not steeper than one unit vertical in 48 inches horizontal (2-percent slope).

R311.7.8 R311.1.8 Handrails. Handrails shall be provided on not less than one side of each flight of stairs with four or more risers.

R311.7.8.1 R311.1.8.1 Height. Handrail height, measured vertically from the sloped plane adjoining the tread nosing, or finish surface of ramp slope, shall be not less than 34 inches (864 mm) and not more than 38 inches (965 mm).

Exceptions:

1. The use of a volute, turnout or starting easing shall be allowed over the lowest tread.
2. Where handrail fittings or bendings are used to provide continuous transition between flights, transitions at winder treads, the transition from handrail to *guard*, or used at the start of a flight, the handrail height at the fittings or bendings shall be permitted to exceed 38 inches (956 mm).

R311.7.8.2 R311.1.8.2 Handrail projection. Handrails shall not project more than 4¹/₂ inches (114 mm) on either side of the stairway.

Exception: Where nosings of landings, floors or passing flights project into the stairway reducing the clearance at passing handrails, handrails shall project not more than 6¹/₂ inches (165 mm) into the stairway, provided that the stair width and handrail clearance are not reduced to less than that required.

R311.7.8.3 R311.1.8.3 Handrail clearance. Handrails adjacent to a wall shall have a space of not less than 1¹/₂ inches (38 mm) between the wall and the handrails.

R311.7.8.4 R311.1.8.4 Continuity. Handrails shall be continuous for the full length of the flight, from a point directly above the top riser of the flight to a point directly above the lowest riser of the flight. Handrail ends shall be returned or shall terminate in newel posts or safety terminals.

Exceptions:

1. Handrail continuity shall be permitted to be interrupted by a newel post at a turn in a flight with winders, at a landing, or over the lowest tread.
2. A volute, turnout or starting easing shall be allowed to terminate over the lowest tread.

R311.7.8.5 R311.1.8.5 Grip size. Required handrails shall be of one of the following types or provide equivalent graspability.

1. Type I. Handrails with a circular cross section shall have an outside diameter of not less than 1¹/₄ inches (32 mm) and not greater than 2 inches (51 mm). If the handrail is not circular, it shall have a perimeter of not less than 4 inches (102 mm) and not greater than 6¹/₄ inches (160 mm) and a cross section of not more than 2¹/₄ inches (57 mm). Edges shall have a radius of not less than 0.01 inch (0.25 mm).
2. Type II. Handrails with a perimeter greater than 6¹/₄ inches (160 mm) shall have a graspable finger recess area on both sides of the profile. The finger recess shall begin within ³/₄ inch (19 mm) measured vertically from the tallest portion of the profile and have a depth of not less than ⁵/₁₆ inch (8 mm) within ⁷/₈ inch (22 mm) below the widest portion of the profile. This required depth shall continue for not less than ³/₈ inch (10 mm) to a level that is not less than 1³/₄ inches (45 mm) below the tallest portion of the profile. The width of the handrail above the recess shall be not less than 1¹/₄ inches (32 mm) and not more than 2³/₄ inches (70 mm). Edges shall have a radius of not less than 0.01 inch (0.25 mm).

~~R311.7.8.6~~ ~~R311.1.8.6~~ Exterior plastic composite handrails. Plastic composite exterior handrails shall comply with the requirements of Section R507.2.2.

~~R311.7.9~~ ~~R311.1.9~~ Illumination. Stairways shall be provided with illumination in accordance with Sections R303.7 and R303.8.

~~R311.7.10~~ ~~R311.1.10~~ Special stairways. Spiral stairways and bulkhead enclosure stairways shall comply with the requirements of Section ~~R311.7~~ ~~R311.1~~ except as specified in Sections ~~R311.7.10.1~~ ~~R311.1.10.1~~ and ~~R311.7.10.2~~ ~~R311.1.10.2~~.

~~R311.7.10.1~~ ~~R311.1.10.1~~ Spiral stairways. The clear width at and below the handrails at spiral stairways shall be not less than 26 inches (660 mm) and the walkline radius shall be not greater than 24¹/₂ inches (622 mm). Each tread shall have a depth of not less than 6³/₄ inches (171 mm) at the walkline. Treads shall be identical, and the rise shall be not more than 9¹/₂ inches (241 mm). Headroom shall be not less than 6 feet 6 inches (1982 mm).

~~R311.7.10.2~~ ~~R311.1.10.2~~ Bulkhead enclosure stairways. Stairways serving bulkhead enclosures, not part of the required building egress, providing access from the outside *grade* level to the *basement* shall be exempt from the requirements of Sections ~~R311.3~~ ~~R310.3~~ and ~~R311.7~~ ~~R311.1~~ where the height from the *basement* finished floor level to *grade* adjacent to the stairway is not more than 8 feet (2438 mm) and the *grade* level opening to the stairway is covered by a bulkhead enclosure with hinged doors or other *approved* means.

~~R311.7.11~~ ~~R311.1.11~~ Alternating tread devices. Alternating tread devices shall not be used as an element of a means of egress. Alternating tread devices shall be permitted provided that a required means of egress stairway or ramp serves the same space at each adjoining level or where a means of egress is not required. The clear width at and below the handrails shall be not less than 20 inches (508 mm).

Exception: Alternating tread devices are allowed to be used as an element of a means of egress for lofts, mezzanines and similar areas of 200 gross square feet (18.6 m²) or less where such devices do not provide exclusive access to a kitchen or bathroom.

~~R311.7.11.1~~ ~~R311.1.11.1~~ Treads of alternating tread devices. Alternating tread devices shall have a tread depth of not less than 5 inches (127 mm), a projected tread depth of not less than 8¹/₂ inches (216 mm), a tread width of not less than 7 inches (178 mm) and a riser height of not more than 9¹/₂ inches (241 mm). The tread depth shall be measured horizontally between the vertical planes of the foremost projections of adjacent treads. The riser height shall be measured vertically between the leading edges of adjacent treads. The riser height and tread depth provided shall result in an angle of ascent from the horizontal of between 50 and 70 degrees (0.87 and 1.22 rad). The initial tread of the device shall begin at the same elevation as the platform, landing or floor surface.

~~R311.7.11.2 R311.1.11.2~~ **Handrails of alternating tread devices.** Handrails shall be provided on both sides of alternating tread devices and shall comply with Sections ~~R311.7.8.2 R311.1.8.2 to R311.7.8.6. R311.1.8.6.~~ Handrail height shall be uniform, not less than 30 inches (762 mm) and not more than 34 inches (864 mm).

~~R311.7.12 R311.1.12~~ **Ships ladders.** Ships ladders shall not be used as an element of a means of egress. Ships ladders shall be permitted provided that a required means of egress stairway or ramp serves the same space at each adjoining level or where a means of egress is not required. The clear width at and below the handrails shall be not less than 20 inches.

Exception: Ships ladders are allowed to be used as an element of a means of egress for lofts, mezzanines and similar areas of 200 gross square feet (18.6 m²) or less that do not provide exclusive access to a kitchen or bathroom.

~~R311.7.12.1 R311.1.12.1~~ **Treads of ships ladders.** Treads shall have a depth of not less than 5 inches (127 mm). The tread shall be projected such that the total of the tread depth plus the nosing projection is not less than 8¹/₂ inches (216 mm). The riser height shall be not more than 9¹/₂ inches (241 mm).

~~R311.7.12.2 R311.1.12.2~~ **Handrails of ships ladders.** Handrails shall be provided on both sides of ships ladders and shall comply with Sections ~~R311.7.8.2 R311.1.8.2 to R311.7.8.6. R311.1.8.6.~~ Handrail height shall be uniform, not less than 30 inches (762 mm) and not more than 34 inches (864 mm).

Add new text as follows:

~~R311.2 Ramps.~~ *Ramps shall comply with Sections R311.2.1 through R311.2.3.3.*

Revise as follows:

~~R311.8.1 R311.2.1~~ **Maximum slope.** Ramps serving the egress door required by Section R311.2 shall have a slope of not more than 1 unit vertical in 12 units horizontal (8.3-percent slope). Other ramps shall have a maximum slope of 1 unit vertical in 8 units horizontal (12.5 percent).

Exception: Where it is technically infeasible to comply because of site constraints, ramps shall have a slope of not more than 1 unit vertical in 8 units horizontal (12.5 percent).

~~R311.8.2 R311.2.2~~ **Landings required.** There shall be a floor or landing at the top and bottom of each ramp, where doors open onto ramps, and where ramps change directions. The width of the landing perpendicular to the ramp slope shall be not less than 36 inches (914 mm).

~~R311.8.3 R311.2.3~~ **Handrails required.** Handrails shall be provided on not less than one side of ramps exceeding a slope of one unit vertical in 12 units horizontal (8.33-percent slope).

~~R311.8.3.1 R311.2.3.1~~ **Height.** Handrail height, measured above the finished surface of the ramp slope, shall be not less than 34 inches (864 mm) and not more than 38 inches (965 mm).

~~R311.8.3.2 R311.2.3.2~~ **Grip size.** Handrails on ramps shall comply with Section ~~R311.7.8.5. R311.1.8.5.~~

~~R311.8.3.3 R311.2.3.3~~ **Continuity.** Handrails where required on ramps shall be continuous for the full length of the ramp. Handrail ends shall be returned or shall terminate in newel posts or safety terminals. Handrails adjacent to a wall shall have a space of not less than 1¹/₂ inches (38 mm) between the wall and the handrails.

Reason: This proposal reorganizes two sections R310 and R311. The intent is to consolidate the different types of egress (Egress Doors, Emergency Escape Windows and Emergency Escape Doors) under one section, Means of Egress and separate Stairways and Ramps into their own section. The deletion of section "R311.5 Landing, deck, balcony and stair construction and attachment" removes a section that is addressed better and

in more detail in other sections of the code.

Separating Stairs and Ramps into their own section clears up the hierarchy and when to apply the codes. Having to look for stair and ramp requirements under means of egress can imply these requirements do not apply to garage or deck stairs as they are not part of the means of egress.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal reorganizes the code.

Proposal # 5641

RB117-19

RB118-19

IRC@: R312.1.1

Proponent: donald sivigny, State of MN, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Residential Code

Revise as follows:

R312.1.1 Where required. *Guards* shall be provided for those portions of open-sided walking surfaces, including floors, stairs, ramps and landings, that are located more than 30 inches (762 mm) measured vertically to the floor or *grade* below at any point within 36 inches (914 mm) horizontally to the edge of the open side. Insect screening shall not be considered as a *guard*.

Reason: The first sentence of the IRC, section R312.1.1, is revised by deleting the phrase “walking surfaces, including” and replacing it with the word “floors.” As amended, guards are required along open-sided floors, stairs, ramps, and landings when they are located more than 30 inches vertically to the floor or grade below. This change is necessary because the term “walking surfaces” is too broad and can be misinterpreted to apply to almost any surface on or in a building or a lot. This requirement could be interpreted to mean that guards are required to be installed around window wells, on the top of retaining walls, along driveways and sidewalks, on landings near window wells, at the edge of swimming pools, and even at the edge of flat roofs. It is reasonable to use terms that are currently defined and that will best convey the intent of the requirement.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Depending on interpretation this code clarification may even save costs.

Proposal # 5057

RB118-19

RB119-19

IRC@: R312.1.2, R312.1.3

Proponent: Kevin Duerr-Clark, representing NYS Department of State (kevin.duerr-clark@dos.ny.gov); Gary Traver, representing NYS Department of State (gary.traver@dos.ny.gov)

2018 International Residential Code

Revise as follows:

R312.1.2 Height. ~~Required~~ Where installed, *guards* at open-sided walking surfaces, including stairs, porches, balconies or landings, shall be not less than 36 inches (914 mm) in height as measured vertically above the adjacent walking surface or the line connecting the *nosings*.

Exceptions:

1. *Guards* on the open sides of stairs shall have a height of not less than 34 inches (864 mm) measured vertically from a line connecting the *nosings*.
2. Where the top of the *guard* serves as a handrail on the open sides of stairs, the top of the *guard* shall be not less than 34 inches (864 mm) and not more than 38 inches (965 mm) as measured vertically from a line connecting the *nosings*.

R312.1.3 Opening limitations. ~~Required~~ Where installed, *guards* shall not have openings from the walking surface to the required *guard* height that allow passage of a sphere 4 inches (102 mm) in diameter.

Exceptions:

1. The triangular openings at the open side of stair, formed by the riser, tread and bottom rail of a *guard*, shall not allow passage of a sphere 6 inches (153 mm) in diameter.
2. *Guards* on the open side of stairs shall not have openings that allow passage of a sphere $4\frac{3}{8}$ inches (111 mm) in diameter.

Reason: The way the language is currently written, only required guards need to meet the height and opening limitations. Meaning guards on a low (30 inches or less above grade) deck, installed voluntarily as a design choice, are permitted to be lower than 36-inches and with openings which would allow small children to get caught in. Just like many other code provisions, if a component is installed, whether it is required or not, it should meet the safety requirements of the code instead of providing a false sense of security.

Cost Impact: The code change proposal will increase the cost of construction. This change will likely marginally increase the cost of construction for those elevated walking surfaces that are 30 inches or less that voluntarily choose to install guards.

Proposal # 4168

RB119-19

RB120-19

IRC®: R312.2.1

Proponent: donald sivigny, State of MN, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Residential Code

Revise as follows:

R312.2.1 ~~Window sills. Lowest part of window openings.~~ In dwelling units, where the ~~top~~lowest part of the sill opening of an operable window opening is located ~~less than 24 inches (610 mm) above the finished floor and greater than more than~~ 72 inches (1829 mm) above the finished grade or other walking surface below on the exterior of the building, the operable window shall comply with one of the following below, the lowest part of the window opening shall be not less than 36 inches (914 mm) above the finished floor of the room in which the window is located.

Exceptions:

1. Operable ~~window openings~~windows that will not allow a 4-inch- diameter (102 mm) sphere to pass through where the openings are in their largest opened position.
2. Operable windows with openings that are provided with window fall prevention devices that comply with ASTM F2090.
3. Operable windows with openings that are provided with window opening control devices that comply with Section R312.2.
4. Replacement windows where the lowest part of the opening is not lower than that of the existing window and the maximum width of the opening of the replacement window does not exceed that of the existing window.

Reason: The first sentence of IRC, section R312.2.1, deletes the IRC language “the lowest part of the clear opening of the window” and replaces it with the phrase “the lowest part of the window opening.” The IRC Technical Advisory Group (TAG) determined that “the lowest part of the window opening” meant the same thing as “lowest part of the clear opening.” The proposed text “lowest part of the window opening” is also consistent with the proposed definition for “sill height” in Code Section 202 (definitions), which clarifies the meaning of sill height pertaining to emergency escape and rescue openings. The first sentence also replaces the phrase “24 inch above finished floor” with “36 inches above the floor.” The 24- and 36-inch dimensions are heights that establish a threshold at which the window fall protection requirements are required. The threshold dimension in the current code is set at 24 inches. The IRC sets this dimension at 24 inches, while the IBC sets this dimension at 36 inches. This threshold dimension must be coordinated between the two codes to provide consistent application and enforcement in residential construction. Windows installed having the lowest part of the window opening below this threshold will require window fall protection compliance. The TAG determined that the 36-inch dimension is reasonable because it will provide increased life safety for occupants since raising the threshold dimension from 24 to 36 inches will require more windows to be fall protection compliant. Requiring more windows to have fall protection devices installed will provide increased life safety to more occupants, especially children. Additionally, these more restrictive requirements are consistent with the intent of codes which require compliance with the standards for window fall protection devices established in the Codes. The proposed exception #4 is added to exempt replacement windows from the window fall protection requirements. The TAG determined that requiring window fall protection devices in replacement windows would mandate retroactive code compliance for existing structures. Typically, the code is not retroactive for existing structures, with the exception of smoke alarms and safety glazing. If homeowners of existing homes are required to add safety devices that must comply with ASTM F 2090, they may not be as likely to replace

windows that trigger this requirement. It is not reasonable to require window fall protection safety devices that may discourage homeowners from replacing old windows that are broken or painted shut.

There will be an increase to the overall cost of windows in a comparable residential unit. Double-hung windows are currently dominant in the market in sizes that would be most likely be affected by adding a window fall protection device would cost about \$30.00 per window. On casement windows, which currently have a smaller share of the market, adding a window fall protection device would increase the cost by approximately \$100.00 per window.

Cost Impact: The code change proposal will increase the cost of construction

Yes there will be a cost increase for some windows depending on the locations where they are installed, however, these more restrictive requirements are being incorporated into the proposed code to provide for increased life safety for the occupants, to coordinate the provisions of the IBC and IRC, and to provide a more consistent application and enforcement between the Codes in Residential construction in both the IBC and the IRC.

Proposal # 5062

RB120-19

RB121-19

IRC@: R312.2.1

Proponent: Timothy Pate, Colorado Chapter Code Change Committee, representing City and County of Broomfield (tpate@broomfield.org)

2018 International Residential Code

Revise as follows:

R312.2.1 Window ~~sills~~-opening height. In dwelling units, where the ~~top-bottom~~ of the ~~sill-clear opening~~ of an operable window opening is located less than 24 inches (610 mm) above the finished floor and greater than 72 inches (1829 mm) above the finished *grade* or other surface below on the exterior of the building, the operable window shall comply with one of the following:

1. Operable window openings will not allow a 4-inch-diameter (102 mm) sphere to pass through where the openings are in their largest opened position.
2. Operable windows are provided with window fall prevention devices that comply with ASTM F2090.
3. Operable windows are provided with window opening control devices that comply with Section R312.2.2.

Reason: This proposal is to change the language on how to measure when you need to protect for child fall protection. Since there is not a definition of sill and typically a window sill is lower than the actual bottom of window opening the language should reflect measuring to the bottom of the actual window opening. This language was changed in the 2015 as a part of a larger change with no apparent reason for this language. I have written a companion change to IRC Section R310.2.2 for egress window heights. This language will now match the revised language that was approved by membership for section IBC 1015.8 as per code change E80-2021

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal is to help clarify the intent of the code

Proposal # 4520

RB121-19

RB122-19

IRC@: R312.2.1

Proponent: Norman Clark, representing Self

2018 International Residential Code

Revise as follows:

R312.2.1 Window sills. In dwelling units, where the top of the sill of an operable window opening is located less than 24 inches (610 mm) above the finished floor or any other horizontal surface below that is within the framed opening of the window, and greater than 72 inches (1829 mm) above the finished *grade* or other surface below on the exterior of the building, the operable window shall comply with one of the following:

1. Operable window openings will not allow a 4-inch-diameter (102 mm) sphere to pass through where the openings are in their largest opened position.
2. Operable windows are provided with window fall prevention devices that comply with ASTM F2090.
3. Operable windows are provided with window opening control devices that comply with Section R312.2.2.

Reason: The National SAFE KIDS campaign indicate that 4,700 children annually in the United States require treatment following a fall from a window. About 18 of these children die from such falls. ASTM F2090 is referenced as a required step in the prevention side with fall protection devices and their installation requirements, but now we need to go a step further. The U.S. Consumer Product Safety Commission studies reported that the majority of child falls occurred from the first and second floors. When the requirement for fall protection came in with the 72 inch above grade or exterior surface below requirement, and the 24 inch interior height above finish floor, there was one thing missing.....Built in Furnishings, such as window seats. We have seen many plans submitted for permits with window seats that are 18 inches maximum above the finished floor. This is a height that a child can climb up onto, and now we have a walking surface with the window sill height only inches above. It is understood that anyone can move a piece of furniture such as a hope chest or table under the window sill, but we are not here to monitor what people will do after the fact, we are hear to educate, along with establishing codes that help protect and save lives. We are here to make places where we live, work, educate, assemble, etc. safer. Having this requirement in the body of the code is a step closer to bringing that 4,700 statistic down.

This entire issue hit close to home when an employees child fell from the second floor of a dwelling. My Plumbing Inspectors child had pushed the screen of an opened window toppling out the window and landing in an empty hot tub that was up against the house. This was due to a bed being pushed up against the window. This child was hospitalized for approximately a month with severe head and liver injuries. If the hot tub hadn't been there, a concrete patio is where he would have landed. The outcome could have been much more grim than it was. Children are curious and they do not recognize danger. They like to climb and explore, and they are top heavy with their center of gravity up near their chest. By inserting this text into section R312.2.1, we are establishing fall protection when window seats or furnishings are constructed below the window. If a window sill happens to be 27 inches above the finish floor and a window seat is constructed at 18 inches above the finish floor, we now have a walking surface with the window sill 9 inches above (see Exhibit A), well below their center of gravity. This is a prime opportunity for a child to get in trouble. By inserting this text in to R312.2.1 for any horizontal surface constructed beneath the window, we are reducing the opportunity for a child to fall. To keep the a child's center of gravity below the windows edge, we have to require the 24 inch requirement from ANY horizontal surface that they can climb upon. I personally know toddlers who can climb up on a 24 inch window seat with no effort at all.

It is very important that we educate the occupants of these dwellings on moving furniture in front of a window. But in addition to that, we can reduce the statistics by not permitting built in raised walking surfaces within 24 inches of the bottom of the window. Every study from the National Safety Council to Consumer Reports lists one of the main problems is furniture in front of a window. A report from WebMD and the American Academy of Pediatrics in 2011 (attached) mentions several times that a major preventer is keeping furniture away from windows. If this is the case, why would we allow these homes to be built with permanent furniture in front of a window without protection? If permanent furniture is to be built in front of a window, then the windows bottom edge needs to be 24 inches or greater above the permanent furnishings, or fall under the requirements of R312.2.1. We have a hard time enforcing R312.2.1 when window seats are constructed because code states only above the finish floor. Some will say that beings how a toddler can climb up on the seat and walk on it that is a walking surface. This doesn't work because there is no definition for a walking surface in the code. This is easily remedied by adding the text to R312.2.1.

American Academy
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Falls from Windows Injure Nearly 100,000 U.S. Children in 19-Year Period

10/22/2011

During a 19-year period, an estimated 98,145 children were treated in U.S. emergency departments for injuries sustained in falls from windows.

The study, "Pediatric Injuries Attributable to Falls from Windows in the United States in 1990-2008" is the first study to use a nationally representative sample to identify risk factors and trends for pediatric window fall-related injuries treated in US hospital emergency departments. The authors found that windows falls occur more frequently during spring and summer months. The rate of injury is higher for children younger than 5 years of age, and those children were more likely to sustain serious injuries. In addition to young age, a fall height of three stories or higher and a hard landing surface (such as concrete) increased the risk for serious injuries.

Window fall prevention measures for young children should include the use of window guards or window locks and **moving furniture away from windows** to decrease a young child's access. Another way to reduce injuries is to consider the surface below windows. Simply planting bushes or plant beds under windows can soften the landing surface, reducing impact and the resulting injuries.

5,000 kids a year hurt in falls from windows

The number of children treated in U.S. emergency departments for falls from windows approached 100,000 between 1990 and 2008, says a [study](#) in the journal *Pediatrics*. The research shows that the number of injuries declined during the first decade of the study period, but has since plateaued.

"We still are seeing over 5,000 children a year treated in hospital emergency departments across the country for injuries related to window falls, said Dr. Gary A. Smith, study author and director of the Center for Injury Research and Policy at Nationwide Children's Hospital in Columbus, Ohio. "That's 14 children a day. This continues to be a very common, important problem."

Researchers studied data from the [National Electronic Injury Surveillance System](#), maintained by the U.S. Consumer Product Safety Commission. The group monitors injuries involving consumer products, treated in emergency departments nationwide. Researchers divided data from almost 4,000 patients into two groups: 0-4 years and 5-17 years.

Boys were involved in more falls from windows than girls were. In addition, the younger children made up two-thirds of the injuries. The injury rate was highest at age 2.

"These are kids who don't recognize danger - they're curious, they want to explore and when they see an open window, they are going to investigate," Smith said. "Kids at that age tend to be top heavy. Their center of gravity is up near their chest and so as they lean out of the window to see what's going on, they'll topple."

Many of the young children experienced injuries to their head or face, and, often times, these led to hospitalization or death. On the other hand, children in the older group were more likely to have fractures to their arms or legs.

While a few children did fall from a third story or higher, many more fell from a first- or second-story window.

"What we're finding is that most of these aren't these really high-rise buildings," Smith added. "These are just often homes or apartments that aren't high-rise, where children live. This is a problem that extends to small towns and even rural areas across the country."

He reinforces the message that a screen does not offer protection and should give parents no feeling of comfort.

Smith, who is a pediatric emergency medicine physician, offers the following [advice](#) for parents.

Parents of children younger than 5:

- Use window guards or locks
- Do not allow any window to be open more than four inches
- Move furniture away from windows so children cannot climb on it

Parents of children older than 5:

- Educate children and teens of the risk of climbing out of a window or jumping from it

The authors also note that the landing surface made a difference. The patients who ended up on a cushioned surface often fared better than those who ended up on a hard surface.

"Our focus should be on preventing the child from falling in the first place, but cushioning the fall can help," Smith noted.

"If a child falls from a window and they land on bushes or a planted flower bed, that often is enough to cushion the fall so that they'll end up with bruises or scrapes instead of a severe injury," he said.

The study points out that great reductions were seen in [New York](#) and [Boston](#) after programs were implemented there to combat the problem. The programs involved education in the community and among parents. Window guards were also made available. In New York City, window guards became mandatory in apartments where young children lived.

"We know what works," Smith said. "We need to now go out and implement that."

Smith said there were limitations with the set of data, especially with fatality numbers, and therefore these numbers under represent the problem.

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Preventing Window Falls

Laela's Law, the first statewide window fall prevention legislation, references two ASTM standards

by Richard Wilhelm

On June 16, 2006, Laela Shaugobay, then not quite 2 years old, climbed on a piece of furniture pushed on an insect screen and fell from a fourth-floor apartment window in Franklin, Minn.

Laela was critically injured but survived the fall and has since fully recovered. However, statistics compiled by the National SAFE KIDS campaign indicate that Laela is one of approximately 4,700 children annually in the United States who require treatment following a fall from a window. According to these same statistics, about 18 children per year die from such falls.

Laela's case inspired action, which resulted in the 2007 passage of a Minnesota state law setting standards for stronger child fall prevention screens and other window fall prevention devices. Laela's Law, as it is now known, took effect in Minnesota on July 1 of this year.

Laela's Law is the first statewide window fall prevention law in the United States, and it could become a model for other state and municipal legislation. The Minnesota law references two ASTM International standards, [F2006](#), Safety Specification for Window Fall Prevention Devices for Non-Emergency Escape (Egress) and Rescue (Ingress) Windows, and [F2090](#), Specification for Window Fall Prevention Devices With Emergency Escape (Egress) Release Mechanisms.

Both standards were developed by Subcommittee F15.38 on Window Fall Prevention, part of ASTM International [Committee F15](#) on Consumer Products.

Kathryn Coen, product safety engineer, product safety and liability prevention group, Andersen Corp., and current chair of Subcommittee F15.38, says that F2006 and F2090 can be used in legislation and in building codes, as well as by individual parents who can purchase devices to comply to the standards for their own homes. “F15.38 wants to educate adults on the importance of window safety, and our standards play an important role in this,” says Coen.

History of Subcommittee F15.38

Subcommittee F15.38 was formed in 1995 following a roundtable meeting and a report issued by the U.S. Consumer Product Safety Commission that found that children age 5 and younger account for a high percentage of window fall fatalities and injuries.

The first standard approved by the subcommittee, F2006, applies strictly to fall prevention devices that protect against potential falls by children age 5 and under through open windows designated for emergency escape or rescue in installations more than 75 ft. (23 m) above ground level in multiple family dwellings. Windows at these heights are beyond the reach of rescue ladders currently in use.

With its second approved standard, F2090, Subcommittee F15.38 covers window fall prevention devices for windows situated up to 75 ft. (23 m) above ground. At this height level, windows have emergency escape release mechanisms, which needed to be taken into account in the standard.

According to its introduction, F2090 addresses window fall prevention devices that protect against potential falls by children age 5 years and under through open windows. The standard covers a variety of currently available window fall prevention devices, including window opening control devices, window fall prevention screens and some types of window guards, all of which use different strategies to prevent children from falling through open windows.

ASTM F2090 covers the general requirements, installation instructions and performance tests for window fall prevention devices, which are defined in the standard as “any device intended to prevent a young child from passing or falling through an open window.” The definition goes on to note that such devices may be an integral part of a window or may be attached to the window, its frame or the area around the window after the window has been installed. F2090 also includes examples of safety information panels to be used within assembly/installation instructions.

Window Fall Prevention Devices

Three types of window fall prevention devices described in the F15.38 standards are:

- Fall prevention window guard — Device designed to fit into or onto a window to prevent a child from passing or falling through an open window. Typically mounted on the interior frame of a window and includes side frames fastened to the sides of a window frame and a plurality of

spaced-apart, transverse, tubular, width-adjustable crosspiece elements to form a grid pattern between the side supports to prevent passage of a child.

- Window fall prevention screen — Screen device designed to fit into or onto a window to prevent a child from passing or falling through an open window. Typically mounted on the exterior surface/frame of a sliding style window and on the interior of a cranking style window and includes screening mesh or material and attachment mechanism(s) of sufficient strength to meet the performance requirements of this standard while preventing passage of a child.
- Window opening control device — Device that limits a window sash to be opened with normal operation of the sash such as to prohibit the free passage of a 4-in. (102-mm) diameter rigid sphere at the lowest opening portion of the window opening, with a release mechanism that shall allow the sash to be opened to a large opening area such as that required for emergency escape and rescue, and that automatically resets when a window is fully closed.

According to Coen, the subcommittee is currently in the process of updating F2090 and invites all interested parties to contribute to future revisions. “We are having ongoing virtual meetings to get everyone on the same page regarding potential updates to the standard,” says Coen.

“There is a wide range of subcommittee members, including parents whose children have been in window fall accidents, injury prevention and fire safety experts, building code officials, homebuilders, window manufacturers, makers of fall prevention devices and CPSC representatives,” says Coen, who notes that the subcommittee is particularly interested in having input from fire safety experts at this time.

Coen is hopeful that the use of F15.38 standards in building codes and in legislation such as Laela’s Law, along with continuing education and information dissemination, will help to lower the incidence of window falls in the future.

About 5,000 Kids Fall From Windows Each Year

Simple Prevention Measures Include Installing Locks, [Keeping Furniture Away From Windows](#)

By Jennifer Warner

Aug. 22, 2011 -- Falls from windows injure about 5,100 children on average each year in the U.S., and most could be prevented with simple window safety measures.

A new study shows an estimated 98,415 children were treated in hospital emergency rooms from 1990 to 2008 for injuries caused by falls from windows. Injuries ranged from cuts and bruises to fatal head injuries, and young children were most at risk for serious injuries.

Researchers say it's the first study to look at the risk factors and injuries associated with children's falls from windows. The results suggest that many of these injuries could be prevented with simple steps, [such as moving furniture away from windows](#), installing locks, and placing plant beds or bushes under windows.

Window Fall Risks

In the study, researchers analyzed information from a nationwide database of children treated in hospital emergency rooms over a 19-year period from 1990 to 2008.

Continue Reading Below

The results showed that an estimated 98,415 children were treated for injuries caused by a fall from a window during this period, an average of 5,180 per year.

Researchers found the following factors were associated with window falls:

- Boys were more likely than girls to fall out of windows and accounted for 58% of window fall injuries.
- Falls from windows were more common in spring and summer months.
- One-fourth of the window fall-related injuries required hospitalization.
- Children under 5 years were more likely to suffer serious injuries from a window fall and three times more likely to suffer a head injury.

The study also showed that the type of landing surface plays a major role in the severity of head injuries caused by window falls. Children who landed on a hard surface, such as concrete, were twice as likely to suffer head injuries, be hospitalized, or die from their injuries compared with those who landed on cushioned surfaces.

How to Improve Window Safety

Researchers say placing bushes or plant beds underneath windows can create a cushioned landing surface and reduce the impact of falls from windows for children of all ages.

WebMD Health News Reviewed by Laura J. Martin, MD on August 22, 2011

Sources

SOURCES:

Harris, V. *Pediatrics*, Aug. 22, 2011.

News release, American Academy of Pediatrics.

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Other steps to increase window safety include reducing access to windows by moving furniture away from windows and installing window guards or locks that prevent the window from opening more than 4 inches.

Although information about whether furniture was placed near the window was not available for 95% of the falls, researchers found 4% of window falls involved children rolling off beds or climbing on furniture before falling out a window.

Similarly, there was little information about whether a screen was in place at the time of the fall. But when this information was available, 83% reported that a screen was in place.

"Findings from other studies demonstrate that screens often are in place (up to 76% of the time) but do not provide adequate protection against window falls involving children," researcher Vaughn A. Harris, of the Center For Injury Research and Policy, The Research Institute at Nationwide Children's Hospital, in Columbus, Ohio, and colleagues write in *Pediatrics*. "Parents and other child caregivers should be counseled not to depend on screens to prevent children from falling out windows."

WebMD Health News Reviewed by Laura J. Martin, MD on August 22, 2011

Sources

SOURCES:

Harris, V. *Pediatrics*, Aug. 22, 2011.

News release, American Academy of Pediatrics.

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Horizontal Surface Below Window Sill

Scale - 1/2" = 1'-0" Code: 2018 IRC section R312.2.1

PROPOSED CHANGE. Added text to R312.2.1
Author: Norman Clark, CBO

Note #1

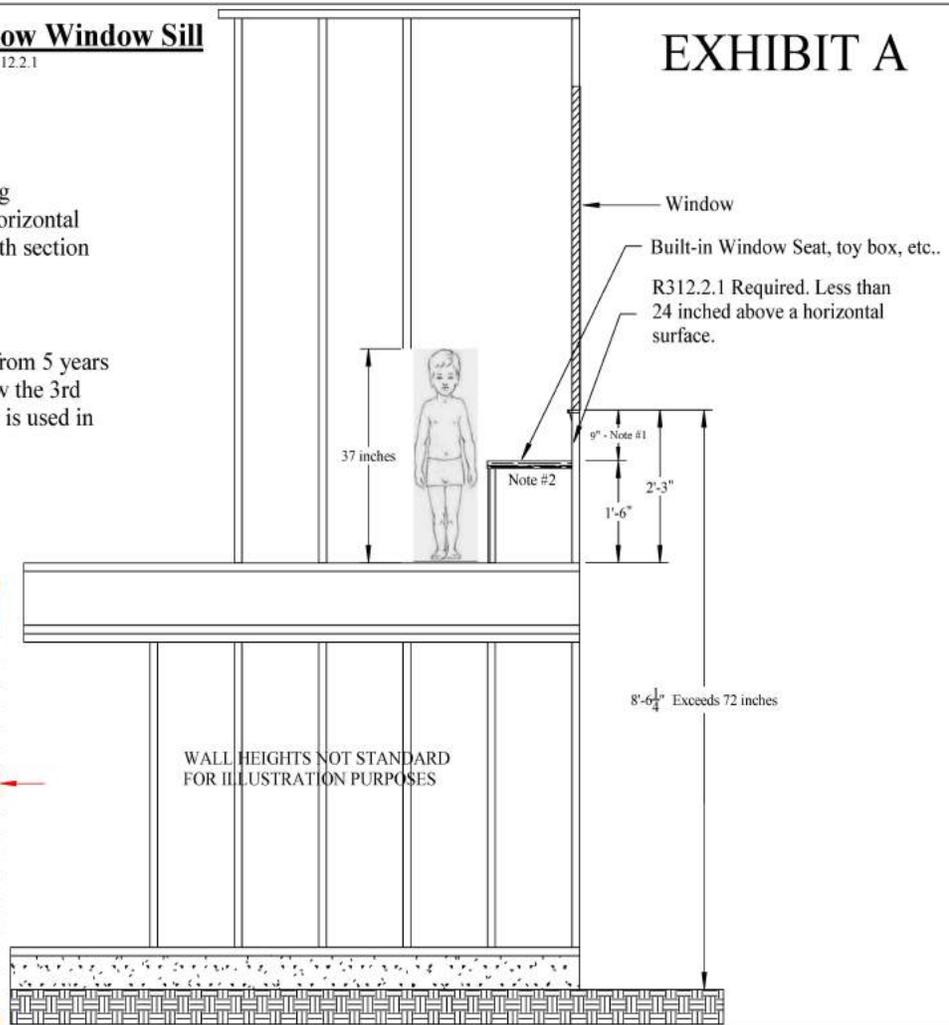
Lowest edge of window opening is less than 24 inches above a horizontal surface below. Must comply with section R312.2.1 of the IRC.

Note #2

The majority of child falls are from 5 years and younger and are from below the 3rd floor. 37 inches for a 4 year old is used in illustration and is to scale.

EXHIBIT A

Age	Height (Inches)	Weight (Pounds)
21 Months	26	25.79
22 Months	27	26.12
23 Months	29	26.57
2 years old	31	28.4
3 years old	33	33
4 years old	37	35-37
5 years old	40	41.8
6 years old	42	46.2
7 years old	44	50.6
8 years old	45	57.2
9 years old	49	61.6
10 years old	51	70.4
11 years old	52	77
12 - 13 years old	58 - 62	85 - 100
14 - 15 years old	63 - 66	105 - 125
16 - 17 years old	67 - 70	130 - 150



Bibliography: American Academy of Pediatrics, WebMD, National Safe Kids, U.S. Consumer Product Safety Commission, National Safety Council NSC, Consumer Reports

Cost Impact: The code change proposal will not increase or decrease the cost of construction. There would be minimal to no cost impact on this change.

Proposal # 3973

RB122-19

RB123-19

IRC®: SECTION R312 (New), R312.2 (New), R312.2.1 (New), R312.2.2 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

SECTION R312 GUARDS AND WINDOW FALL PROTECTION

R312.2 Window fall protection. Window fall protection shall be provided in accordance with Sections R312.2.1 and R312.2.2.

R312.2.1 Window sills. In dwelling units, where the ~~top~~ bottom of the ~~sill~~ clear opening of an operable window opening is located less than 24 inches (610 mm) above the finished floor and greater than 72 inches (1829 mm) above the finished *grade* or other surface below on the exterior of the building, the operable window shall comply with one of the following:

1. Operable window openings will not allow a 4-inch-diameter (102 mm) sphere to pass through where the openings are in their largest opened position.
2. Operable windows are provided with window opening control devices or fall prevention devices that comply with ASTM F2090.
3. ~~Operable windows are provided with window opening control devices that comply with Section R312.2.2.~~

R312.2.2 ~~Window opening control devices.~~ Emergency escape and rescue openings. ~~Window opening control devices shall comply with ASTM F2090. The~~ Where an operable window serves as an emergency escape and rescue opening, the window opening control device or fall prevention devices, after operation to release the control device allowing the window to fully open, shall not reduce the net clear opening area of the window unit to less than the area required by Section R310.2.1.

Reason: ASTM F2090, *Specification for Window Fall Prevention Devices with Emergency Escape (Egress Release Mechanisms)*, includes criteria for window fall prevention devices and window opening control devices (see Section R312.2). This standard is specifically written for window openings within 75 feet (22 860 mm) of grade and specifically allows for windows to be used for emergency escape and rescue. This standard was updated in 2008 to address window opening control devices. This control device can be released from the inside to allow the window to be fully opened in order to comply with the emergency escape provisions in IRC. Section 312.2.2.1 - The change to the first sentence is to clarify where the measurement for the bottom of the window should be taken. Exception 2 and 3 are combined since ASTM F2090 includes information on both opening control devices and fall prevention devices.

Section 312.2.2 - The revision does not require opening control devices or fall prevention devices. This section would just allow for them to be on windows that were also serving as emergency escape and rescue openings. This is coordinated with the proposals for emergency escape and rescue openings.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included

members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is a clarification with no technical changes.

Proposal # 4145

RB123-19

RB124-19

IRC®: 312.3 (New)

Proponent: Thomas Olson, Kirkland Dynamics, LLC., representing Kirkland Dynamics, LLC.
(tom@kirklanddynamics.com)

2018 International Residential Code

Add new text as follows:

312.3 Roof guards. Guards shall be provided where various components that require service are located within 10 feet (3048 mm) of a roof edge or open side of a walking surface and such edge or open side is located more than 30 inches (762 mm) above the floor, roof or grade below. The guards shall extend not less than 30 inches (762 mm) beyond each end of such components. The guard shall be constructed so as to prevent the passage of a sphere 21 inches (533 mm) in diameter.

Guards shall be provided where the roof hatch opening is located within 10 feet (3048 mm) of a roof edge or open side of a walking surface and such edge or open side is located more than 30 inches (762 mm) above the floor, roof or grade below. The guard shall be constructed so as to prevent the passage of a sphere 21 inches (533 mm) in diameter.

Exception: Guards are not required where permanent fall arrest/restraint anchorage connector devices that comply with ANSI/ASSE Z 359.1 are affixed for use during the entire roof covering lifetime. The devices shall be reevaluated for possible replacement when the entire roof covering is replaced. The devices shall be placed not more than 10 feet (3048 mm) on center along hip and ridge lines and placed not less than 10 feet (3048 mm) from the roof edge or open side of the walking surface

Reason: To create parity with the IRC and the IBC, IMC, IFC, and the SRCC requirements for guards. This exception to the requirement for guards is currently in these codes. We are looking to create parity with the requirements and have the same requirement in the IRC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
No cost impact. The installation of the ANSI/ ASSE Z 359.1 devices offset any increase in construction costs.

Proposal # 5275

RB124-19

RB125-19

IRC@: SECTION R314, R314.1, R314.1.1, R314.2, R314.2.1, R314.2.2, R314.2.3 (New), R314.3, R314.3.1, R314.4, R314.4.1 (New), R314.5, R314.6, R314.7, R314.7.1, R314.7.2, R314.7.3, R314.7.4

Proponent: Francis McAndrew, NYS Department of State, representing NYS Department of State (francis.mcandrew@dos.ny.gov); Ronald Stark, NYS Department of State, representing NYS Department of State (ronald.stark@dos.ny.gov)

2018 International Residential Code

Revise as follows:

SECTION R314 SMOKE ALARMS AND HEAT DETECTION

R314.1 General. ~~Smoke alarms, heat detectors, and heat alarms shall comply with NFPA 72 and Section R314.~~

R314.1.1 Listings. Smoke alarms shall be *listed* in accordance with UL 217. ~~Heat detectors and heat alarms shall be listed for the intended application.~~ Combination smoke and carbon monoxide alarms shall be *listed* in accordance with UL 217 and UL 2034.

R314.2 Where required. ~~Smoke alarms, heat detectors, and heat alarms shall be provided in accordance with this section.~~

R314.2.1 New construction. Smoke alarms shall be provided in *dwelling units*. ~~A heat detector or heat alarm shall be provided in new attached garages.~~

R314.2.2 Alterations, repairs and additions. Where *alterations, repairs* or *additions* requiring a permit occur, the individual *dwelling unit* shall be equipped with smoke alarms located as required for new *dwellings*.

Exceptions:

1. Work involving the exterior surfaces of *dwellings*, such as the replacement of roofing or siding, the *addition* or replacement of windows or doors, or the addition of a porch or deck.
2. Installation, alteration or repairs of plumbing or mechanical systems.

Add new text as follows:

R314.2.3 New attached garages. A heat detector or heat alarm rated for the ambient outdoor temperatures and humidity shall be installed in new garages that are attached to or located under new and existing dwellings. Heat detectors and heat alarms shall be installed in a central location and in accordance with the manufacturer's instructions.

Exception: Heat detectors and heat alarms shall not be required in dwellings without commercial power.

R314.3 Location. Smoke alarms shall be installed in the following locations:

1. In each sleeping room.
2. Outside each separate sleeping area in the immediate vicinity of the bedrooms.
3. On each additional *story* of the *dwelling*, including *basements* and *habitable attics* and not including crawl spaces and uninhabitable *attics*. In *dwellings* or *dwelling units* with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full

story below the upper level.

4. Smoke alarms shall be installed not less than 3 feet (914 mm) horizontally from the door or opening of a bathroom that contains a bathtub or shower unless this would prevent placement of a smoke alarm required by this section.

R314.3.1 Installation near cooking appliances. Smoke alarms shall not be installed in the following locations unless this would prevent placement of a smoke alarm in a location required by Section R314.3.

1. Ionization smoke alarms shall not be installed less than 20 feet (6096 mm) horizontally from a permanently installed cooking *appliance*.
2. Ionization smoke alarms with an alarm-silencing switch shall not be installed less than 10 feet (3048 mm) horizontally from a permanently installed cooking *appliance*.
3. Photoelectric smoke alarms shall not be installed less than 6 feet (1828 mm) horizontally from a permanently installed cooking *appliance*.

Revise as follows:

R314.4 Interconnection. Where more than one smoke alarm is required to be installed within an individual dwelling unit in accordance with Section R314.3, the alarm devices shall be interconnected in such a manner that the actuation of one alarm will activate all of the alarms in the individual *dwelling unit*. Physical interconnection of smoke alarms shall not be required where listed wireless alarms are installed and all alarms sound upon activation of one alarm.

Exception: Smoke alarms and alarms installed to satisfy Section R314.4.1 shall not be required to be interconnected to existing smoke alarms where such existing smoke alarms are not interconnected or where such new smoke alarm or alarm is not capable of being interconnected to the existing smoke alarms.

Add new text as follows:

R314.4.1 Heat detection interconnection. Heat detectors and heat alarms shall be connected to an alarm or a smoke alarm that is installed in the dwelling. Alarms and smoke alarms that are installed for this purpose shall be located in a hallway, room, or other location that will provide occupant notification.

R314.5 Combination alarms. Combination smoke and carbon monoxide alarms shall be permitted to be used in lieu of smoke alarms.

Revise as follows:

R314.6 Power source. Smoke alarms, alarms, and heat detectors shall receive their primary power from the building wiring where such wiring is served from a commercial source and, where primary power is interrupted, shall receive power from a battery. Wiring shall be permanent and without a disconnecting switch other than those required for overcurrent protection.

Exceptions:

1. Smoke alarms shall be permitted to be battery operated where installed in buildings without commercial power.
2. Smoke alarms installed in accordance with Section R314.2.2 shall be permitted to be battery powered.

R314.7 Fire alarm systems. Fire alarm systems shall be permitted to be used in lieu of smoke alarms and shall comply with Sections R314.7.1 through R314.7.4.

R314.7.1 General. Fire alarm systems shall comply with the provisions of this code and the household fire warning *equipment* provisions of NFPA 72. Smoke detectors shall be *listed* in accordance with UL 268.

R314.7.2 Location. Smoke detectors shall be installed in the locations specified in Section R314.3.

R314.7.3 Permanent fixture. Where a household fire alarm system is installed, it shall become a permanent fixture of the occupancy, owned by the homeowner.

R314.7.4 Combination detectors. Combination smoke and carbon monoxide detectors shall be permitted to be installed in fire alarm systems in lieu of smoke detectors, provided that they are *listed* in accordance with UL 268 and UL 2075.

Reason: An estimated 9,000 residential garage fires are reported to United States fire departments each year and cause an estimated 50 deaths, 400 injuries, and \$557 million in property loss (NFPA Research Report: Home Structure Fires, September 2017).

Fires that originate in residential garages are normally larger, spread farther, and cause more damage than fires that start in other areas of a home. This is largely due to garages not having any means of smoke or heat detection. By the time a smoke detector in the dwelling detects the fire, or the home owner or a neighbor notices the fire, it is often too late, and the fire has begun to burn through the fire separation between the garage and the dwelling. At this point, the fire rapidly spreads through wall cavities and begins to attack the structural parts of the home. Unfortunately, smoke alarms installed in garages may lead to nuisance alarms due to vehicle exhaust fumes.

Installing a heat detector or heat alarm in these unprotected areas of a home will significantly reduce fire related deaths, injuries, and property loss.



Bibliography:

1. NFPA Research Report: Home Structure Fires, September 2017. <https://www.nfpa.org/-/media/Files/News-and-Research/Fire-statistics-and-reports/Building-and-life-safety/osHomes.pdf>
2. FEMA Topical Fire Report Series: Residential Building Garage Fires (2009-2011). <https://www.usfa.fema.gov/downloads/pdf/statistics/v14i12.pdf>

3. USFA Prevent Home Garage Fires.

https://www.usfa.fema.gov/downloads/pdf/publications/prevent_home_garage_fires_flyer.pdf

Cost Impact: The code change proposal will increase the cost of construction

- An interconnected heat detector or heat alarm will increase the cost of construction by about \$100, which includes installation.
- If a new garage is attached to an existing dwelling that has only battery powered smoke alarms installed, the heat detector or heat alarm will require the installation of an interconnected alarm or smoke alarm to be installed in the dwelling for the purposes of providing occupant notification. Under this scenario, the total cost will increase to about \$200.

Proposal # 4850

RB125-19

RB126-19

IRC@: R314.2 (New), R314.3, R315.3

Proponent: Gregory Wickline, Snohomish county, representing self (gwickline@comcast.net)

2018 International Residential Code

Revise as follows:

R314.2 Where required. Smoke alarms shall be provided in accordance with this section.

R314.3 Location. Smoke alarms shall be installed in the following locations:

1. In each sleeping room.
2. Outside each separate sleeping area in the immediate vicinity of the bedrooms.
3. On each additional *story* of the *dwelling*, including *basements* and *habitable attics* and not including crawl spaces and uninhabitable *attics*. In *dwellings* or *dwelling units* with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full *story* below the upper level.
4. Smoke alarms shall be installed not less than 3 feet (914 mm) horizontally from the door or opening of a bathroom that contains a bathtub or shower unless this would prevent placement of a smoke alarm required by this section.
5. In attics where fuel-fired appliances are installed.

R315.3 Location. Carbon monoxide alarms in *dwelling units* shall be installed outside of each separate sleeping area in the immediate vicinity of the bedrooms. Where a fuel-burning *appliance* is located within a bedroom or its attached bathroom, a carbon monoxide alarm shall be installed within the bedroom. Where a fuel fired appliance is located in and attic, a carbon monoxide alarm shall be installed within the attic.

Reason: More and more I see furnaces being installed in attics and if it was to catch fire, no one would ever know

Cost Impact: The code change proposal will increase the cost of construction
20 bucks

Proposal # 3549

RB126-19

RB127-19

IRC@: R314.3

Proponent: Timothy Pate, Colorado Chapter Code Change Committee, representing City and County of Broomfield (tpate@broomfield.org)

2018 International Residential Code

Revise as follows:

R314.3 Location. Smoke alarms shall be installed in the following locations:

1. In each sleeping room.
2. Outside each separate sleeping area in the immediate vicinity of the bedrooms.
3. On each additional *story* of the *dwelling*, including *basements* and *habitable attics* and not including crawl spaces and uninhabitable *attics*. In *dwellings* or *dwelling units* with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full *story* below the upper level.
4. Smoke alarms shall be installed not less than 3 feet (914 mm) horizontally from the door or opening of a bathroom that contains a bathtub or shower unless this would prevent placement of a smoke alarm required by this section.
5. In dwelling units where the ceiling height of a room open to a hallway serving bedrooms exceeds that of the hallway by 24 inches (610 mm) or more smoke alarms shall be installed in the hallway and in the room open to the hallway.

Reason: The proposed added language existing on one of the legacy codes and did not make it into the IRC or the IBC. It is not clear why it did not. In the case of a floor plan that has a taller ceiling immediately outside the hallway that leads to the bedrooms smoke from a fire would move to the upper level of the taller ceiling first and then have to build up to get down to the level of the hallway that leads to the bedrooms and where the required smoke alarm is placed. It makes sense to put a smoke alarm at the taller ceiling so as to signal smoke from a fire quicker in order to notify the occupants of a problem. This would not be a significant cost addition since it would be a small amount of wiring along with one more smoke alarm. It is proven that smoke alarms do save lives. This would be even more important for the many jurisdictions that have amended out the residential fire sprinkler requirements.

Cost Impact: The code change proposal will increase the cost of construction
There will be additional cost for wiring and smoke alarms

Proposal # 4521

RB127-19

RB128-19

IRC@: R314.3 (New), R315.3

Proponent: Lisa Simmons, Dorchester County, representing Dorchester County
(lsimmons2@dorchestercountysc.gov)

2018 International Residential Code

Revise as follows:

R314.3 Location. Smoke alarms shall be installed in the following locations:

1. In each sleeping room.
2. Outside each separate sleeping area in the immediate vicinity of the bedrooms.
3. On each additional *story* of the *dwelling*, including *basements* and *habitable attics* and not including crawl spaces and uninhabitable *attics*. In *dwellings* or *dwelling units* with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full *story* below the upper level.
4. Smoke alarms shall be installed not less than 3 feet (914 mm) horizontally from the door or opening of a bathroom that contains a bathtub or shower unless this would prevent placement of a smoke alarm required by this section.
5. Inside each room located on the second floor of a detached garage or accessory structure where supplied with power.

R315.3 Location. Carbon monoxide alarms in *dwelling units* shall be installed outside of each separate sleeping area in the immediate vicinity of the bedrooms. Where a fuel-burning *appliance* is located within a bedroom or its attached bathroom, a carbon monoxide alarm shall be installed within the bedroom. Carbon monoxide alarms shall be installed inside each room located on the second floor of a detached garage or accessory structure where supplied with power.

Reason: This area could be occupied as habitable space or used for sleeping purposes.

Cost Impact: The code change proposal will increase the cost of construction
The cost impact would be one additional smoke/carbon monoxide alarm combo.

Proposal # 419

RB128-19

RB129-19

IRC®: R314.3.1 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

R314.3.1 Installation near cooking appliances. Smoke alarms shall not be installed in the following locations unless this would prevent placement of a smoke alarm in a location required by Section R314.3.

1. Ionization smoke alarms shall not be installed less than 20 feet (6096 mm) horizontally from a permanently installed cooking *appliance*.
2. Ionization smoke alarms with an alarm-silencing switch shall not be installed less than 10 feet (3048 mm) horizontally from a permanently installed cooking *appliance*.
3. Photoelectric smoke alarms shall not be installed less than 6 feet (1828 mm) horizontally from a permanently installed cooking *appliance*.
4. Smoke alarms listed and marked “helps reduce cooking nuisance alarms” shall not be installed less than 6 feet (1828 mm) horizontally from a permanently installed cooking appliance.

Reason: This proposal recognizes that smoke alarms listed to the new edition of UL 217 (with an effective date of May 29, 2020) are required to pass tests designed to reduce nuisance alarms caused by residential cooking. The proposal provides an additional option for the types of smoke alarms that can be used near cooking appliances, without changing additional options.

The wording is based on the following 2019 NFPA 72 language:

29.11.3.4 (6) Effective January 1, 2022, smoke alarms and smoke detectors installed between 6 ft (1.8 m) and 20 ft (6.1 m) along a horizontal flow path from a stationary or fixed cooking appliance shall be listed for resistance to common nuisance sources from cooking.

There is no need to reference the 2022 effective date in NFPA 72 because if smoke alarms are listed to the new requirements prior to that date they should be allowed to be used as an option to the other technologies provided in Items 1 to 3.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will increase the cost of construction. The increased cost will be for providing carbon monoxide detection when classrooms in Group E occupancies are covered by these code sections.

Proposal # 4309

RB129-19

RB130-19

IRC®: R315.2.2

Proponent: Terry Kozlowski, representing Southern Nevada Chapter; Amanda Moss, representing SN-ICC Member; Cassidy Wilson, representing SN-ICC Member; Valarie Evans, representing Southern Nevada Chapter

2018 International Residential Code

Revise as follows:

R315.2.2 Alterations, repairs and additions. Where *alterations, repairs* or *additions* requiring a permit occur, the individual *dwelling unit* shall be equipped with carbon monoxide alarms located as required for new *dwellings*.

Exceptions:

1. Work involving the exterior surfaces of *dwellings*, such as the replacement of roofing or siding, or the addition or replacement of windows or doors, or the addition of a porch or deck.
2. Installation, alteration or repairs of plumbing or non-fuel fired mechanical systems.

Reason: Mechanical systems, including forced air units, dryers, water heaters, stoves, etc., are often fuel burning and therefore subject to leakage, should not be exempt from the requirement for carbon monoxide alarms.

Cost Impact: The code change proposal will increase the cost of construction
Will increase the cost of construction by modifying the current exemption to mechanical systems to include mechanical systems that are fuel-fired to have carbon monoxide detection and only exempt non fuel-fired mechanical systems.

Proposal # 4340

RB130-19

RB131-19

IRC@: R316.2.1 (New), R316.3

Proponent: David Rich, Reax Engineering, representing Reax Engineering Inc. (rich@reaxengineering.com); Joe Charbonnet, representing Green Science Policy Institute (joe@greensciencepolicy.org); Martin Hammer, representing Martin Hammer, Architect (mfhammer@pacbell.net); David Eisenberg, DCAT, representing DCAT (strawnet@gmail.com); Arlene Blum, representing Green Science Policy Institute (arleneb@lmi.net); Donald Lucas, representing Self (dlucas0929@gmail.com); Suzanne Drake, representing PERKINS+WILL (suzanne.drake@perkinswill.com); Marjorie Smith, representing Siegel & Strain Architects (msmith@siegelstrain.com); Paul Wermer, representing self (paul@pw-sc.com); Michael Lipsett, representing Self (mlipsett@astound.net); Alicia Daniels Uhlig, representing International Living Future Institute (alicia.uhlig@living-future.org); William Kelley, County of Marin, representing County of Marin and County Building Officials Association of California (CBOAC); Tony Stefani, representing San Francisco Firefighters Cancer Prevention Foundation (stefanit@sbcglobal.net); Clark Rendall, representing Troon Pacific (cpr@troonpacific.com); Vytenis Babrauskas, representing Fire Science and Technology Inc. (vytob@doctorfire.com); Joseph Fleming, Boston Fire Dept., representing Boston Fire Dept.; Teresa McGrath, representing Healthy Building Network (tmcgrath@healthybuilding.net); Alison Mears, Parsons The New School, representing Healthy Materials Lab (mearsa@newschool.edu); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Residential Code

Add new text as follows:

R316.2.1 Mark on polystyrene foam insulation without flame retardants. Polystyrene foam insulation boards manufactured without flame retardants shall be marked in accordance with this section.

1. Each board shall be marked on both faces every 8 square feet in red 1/2" text with the following information:

- WARNING - FIRE HAZARD
- This product must only be installed below a minimum 3.5-inch thick concrete slab on grade.
- NOT FOR VERTICAL OR ABOVE GRADE APPLICATIONS
- This product contains NO flame retardants
- Not tested for flame spread or smoke development requirements of the model building codes

2. Each package shall be marked on at least two sides in red 1/2" text with the following information:

- WARNING – COMBUSTIBLE MATERIAL
- Keep away from ignition sources
- Maintain code required separation between product storage and structures under construction (minimum 30 feet).

Revise as follows:

R316.3 Surface burning characteristics. Unless otherwise allowed in Section R316.5, foam plastic, or foam plastic cores used as a component in manufactured assemblies, used in building construction shall have a flame spread index of not more than 75 and shall have a smoke-developed index of not more than 450 when tested in the maximum thickness and density intended for use in accordance with ASTM E84 or UL 723. Loose-fill-type foam plastic insulation shall be tested as board stock for the flame spread index and smoke-developed index.

~~Exception~~**Exceptions:**

1. Foam plastic insulation more than 4 inches (102 mm) thick shall have a flame spread index of not more than 75 and a smoke-developed index of not more than 450 where tested at a thickness of not more than 4 inches (102 mm), provided that the end use is *approved* in accordance with Section R316.6 using the thickness and density intended for use.

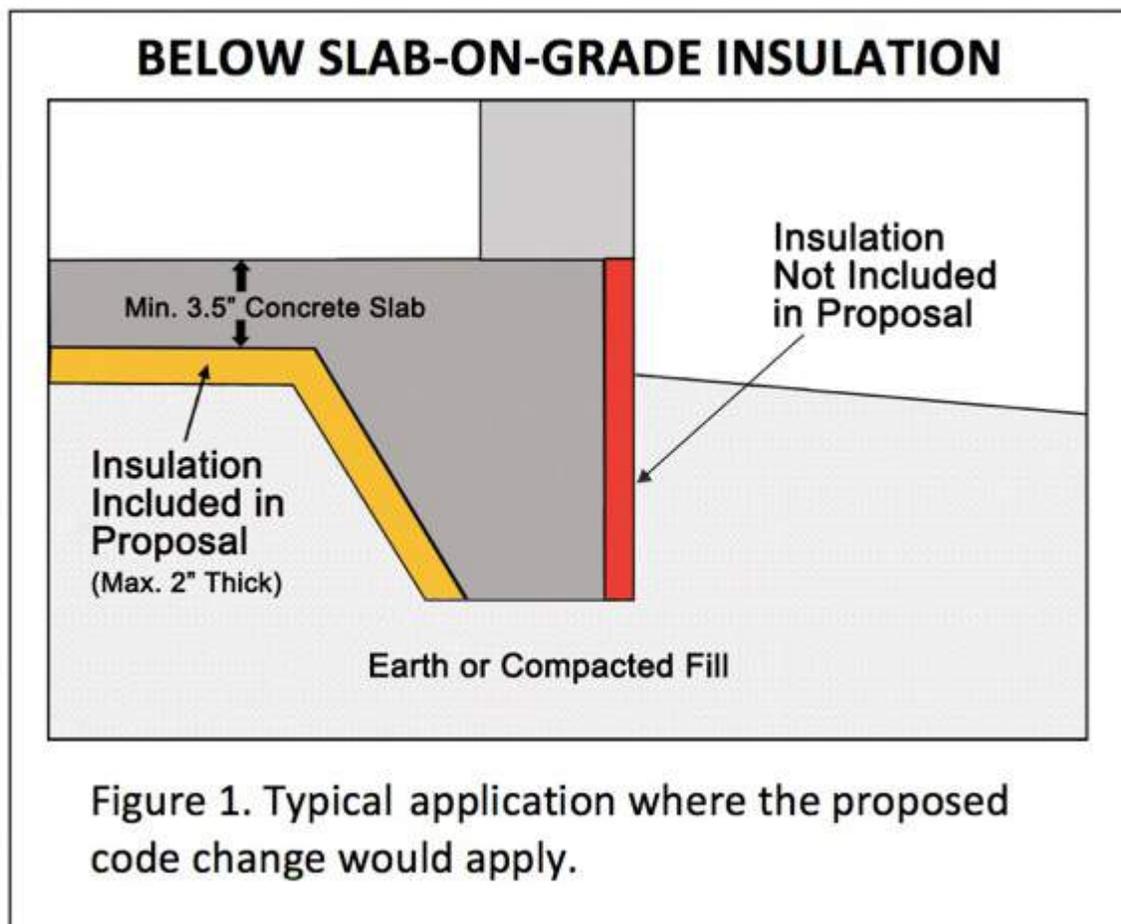
2. Polystyrene foam insulation boards with a maximum thickness of 2 inches (51 mm) where installed below a minimum 3.5-inch (89 mm) thick concrete slab-on-grade.

Reason: Purpose of Proposal

Polystyrene insulation (EPS and XPS) is commonly used in buildings to improve energy efficiency. To meet fire test building code requirements in the US and Canada all such insulation currently must contain flame retardant chemicals. In many cases, the tests do not accurately assess the fire safety of insulation.¹ Research has shown that flame retardants used in polystyrene insulation below a slab-on-grade do not provide a significant fire-safety benefit. However, across their lifecycle these chemicals can harm human and ecosystem health.²

This code change proposal would allow, but not require, the use of polystyrene insulation without flame retardants when installed below a concrete slab-on-grade at least 3-1/2 inches thick. The proposal was developed in response to the demand for healthier building materials from designers, developers and builders.

This proposed code change is nearly identical to the code change developed and advanced by the California Office of the State Fire Marshal for both the California Residential and the California Building Codes.



Justification for Proposal

Academic research and expert opinion that flame retardants are unnecessary for insulation below a slab-on-

grade.^{1,3} Neither an ignition source nor sufficient oxygen are present below a concrete slab-on-grade to support combustion. This proposal stipulates that flame retardant-free insulation and packaging be labeled with red 1/2" text lettering to ensure safe transport, storage, and proper installation.

Flammable liquids and gases, engineered wood products, and ABS pipe are all commonplace on construction sites. Other flame retardant-free polystyrene products such as cups and plates, packaging, and ice chests are stored and transported safely. Existing fire safety requirements in the fire and building codes, and in transportation regulations, adequately address necessary design and safety precautions for flame retardant-free polystyrene insulation.

Through the process described below, the California Office of the State Fire Marshal determined that chemical flame retardants provide no fire safety benefit for polystyrene insulation below a concrete slab-on-grade.

On the other hand, considerable peer-reviewed research has found that flame retardants used in building insulation are harmful to human and ecosystem health.^{4,5} Flame retardants have been linked to neurological impairment, hormone disruption, and aquatic toxicity.⁶⁻⁸ The flame retardant currently used in polystyrene insulation, PolyFR, is a brominated chemical that has not been well-studied nor proven safe.^{4,9} The manufacture, installation, demolition, landfilling, incineration, and recycling of flame-retarded polystyrene insulation can lead to environmental release of flame retardants and their toxic combustion by-products including brominated dioxins and furans. These chemicals can harm the health of construction workers and others exposed throughout the product life-cycle.

Human and ecosystem health and safety are within the ICC's scope of concern. The language of intent of the 2018 IRC in Section R102.3 states: "The purpose of this code is...to safeguard the public safety, health and general welfare...from...hazards attributed to the built environment."¹⁰ Action has been taken in ICC codes to limit exposure to lead, carbon monoxide, ozone depleting substances, volatile organic compounds, toxic compounds, and formaldehyde based on scientific evidence demonstrating that these materials present human health and environmental hazards.¹⁰⁻¹³

History of Proposal Development

The California Office of the State Fire Marshal developed the language in this IRC proposal in collaboration with a large, multi-stakeholder Working Group on flammability standards for building insulation materials from 2014-2016. The Working Group recommended testing to determine the fire safety benefit of adding flame retardants to polystyrene insulation below a slab-on-grade.¹⁴

The Office of the State Fire Marshal commissioned Oklahoma State University (OSU) to compare the flammability of polystyrene insulation in a subgrade installation with and without flame retardants. The CAL Fire/OSU Phase II Working Group reviewed and provided input on the testing criteria and results. Members of the Working Group representing multiple stakeholder perspectives were present for the testing. This group included scientists, NGOs, and representatives of flame-retardant manufacturers. Standard testing protocols had not been previously developed for combustible materials below a concrete slab-on-grade due to a lack of fire hazard in this application. Therefore, the Working Group, in collaboration with the OSU researchers, developed the specific tests and testing configurations.

The OSU researchers found:¹⁵

- When installed below-slab, insulation without flame retardants presents no risk of fire spread to the building and will not endanger occupants or first responders.
- Adding flame retardants to polystyrene insulation does not significantly reduce peak heat release rates.

- The time to ignition of flame-retardant free polystyrene was comparable to other combustible materials commonly found at construction sites.

The Phase II report can be found at: http://osfm.fire.ca.gov/codedevelopment/pdf/CalFire-OSU_Phase_II_Working_Group_Final_Report.pdf

Based on the result of the independent testing and following review by the California Building Standards Commission's Code Advisory Committee and public comment, the Office of the State Fire Marshal proposed code changes to the California Building Standards Commission which are technically identical to this proposal for the IRC.

In summary, the California Office of the State Fire Marshal concluded, based on extensive stakeholder input, prior research, and transparent and independent testing by OSU, that flame retardant-free polystyrene foam insulation below slab-on-grade presents no fire risk, and the addition of flame retardants provides no fire-safety benefit. Flame retardant-free polystyrene insulation boards would create no more of a fire hazard than other combustible materials commonly found on construction sites, existing codes and standards that cover fire safety during construction.

Precedent in Scandinavian countries

Code updates in Norway have allowed polystyrene insulation board without flame retardants in buildings. A report by the Norwegian government in 2011 stated insulation placed underneath the concrete slab is considered to be the most fire safe solution. In the finished foundation, the insulation material is well protected from fire exposure. There is no advantage of using fire resistant materials or materials with flame retardants in this construction."

Similarly, a Risk Management Evaluation for EPS and XPS foam insulation stated: "By using thermal barriers it is possible to fulfill fire safety requirements in most uses in construction and buildings with EPS and XPS without a fire retardant do not represent a higher cost to the manufacturer. Our research of available data from these countries found no evidence of increased fire risk, insulation fires, or rollbacks of these code changes.^{18,19} Thus, this proposed code change has a significant precedent without increased fire risk.

Summary Statement

The proponents urge you to support this common-sense proposal. Human and ecosystem health will be improved. Fire fighters, building officials, and architects agree that builders should be able to choose flame retardant-free polystyrene insulation below a slab-on-grade.

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Cost Impact: The code change proposal will not increase or decrease the cost of construction
Because this code change is not mandatory, there would be no required increased or decreased costs.

Proposal # 4622

RB131-19

RB132-19

IRC@: R316.3, R316.3.1 (New), R316.3.2 (New)

Proponent: John Woestman, representing Extruded Polystyrene Foam Association
(jwoestman@kellencompany.com)

2018 International Residential Code

Revise as follows:

R316.3 Surface burning characteristics. Unless otherwise allowed in Section R316.5, foam plastic, or foam plastic cores used as a component in manufactured assemblies, used in building construction shall comply with Section R316.3.1 or Section R316.3.2. Loose-fill-type foam plastic insulation shall be tested as board stock for the flame spread index and smoke developed index.

Add new text as follows:

R316.3.1 Foam plastic insulation 4" thick or less. Foam plastic insulation installed at 4" thickness or less shall have a flame spread index of not more than 75 and shall have a smoke-developed index of not more than 450 where tested in the maximum thickness and density intended for use in accordance with ASTM E84 or UL 723.

R316.3.2 Foam plastic insulation more than 4" thick. Foam plastic insulation installed at more than 4 inches (102 mm) thickness shall have a flame spread index of not more than 75 and a smoke-developed index of not more than 450 where tested at a thickness of not more than 4 inches (102 mm) in accordance with ASTM E84 or UL 723, provided that the end use is approved in accordance with Section R316.6 using the thickness and density intended for use..

Reason: Proposed Section R316.3.2 is currently written as an exception. This exception allows foam plastic insulation intended to be installed in thickness greater than 4" to be tested in the Steiner Tunnel (ASTM E84) at a 4" thickness. This addresses the concern that Steiner Tunnels are generally physically limited to fire testing materials of not more than about 4" thickness. Rearranging and revising this section clarifies what fire testing is required.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
No technical changes are proposed.

Proposal # 5221

RB132-19

RB133-19

IRC@: R316.3

Proponent: Mike Fischer, Kellen Company, representing The Center for the Polyurethanes Industry of the American Chemistry Council (mfischer@kellencompany.com)

2018 International Residential Code

Revise as follows:

R316.3 Surface burning characteristics. Unless otherwise allowed in Section R316.5, foam plastic, or foam plastic cores used as a component in manufactured assemblies, used in building construction shall have a flame spread index of not more than 75 and shall have a smoke-developed index of not more than 450 when tested in the maximum thickness and density intended for use in accordance with ASTM E84 or UL 723. Loose-fill-type foam plastic insulation shall be tested as board stock for the flame spread index and smoke-developed index.

~~Exception~~ - Exceptions:

1. Foam plastic insulation more than 4 inches (102 mm) thick shall have a flame spread index of not more than 75 and a smoke-developed index of not more than 450 where tested at a thickness of not ~~more~~-less than 4 inches (102 mm), provided that the end use is *approved* in accordance with Section R316.6 using the thickness and density intended for use.

2. Spray foam plastic insulation more than 4 inches (102 mm) in thickness shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 450 where tested at a thickness of not less than 4 inches (102 mm), and at the density intended for use, provided that the spray foam plastic is separated from the interior of a building by an *approved* thermal barrier in accordance with Section R316.4.

Reason: Multiple successful NFPA 286 tests with a variety of spray foam plastic insulations with a 25 or less Flame Spread and thicknesses far exceeding 4 inches have demonstrated that any thickness will pass when covered with a prescriptive thermal barrier. Test have been burned with as much as 16 inches of spray foam in the NFPA 286 assembly (approx R-value over 100) and passed. The assembly construction is needlessly complicated to accommodate these excess thickness of foam, and only adds unnecessary expense to the test procedure. With the extensive available data, ICC Evaluation Services recognized there was no usefulness in full-scale testing of foam plastics with FS ± 25 when covered with a prescriptive thermal barrier. ICC-ES began issuing code compliance evaluation reports using AC377 that permit these foam plastic insulations to be installed at any thickness when covered with a prescriptive thermal barrier. This provision is in the draft ICC 1100 Standard for Spray-applied Polyurethane Foam Plastic Insulation, which is in the final stages of approval for publication and has been approved for reference in the 2021 IBC (Code Proposal FS 155-18).

Cost Impact: The code change proposal will decrease the cost of construction
The proposal adds options to the code.

Proposal # 5617

RB133-19

RB134-19

IRC®: R316.4

Proponent: Marcelo M Hirschler, GBH International, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Revise as follows:

R316.4 Thermal barrier. Unless otherwise allowed in Section R316.5, foam plastic shall be separated from the interior of a building by an *approved* thermal barrier of not less than 1/2-inch (12.7 mm) gypsum wallboard ; ~~23/32-inch (18.2 mm) wood structural panel~~ or a material that is tested in accordance with and meets the acceptance criteria of both the Temperature Transmission Fire Test and the Integrity Fire Test of NFPA 275.

Reason: Thermal barriers are intended to protect foam plastics in case of fire from two hazards: (1) the foam plastic should not catch fire and reach flashover in 15 minutes when exposed to a fire similar to what can be expected in a room and (2) the foam plastic should not breach the thermal barrier for a period of 15 minutes so as to transmit high temperatures, fire and smoke from the concealed space (where the foam plastic is located) to the room (or viceversa). The NFPA 275 contains two tests that thermal barriers need to pass to demonstrate that they provide that protection: the temperature transmission fire test (which is a small scale ASTM E119 test conducted for 15 minutes) and the integrity fire test (that can be conducted using NFPA 286, FM 4880, UL 1715 or UL 1040). One of the key criteria of the integrity fire test is that the thermal barrier not reach flashover and not burn completely. If the integrity fire test is conducted as NFPA 286, the same criteria are used as shown in section 302 of the IRC for NFPA 286 (and equivalent criteria are used for the other tests).

It has been shown that a 0.5 inch gypsum wallboard is equivalent to a material that meets the test requirements of NFPA 275 and provides the appropriate fire protection from both fire penetration and fire integrity. On the other hand, tests conducted to NFPA 286 show clearly that a 23/32 inch wood structural panel burns and is not equivalent: it clearly reaches flashover and will lead to the foam plastic insulation burning. Therefore, it does not provide equivalent protection to a thermal barrier or to a 0.5 inch gypsum board.

Note that the language in the code states that the thermal barrier must be an approved material but gives two exceptions to a material that passes NFPA 275, clearly suggesting that they are equivalent: a 0.5 inch gypsum board (which are equivalent) and a thin wood product, which is easily combustible and clearly not equivalent to gypsum board.

Thermal barriers are required in the IRC to protect building occupants from fires associated with foam plastics (as separated from the building interior, R302.8 and R316) and structural insulated panels (SIPs) in walls (R610.5.6). The IBC (section 2603.4) describes a thermal barrier and also allows a wood product as an untested alternate, but the exception in IBC is heavy timber and not a thin wood panel.

Cost Impact: The code change proposal will increase the cost of construction
This will prohibit the use of thin wood as a thermal barrier.

Proposal # 4349

RB134-19

RB135-19

IRC@: R316.5.13

Proponent: Mike Fischer, Kellen Company, representing The Center for the Polyurethanes Industry of the American Chemistry Council (mfischer@kellencompany.com)

2018 International Residential Code

Revise as follows:

R316.5.13 Floors. The thermal barrier specified in Section R316.4 is not required to be installed on the walking surface of a structural floor system that contains foam plastic insulation where the foam plastic is covered by not ~~more~~less than a nominal $1/2$ -inch-thick (12.7 mm) wood structural panel or equivalent. The thermal barrier specified in Section R316.4 is required on the underside of the structural floor system that contains foam plastic insulation where the underside of the structural floor system is exposed to the interior of the building.

Reason: The current code contains an error by specifying a maximum thickness for wood structural panel used to cover foam plastic insulation in floor systems. The code should establish a minimum thickness for protection.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal fixes an editorial flaw in the current text.

Proposal # 5611

RB135-19

RB136-19

IRC@: R317.1, R317.1.3, R317.1.5

Proponent: Paul Coats, representing American Wood Council (pcoats@awc.org)

2018 International Residential Code

Revise as follows:

R317.1 Location required. Protection of wood and wood-based products from decay shall be provided in the following locations by the use of naturally durable wood or wood that is preservative-treated in accordance with AWPA U1.

1. Wood joists or the bottom of a wood structural floor where closer than 18 inches (457 mm) or wood girders where closer than 12 inches (305 mm) to the exposed ground in crawl spaces or unexcavated area located within the periphery of the building foundation.
2. Wood framing members that rest on concrete or masonry exterior foundation walls and are less than 8 inches (203 mm) from the exposed ground.
3. Sills and sleepers on a concrete or masonry slab that is in direct contact with the ground unless separated from such slab by an impervious moisture barrier.
4. The ends of wood girders entering exterior masonry or concrete walls having clearances of less than $\frac{1}{2}$ inch (12.7 mm) on tops, sides and ends.
5. Wood siding, sheathing and wall framing on the exterior of a building having a clearance of less than 6 inches (152 mm) from the ground or less than 2 inches (51 mm) measured vertically from concrete steps, porch slabs, patio slabs and similar horizontal surfaces exposed to the weather.
6. Wood structural members supporting moisture-permeable floors or roofs that are exposed to the weather, such as concrete or masonry slabs, unless separated from such floors or roofs by an impervious moisture barrier.
7. Wood furring strips or other wood framing members attached directly to the interior of exterior masonry walls or concrete walls below *grade* except where an *approved* vapor retarder is applied between the wall and the furring strips or framing members.
8. Portions of wood structural members that form the structural supports of buildings, balconies, porches or similar permanent building appurtenances where those members are exposed to the weather without adequate protection from a roof, eave, overhang or other covering that would prevent moisture or water accumulation on the surface or at joints between members.

Exception: Sawn lumber used in buildings located in a geographical region where experience has demonstrated that climatic conditions preclude the need to use naturally durable or preservative-treated wood where the structure is exposed to the weather.

Delete without substitution:

~~**R317.1.3 Geographical areas.** In geographical areas where experience has demonstrated a specific need, *approved* naturally durable or pressure preservative treated wood shall be used for those portions of wood members that form the structural supports of buildings, balconies, porches or similar permanent building appurtenances where those members are exposed to the weather without adequate protection from a roof, eave, overhang or other covering that would prevent moisture or water accumulation on the surface or at joints between members. Depending on local experience, such members typically include:~~

- ~~1. Horizontal members such as girders, joists and decking.~~
- ~~2. Vertical members such as posts, poles and columns.~~
- ~~3. Both horizontal and vertical members.~~

~~**R317.1.5 Exposed glued-laminated timbers.** The portions of glued-laminated timbers that form the structural supports of a building or other structure and are exposed to weather and not properly protected by a roof, eave or similar covering shall be pressure treated with preservative, or be manufactured from naturally durable or preservative-treated wood.~~

Reason: The proposed change does several things:

First, the existing section R317.1.3 (Geographical areas) seems to require wood members exposed to the weather to be treated or naturally durable only if a need is demonstrated. It makes more sense to require them to be protected outright and have an exception for arid geographical regions where it has been demonstrated that the protection is not needed. Relocating it to the list of locations in R317.1 and providing an exception to the item will be clearer. The text of R317.1.3 was moved to the new item 8, except for the descriptors about horizontal and vertical members in the three items at the end of the current section, which seem more appropriate for the commentary to the code.

The wording of the proposed exception to new item 8 is the same as the wording of the parallel exception in Section 2304.12.2.3 of the IBC, with the addition of the words "Sawn lumber used in" at the beginning and replacing the words "durable materials" with "naturally durable or preservative-treated wood" for better language without changing the meaning. The proposal limits the "geographic areas" exception to sawn lumber and excludes engineered wood products such as glued-laminated timber. Under the current code structure, glued-laminated timbers are covered under their own section R317.1.5 and it is commonly understood that the provisions of current Section R317.1.3 are not applicable to them anyway. Presumably all engineered wood products using adhesives should be protected when exposed to the weather regardless of climate or geographic locations, and manufacturers' recommendations would require it.

It is intended to be a new item 8 with the same hierarchy as the current seven items preceding it, and the Exception is intended to be indented under new item 8 so that it only applies to item 8.

Finally, since the proposed item 8 is broad enough to include the current requirement in R317.1.5 for glued-laminated timber, R317.1.5 can also be deleted.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The application of the current code section may vary depending on interpretation. It is not intended to change the requirements from the most common interpretations, therefore there will be no difference in cost of construction.

Proposal # 4687

RB136-19

RB137-19

IRC@: R317.1, R317.1.4

Proponent: Paul Coats, representing American Wood Council (pcoats@awc.org)

2018 International Residential Code

Revise as follows:

R317.1 Location required. Protection of wood and wood-based products from decay shall be provided in the following locations by the use of naturally durable wood or wood that is preservative-treated in accordance with AWPA U1.

1. ~~Wood joists or the bottom of a wood structural floor where closer than 18 inches (457 mm) or~~ wood joists or the bottom of a wood structural floor where closer than 18 inches (457 mm) to exposed ground, ~~wood girders where closer than 12 inches (305 mm) to the exposed ground, in In crawl spaces or unexcavated area located within the periphery of the building foundation,~~ wood girders where closer than 12 inches (305 mm) to exposed ground, and wood columns where closer than 8 inches (204 mm) to exposed ground.
2. Wood framing members, including columns, that rest on concrete or masonry exterior foundation walls and are less than 8 inches (203 mm) from the exposed ground.
3. Sills and sleepers on a concrete or masonry slab that is in direct contact with the ground unless separated from such slab by an impervious moisture barrier.
4. The ends of wood girders entering exterior masonry or concrete walls having clearances of less than 1/2 inch (12.7 mm) on tops, sides and ends.
5. Wood siding, sheathing and wall framing on the exterior of a building having a clearance of less than 6 inches (152 mm) from the ground or less than 2 inches (51 mm) measured vertically from concrete steps, porch slabs, patio slabs and similar horizontal surfaces exposed to the weather.
6. Wood structural members supporting moisture-permeable floors or roofs that are exposed to the weather, such as concrete or masonry slabs, unless separated from such floors or roofs by an impervious moisture barrier.
7. Wood furring strips or other wood framing members attached directly to the interior of exterior masonry walls or concrete walls below *grade* except where an *approved* vapor retarder is applied between the wall and the furring strips or framing members.
8. Wood columns in contact with basement floor slabs unless supported by concrete piers or metal pedestals projecting at least 1 inch (25 mm) above the concrete floor and separated from the concrete pier by an impervious moisture barrier.

Delete without substitution:

~~**R317.1.4 Wood columns.** Wood columns shall be *approved* wood of natural decay resistance or *approved* pressure-preservative-treated wood.~~

Exceptions:

- ~~1. Columns exposed to the weather or in *basements* where supported by concrete piers or metal pedestals projecting 1 inch (25 mm) above a concrete floor or 6 inches (152 mm) above exposed earth and the earth is covered by an *approved* impervious moisture barrier.~~
- ~~2. Columns in enclosed crawl spaces or unexcavated areas located within the periphery of the building where supported by a concrete pier or metal pedestal at a height more than 8 inches (203 mm) from exposed earth and the earth is covered by an impervious moisture barrier.~~

- 3- ~~Deck posts supported by concrete piers or metal pedestals projecting not less than 1 inch (25 mm) above a concrete floor or 6 inches (152 mm) above exposed earth.~~

Reason: Current Section R317.1.4 on wood column protection is unnecessarily confusing and contains errors in syntax, making it difficult to apply.

Current Exceptions 1 and 2: Current Exception 1 seems to exempt all columns exposed to the weather, which is not the intent. The rest of Exception 1 has criteria which conflicts with the current IBC and also seems to conflict with Exception 2—does the elevation of concrete piers and metal pedestals need to be 6 inches or 8 inches? It may be confusing when comparing the exceptions. In addition, the parallel section in the IBC, Section 2304.12.2.2, says nothing about covering the exposed ground in the crawl space with an impervious moisture barrier as a criterium for column protection, and sets the clearance for the bottom of the column at 8 inches above exposed earth, the same as is required for framing on exterior walls.

Current Exception 3: Current Exception 3 seems to exempt any deck posts that are supported by piers or pedestals extending 1 inch above concrete or 6 inches above exposed earth. But it would seem good policy that any deck post exposed to the weather should be treated regardless of clearance to a slab or ground.

Current charging language: The charging language in R317.1.4 requires all columns, regardless of location, to be treated unless they fit into an exception. Interior columns completely protected from the weather, such as heavy timber columns in the interior of the building or built-up columns in walls, are technically required to be treated since they don't fit into any exception. This is not the intent of the code.

This proposal attempts to incorporate wood columns in the general "location" items of R317.1 and eliminate the separate confusing columns section altogether:

Revisions to R317.1 item 1: Similar to floor framing and girders, columns are given a required clearance from exposed earth in crawl spaces, a clearance which is generally consistent with current Exception 2 except the requirement to cover the exposed ground with an impervious moisture barrier is dropped. The reason this requirement was dropped is because there is no such requirement in the parallel sections of the IBC (2304.12.2.2), and it seems that as long as a conservative clearance is required, provisions for moisture barriers over exposed earth in a crawl space should be governed by the crawl space section of the code (R408 Under-Floor Spaces, which has provisions for moisture barriers). The wording of item 1 is rearranged to retain readability with the addition of the new provision for columns.

Revision to R317.1 item 2: Including columns here specifically with other "wood framing members" seems prudent since the columns section is proposed for deletion. However, it may not be necessary since wood columns would normally be considered a wood framing member.

New item 8 to R317.1: This new item is necessary to preserve the reduced clearance for columns above basement floor slabs. It provides for as little as 1 inch of clearance if on a metal pedestal (consistent with current Exception 1 to R317.1.4), and 1 inch of clearance on a concrete pier if it is separated from the pier by an impervious moisture barrier, since concrete is porous and will allow wicking of moisture more readily (this consistent with current Exception 1 of R317.1.4 and also with IBC Section 2304.12.2.2 Exception 2).

Cost Impact: The code change proposal will not increase or decrease the cost of construction. These proposed revisions correct errors to match how the code is currently applied. Therefore, no cost increase is anticipated.

RB138-19

IRC@: R317.1.4

Proponent: Matthew Hunter, American Wood Council, representing American Wood Council
(mhunter@awc.org)

2018 International Residential Code

Delete and substitute as follows:

~~**R317.1.4 Wood columns.** Wood columns shall be *approved* wood of natural decay resistance or *approved* pressure-preservative-treated wood.~~

Exceptions:

- ~~1. Columns exposed to the weather or in *basements* where supported by concrete piers or metal pedestals projecting 1 inch (25 mm) above a concrete floor or 6 inches (152 mm) above exposed earth and the earth is covered by an *approved* impervious moisture barrier.~~
- ~~2. Columns in enclosed crawl spaces or unexcavated areas located within the periphery of the building where supported by a concrete pier or metal pedestal at a height more than 8 inches (203 mm) from exposed earth and the earth is covered by an impervious moisture barrier.~~
- ~~3. Deck posts supported by concrete piers or metal pedestals projecting not less than 1 inch (25 mm) above a concrete floor or 6 inches (152 mm) above exposed earth.~~

R317.1.4 Posts or columns Posts and columns supporting permanent structures and supported by a concrete or masonry slab or footing that is in direct contact with the earth shall be of naturally durable or preservative-treated wood.

Exceptions:

1. Are not exposed to the weather, or are protected by a roof, eave, overhang, or other covering where exposed to the weather.
2. Are supported by concrete piers or metal pedestals projected not less than 1 inch (25 mm) above the slab or deck and the posts and columns are separated from the concrete pier by an impervious moisture barrier.
3. Are located not less than 8 inches (203 mm) above exposed earth.

Reason: This proposal completely replaces the current text of R317.1.4 with the current provisions of Section 2304.12.2.2 from the IBC. The proposed text is exactly what appears in the current section 2304.12.2.2 of the IBC. The current IRC Section R317.1.4 on wood column protection is unnecessarily confusing and contains errors in syntax, making it difficult to apply. Current charging language requires all wood columns to be preservative treated and the exceptions are inadequate. Current Exception #1 erroneously references "*columns exposed to the weather*", which is not the intent. Rather it should read "Columns NOT exposed to weather...". The rest of Exception 1 has criteria which conflicts with the current IBC and also may conflict with Exception 2. The parallel section in the IBC says nothing about impervious moisture barriers on exposed ground. In addition, Exception 3 would seem to permit deck posts exposed to the weather to be untreated, as long as they are elevated off of the ground. Also, the current section does not contain an adequate exception for interior columns.

This proposal is one alternative to correcting the errors in this section.

Bibliography: None.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. These proposed revisions correct errors to match how the code is currently applied. Therefore, no cost increase is anticipated.

Proposal # 5141

RB138-19

RB139-19

IRC: 202 (New), R320.1, R320.1.1

Proponent: Steven Mickley, representing American Institute of Building Design (steve.mickley@aibd.org)

2018 International Residential Code

SECTION R320 ACCESSIBILITY

Revise as follows:

R320.1 Scope. Where there are four or more *dwelling units* or sleeping units in a single structure, the provisions of Chapter 11 of the *International Building Code* for Group R-3 shall apply. For the purpose of applying the requirements of Chapter 11 of the *International Building Code*, guestrooms shall be considered to be sleeping units.

Exceptions:

1. *A multistory dwelling unit* that is not provided with elevator service is not required to comply with this section.
2. *Owner-occupied lodging houses with five or fewer guestrooms constructed in accordance with the *International Residential Code** are not required to comply with this section.

Delete without substitution:

~~**R320.1.1 Guestrooms.** A *dwelling* with guestrooms shall comply with the provisions of Chapter 11 of the *International Building Code* for Group R-3. For the purpose of applying the requirements of Chapter 11 of the *International Building Code*, guestrooms shall be considered to be sleeping units.~~

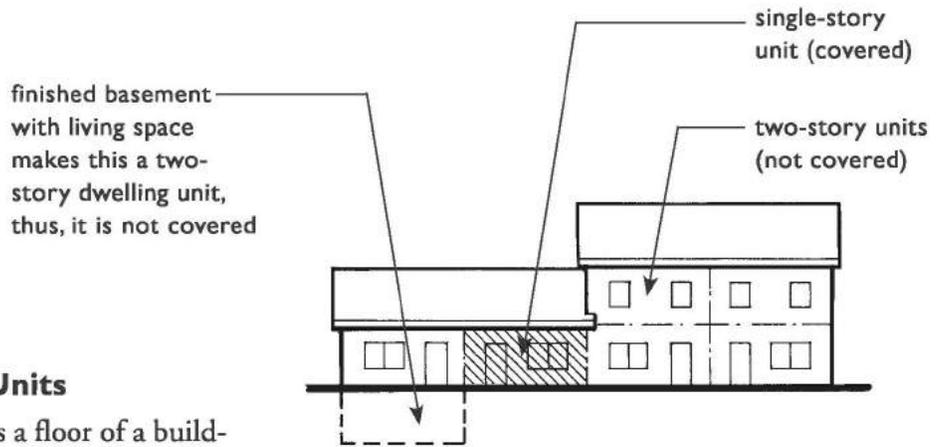
~~**Exception:** *Owner-occupied lodging houses with five or fewer guestrooms constructed in accordance with the *International Residential Code** are not required to be accessible.~~

Add new definition as follows:

MULTISTORY UNIT. A *dwelling unit* or *sleeping unit* with *habitable space* located on more than one *story*.

Reason: Chapter 11 of the IBC exempts owner-occupied lodging houses with no more than five sleeping units and multistory dwelling units not provided with elevator service. IRC, Section 320 currently only mentions lodging houses being exempt. Therefore, this proposed amendment is intended to clarify, without the designer having to refer to both Section 320 of the IRC and Chapter 11 of the IBC, multistory dwelling units not provided with elevator service are not required to comply.

The following illustration from the Fair Housing Act Design Manual visually depicts which units are "covered" by the act, and which are "not covered." It also depicts the scope of Chapter 11 of the IBC and the intent of this amendment.



Ground Floor Dwelling Units

The **ground floor** is defined as a floor of a building with a building entrance on an accessible route. The ground floor may or may not be at grade.

Ground Floor Units in Buildings of 4 or More Units Are Covered

 = covered unit

Bibliography: International Building Code, International Code Council, published in September 2018
 Fair Housing Act Design Manual, U.S. Department of Housing and Urban Development, published in August 1996, revised in April 1998.

Cost Impact: The code change proposal will decrease the cost of construction
 This proposal will decrease the cost of design and construction by eliminating potential misinterpretation and unnecessary regulation.

Proposal # 5528

RB139-19

RB140-19

IRC: R202, R320.1, R320.1.1, R320.2 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Add new text as follows:

LIVE/WORK UNIT. A dwelling unit or sleeping unit in which a significant portion of the space includes a nonresidential use that is operated by the tenant.

Add new definition as follows:

SLEEPING UNIT. A single unit that provides rooms or spaces for one or more persons, includes permanent provisions for sleeping and can include provisions for living, eating and either sanitation or kitchen facilities but not both. Such rooms and spaces that are also part of a dwelling unit are not sleeping units.

Revise as follows:

SECTION R320 ACCESSIBILITY

R320.1 Scope. Where there are four or more *dwelling units* or sleeping units in a single structure, the provisions of Chapter 11 of the International Building Code for Group R-3 shall apply.

Exception: Owner-occupied lodging houses with five or fewer guestrooms are not required to be accessible.

Delete without substitution:

~~**R320.1.1 Guestrooms.** A *dwelling* with guestrooms shall comply with the provisions of Chapter 11 of the International Building Code for Group R-3. For the purpose of applying the requirements of Chapter 11 of the International Building Code, guestrooms shall be considered to be sleeping units.~~

~~**Exception:** Owner-occupied lodging houses with five or fewer guestrooms constructed in accordance with the International Residential Code are not required to be accessible.~~

Add new text as follows:

R320.2 Live/work units. In live/work units, the nonresidential portion shall be accessible in accordance with Sections 419.7 and 419.9 of the International Building Code. In a structure where there are four or more live/work units, the dwelling portion of the live/work unit shall comply with Section 1107.6.2.1 of the International Building Code.

Reason: The accessibility provisions have not kept up with the revised scope of the IRC. This is the scope - **R101.2 Scope.** The provisions of this code shall apply to the construction, *alteration*, movement, enlargement, replacement, repair, *equipment*, use and occupancy, location, removal and demolition of detached one- and two-family dwellings and *townhouses* not more than three stories above *grade plane* in height with a separate means of egress and their *accessory structures* not more than three stories above *grade plane* in height.

Exception: The following shall be permitted to be constructed in accordance with this code where provided with a residential fire sprinkler system complying with Section P2904:

1. Live/work units located in *townhouses* and complying with the requirements of Section 419 of the *International Building Code*.
2. Owner-occupied lodging houses with five or fewer guestrooms.
3. A care facility with five or fewer persons receiving custodial care within a dwelling unit.
4. A care facility with five or fewer persons receiving medical care within a dwelling unit.
5. A care facility for five or fewer persons receiving care that are within a single-family dwelling.

The scope in the IRC of the transient lodging is limited to owner occupied with 5 or fewer guestrooms, so there will be no larger facilities. Guestrooms are sleeping units which is covered in R320.1, so a separate section that start by applying to something that is not permitted just to get the exception is not needed. You can just apply the exception to R310.1. This does coordinate with IBC Section 1103.2.11.

1103.2.11 Residential Group R-1. Buildings of Group R-1 containing not more than five sleeping units for rent or hire that are also occupied as the residence of the proprietor are not required to comply with this chapter.

For Live work units, the IBC has

419.7 Accessibility. Accessibility shall be designed in accordance with Chapter 11 for the function served.

419.9 Plumbing facilities. The nonresidential area of the *live/work unit* shall be provided with minimum plumbing facilities as specified by Chapter 29, based on the function of the nonresidential area. Where the nonresidential area of the *live/work unit* is required to be *accessible* by Section 1107.6.2.1, the plumbing fixtures specified by Chapter 29 shall be *accessible*.

1107.6.2.1 Live/work units. In *live/work units* constructed in accordance with Section 419, the nonresidential portion is required to be *accessible*. In a structure where there are four or more *live/work units intended to be occupied as a residence*, the residential portion of the *live/work unit* shall be a *Type B unit*.

Exception: The number of *Type B units* is permitted to be reduced in accordance with Section 1107.7.

It is proposed to add a reference to this language to the IRC for consistency for accessibility requirements for Live/work units.

Since the terms 'sleeping units' and 'live/work units' are used in the IRC, in this section and others. It is proposed to add the definitions currently found in the IBC.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This will make the IRC requirements consistent with the IBC for owner-occupied lodging houses and live/work

units.

Proposal # 4235

RB140-19

RB141-19

IRC@: R309.3, R322.1.6, R322.2.1, R322.2.2, R322.2.2.1, R322.3.2, R322.3.5, R322.3.6, R322.3.7

Proponent: Gregory Wilson, representing Federal Emergency Management Agency (gregory.wilson2@fema.dhs.gov); Rebecca Quinn, RCQuinn Consulting, on behalf of Federal Emergency Management Agency, representing Federal Emergency Management Agency (rcquinn@earthlink.net)

2018 International Residential Code

Revise as follows:

R309.3 Flood hazard areas. For buildings located in flood hazard areas as established by Table R301.2(1), garage floors shall be one of the following:

1. Elevated to or above the ~~design flood~~ required lowest floor elevation as determined in accordance with Section R322.
2. Located below the ~~design flood~~ required lowest floor elevation provided that the floors are at or above *grade* on not less than one side, are used solely for parking, building access or storage, meet the requirements of Section R322 and are otherwise constructed in accordance with this code.

R322.1.6 Protection of mechanical, plumbing and electrical systems. Electrical systems, *equipment* and components; heating, ventilating, air-conditioning; plumbing *appliances* and plumbing fixtures; *duct systems*; and other service *equipment* shall be located at or above the elevation required in Section R322.2 or R322.3. If replaced as part of a substantial improvement, electrical systems, *equipment* and components; heating, ventilating, air-conditioning and plumbing *appliances* and plumbing fixtures; *duct systems*; and other service *equipment* shall meet the requirements of this section. Systems, fixtures, and *equipment* and components shall not be mounted on or penetrate through walls intended to break away under flood loads.

Exception: Locating electrical systems, *equipment* and components; heating, ventilating, air-conditioning; plumbing *appliances* and plumbing fixtures; *duct systems*; and other service *equipment* is permitted below the elevation required in Section R322.2 or R322.3 provided that they are designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the ~~design flood~~ required elevation in accordance with ASCE 24. Electrical wiring systems are permitted to be located below the required elevation provided that they conform to the provisions of the electrical part of this code for wet locations.

R322.2.1 Elevation requirements.

1. Buildings and structures in flood hazard areas, including flood hazard areas designated as Coastal A Zones, shall have the lowest floors elevated to or above the base flood elevation plus 1 foot (305 mm), or the design flood elevation, whichever is higher.
2. In areas of shallow flooding (AO Zones), buildings and structures shall have the lowest floor (including *basement*) elevated to a height above the highest adjacent *grade* of not less than the depth number specified in feet (mm) on the FIRM plus 1 foot (305 mm), or not less than 3 feet (915 mm) if a depth number is not specified.
3. Basement floors that are below *grade* on all sides shall be elevated to or above base flood elevation plus 1 foot (305 mm), or the design flood elevation, whichever is higher.

Exception: Enclosed areas below the ~~design flood~~ elevation required in this section, including *basements* with floors that are not below *grade* on all sides, shall meet the requirements of Section R322.2.2.

R322.2.2 Enclosed area below ~~design flood~~ required elevation. Enclosed areas, including crawl spaces, that are below the ~~design flood~~ elevation required in Section R322.2.1 shall:

1. Be used solely for parking of vehicles, building access or storage.
2. Be provided with flood openings that meet the following criteria and are installed in accordance with Section R322.2.2.1:
 - 2.1. The total net area of nonengineered openings shall be not less than 1 square inch (645 mm²) for each square foot (0.093 m²) of enclosed area where the enclosed area is measured on the exterior of the enclosure walls, or the openings shall be designed as engineered openings and the *construction documents* shall include a statement by a registered *design professional* that the design of the openings will provide for equalization of hydrostatic flood forces on *exterior walls* by allowing for the automatic entry and exit of floodwaters as specified in Section 2.7.2.2 of ASCE 24.
 - 2.2. Openings shall be not less than 3 inches (76 mm) in any direction in the plane of the wall.
 - 2.3. The presence of louvers, blades, screens and faceplates or other covers and devices shall allow the automatic flow of floodwater into and out of the enclosed areas and shall be accounted for in the determination of the net open area.

R322.2.2.1 Installation of openings. The walls of enclosed areas shall have openings installed such that:

1. There shall be not less than two openings on different sides of each enclosed area; if a building has more than one enclosed area ~~below the design flood elevation~~, each area shall have openings.
2. The bottom of each opening shall be not more than 1 foot (305 mm) above the higher of the final interior grade or floor and the finished exterior grade immediately under each opening.
3. Openings shall be permitted to be installed in doors and windows; doors and windows without installed openings do not meet the requirements of this section.

R322.3.2 Elevation requirements.

1. Buildings and structures erected within coastal high-hazard areas and Coastal A Zones, shall be elevated so that the bottom of the lowest horizontal structural members supporting the lowest floor, with the exception of piling, pile caps, columns, grade beams and bracing, is elevated to or above the base flood elevation plus 1 foot (305 mm) or the design flood elevation, whichever is higher.
2. Basement floors that are below *grade* on all sides are prohibited.
3. The use of fill for structural support is prohibited.
4. Minor grading, and the placement of minor quantities of fill, shall be permitted for landscaping and for drainage purposes under and around buildings and for support of parking slabs, pool decks, patios and walkways.
5. Walls and partitions enclosing areas below the ~~design flood~~ elevation required in this section shall meet the requirements of Sections R322.3.5 and R322.3.6.

R322.3.5 Walls below ~~design flood~~ required elevation. Walls and partitions are permitted below the ~~elevated floor~~ elevation required in Section R322.3.2, provided that such walls and partitions are not part of the structural support of the building or structure and:

1. Electrical, mechanical and plumbing system components are not to be mounted on or penetrate through walls that are designed to break away under flood loads; and
2. Are constructed with insect screening or open lattice; or
3. Are designed to break away or collapse without causing collapse, displacement or other structural damage to the elevated portion of the building or supporting foundation system. Such

- walls, framing and connections shall have a resistance of not less than 10 (479 Pa) and not more than 20 pounds per square foot (958 Pa) as determined using allowable stress design; or
4. Where wind loading values of this code exceed 20 pounds per square foot (958 Pa), as determined using allowable stress design, the *construction documents* shall include documentation prepared and sealed by a registered *design professional* that:
 - 4.1. The walls and partitions below the ~~design flood~~ required elevation have been designed to collapse from a water load less than that which would occur during the base flood.
 - 4.2. The elevated portion of the building and supporting foundation system have been designed to withstand the effects of wind and flood loads acting simultaneously on structural and nonstructural building components. Water-loading values used shall be those associated with the design flood. Wind-loading values shall be those required by this code.
 5. Walls intended to break away under flood loads as specified in Item 3 or 4 have flood openings that meet the criteria in Section R322.2.2, Item 2.

R322.3.6 Enclosed areas below ~~design flood~~ required elevation. Enclosed areas below the ~~design flood~~ elevation required in Section R322.3.2 shall be used solely for parking of vehicles, building access or storage.

R322.3.7 Stairways and ramps. Stairways and ramps that are located below the lowest floor elevations specified in Section R322.3.2 shall comply with one or more of the following:

1. Be designed and constructed with open or partially open risers and guards.
2. Stairways and ramps not part of the required means of egress shall be designed and constructed to break away during design flood conditions without causing damage to the building or structure, including foundation.
3. Be retractable, or able to be raised to or above the lowest floor elevation, provided that the ability to be retracted or raised prior to the onset of flooding is not contrary to the means of egress requirements of the code.
4. Be designed and constructed to resist flood loads and minimize transfer of flood loads to the building or structure, including foundation.

Areas below stairways and ramps shall not be enclosed with walls below the ~~design flood~~ elevation required in Section R322.3.2 unless such walls are constructed in accordance with Section R322.3.5.

Reason: The primary aspect of elevated homes in flood hazard areas that contributes to reducing damage is the elevation of the lowest floor (R322.2.1) or lowest horizontal structural member of the lowest floor in Zone V and Coastal A Zones (R322.3.2) relative to the base flood elevation. The higher the floor, the lower the risk (and the lower are NFIP flood insurance premiums). To ensure the same level of protection is applied to all aspects of dwellings, Section R322.1.6 requires mechanical, plumbing and electrical equipment to be located at or above the required elevations, and R322.1.8 requires use of flood damage-resistant materials below the required elevations. This same level of protection should apply to enclosures and walls below the required elevations. Currently, the level of protection for enclosures and walls is at the design flood elevation, which may be lower than the lowest floor elevations required in R322.2.1 and R322.3.2.

This proposal is consistent with ASCE 24, in which each table specifying elevations refers not to the elevation of the flood, but the required elevation of the lowest floor (ow lowest horizontal structural member of the lowest floor). This proposal is consistent with the NFIP regulations which, in Section 60.3(c)(5) specifies.... “fully enclosed areas below the lowest floor...” and Section 60.3(e)(5) which specifies....”space below the lowest floor either free of obstruction or constructed with non-supporting breakaway walls ...”.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Most enclosures below elevated buildings in flood hazard areas are constructed with all elements required for enclosures applied below the elevated lowest floor, thus no change in cost of construction. There may be a

slight increase in cost in those rare situations where someone determines the DFE/BFE and “precisely” applies the regulations up to that elevation rather than up to the actual elevation of the lowest floor.

Proposal # 4437

RB141-19

RB142-19

IRC@: R322.2.1

Proponent: Gregory Wilson, representing Federal Emergency Management Agency (gregory.wilson2@fema.dhs.gov); Rebecca Quinn, RCQuinn Consulting, on behalf of Federal Emergency Management Agency, representing Federal Emergency Management Agency (rcquinn@earthlink.net)

2018 International Residential Code

Revise as follows:

R322.2.1 Elevation requirements.

1. Buildings and structures in flood hazard areas, not including flood hazard areas designated as Coastal A Zones, shall have the lowest floors elevated to or above the base flood elevation plus 1 foot (305 mm), or the design flood elevation, whichever is higher.
2. In areas of shallow flooding (AO Zones), buildings and structures shall have the lowest floor (including *basement*) elevated to a height above the highest adjacent *grade* of not less than the depth number specified in feet (mm) on the FIRM plus 1 foot (305 mm), or not less than 3 feet (915 mm) if a depth number is not specified.
3. Basement floors that are below *grade* on all sides shall be elevated to or above base flood elevation plus 1 foot (305 mm), or the design flood elevation, whichever is higher.

Exception: Enclosed areas below the design flood elevation, including *basements* with floors that are not below *grade* on all sides, shall meet the requirements of Section R322.2.2.

Reason: Two successful changes were approved in the 2015 code development cycle. One change modified the elevation requirement by adding 1 foot (freeboard) uniformly into R322, and one change made buildings in designated Coastal A Zones subject to the requirements of R322.3. The clear intent of the second change is to require buildings in Coastal A Zones to comply with R322.3. This is also clear in both R322.2 and R322.3. However, the combination of the two changes approved for R322.2.1 resulted in misleading phrasing. As written, buildings in flood hazard areas designated as Coastal A Zones are subject to the elevation requirements of both R322.2.1 (item #1) and R322.3.2. This proposal adds the word "not" in the first item, removing confusion by explicitly stating buildings in flood hazard areas designated as Coastal A Zones are not addressed by R322.2.1.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. No additional cost. This proposal does not change any requirements for buildings in flood hazard areas designated as Coastal A Zones, which must comply with R322.3.

Proposal # 4436

RB142-19

RB143-19

IRC@: R322.2.3

Proponent: Gregory Wilson, representing Federal Emergency Management Agency (gregory.wilson2@fema.dhs.gov); Rebecca Quinn, RCQuinn Consulting, on behalf of Federal Emergency Management Agency, representing Federal Emergency Management Agency (rcquinn@earthlink.net)

2018 International Residential Code

Revise as follows:

R322.2.3 Foundation design and construction. ~~Foundation walls~~ Foundations for buildings and structures erected in flood hazard areas shall meet the requirements of Chapter 4. Plain masonry walls are not permitted unless designed to account for flood loads.

~~**Exception:** Unless designed in accordance with Section R404:~~

- ~~1. The unsupported height of 6-inch (152 mm) plain masonry walls shall be not more than 3 feet (914 mm).~~
- ~~2. The unsupported height of 8-inch (203 mm) plain masonry walls shall be not more than 4 feet (1219 mm).~~
- ~~3. The unsupported height of 8-inch (203 mm) reinforced masonry walls shall be not more than 8 feet (2438 mm).~~

~~For the purpose of this exception, unsupported height is the distance from the finished *grade* of the under-floor space to the top of the wall.~~

Reason: Section R322.2 applies in flood hazard areas other than coastal high hazard areas (Zone V) and coastal A zones. These are flood hazard areas along waterways, around lakes, and inland of the Zone V or Limit of Moderate Wave Action (if delineated). This proposal removes the exception to allow prescriptive heights for unsupported masonry walls and therefore requires all foundations in flood hazard areas to meet the requirements of Chapter 4. The proposal also would not allow plain masonry walls. The proposal also clarifies that all foundations, not just foundation walls, must meet Chapter 4 requirements.

The wall height limitations in R322.2.3 are based on analyses performed in 1998 for a range of flood depths and flood velocities. FEMA re-examined those limitations in 2013 after observing foundation damage documented in FEMA's post-disaster Mitigation Assessment Team reports which identified failure of unreinforced masonry (URM) walls under flood loads (see FEMA P-765, Midwest Floods of 2008 in Iowa and Wisconsin) and design wind loads (see FEMA P-908, Spring 2011 Tornadoes). MAT teams deployed after Hurricane Sandy documented numerous examples of failed unreinforced and lightly reinforced walls sections in areas shown on Flood Insurance Rate Maps as Zone A, both with and without evidence of moderate waves. Analyses performed in 2013 for a range of wall types and heights, and a range of flood conditions, demonstrated the importance of reinforcement. If this proposal passes, FEMA will provide commentary with guidance for foundations in special flood hazard areas where velocities may exceed 5 fps.

When wind and flood loads are applied under Allowable Stress Design (ASD) Load Combination 7 per ASCE 7-10 Section 2.4.2 (2), net tension results at the top of the foundation wall from the minimum ASCE 7-10 basic wind speed of 115 mph (Exposure Category B). Higher design wind speeds result in greater uplift. The design criteria of ACI-530 Section 2.2.4 specifies that the tensile strength of unreinforced masonry shall be neglected when subjected to axial tension forces. Accordingly, unreinforced wall sections analyzed with net axial tension at

the top of wall from the combined effects of wind and flood loading have been disallowed. ACI-530 commentary to Section 2.2.4 further stipulates, "Net axial tension in unreinforced masonry walls due to axially applied load are not permitted. If axial tension develops in walls due to uplift of connected roofs or floors, the walls must be reinforced to resist the tension. Compressive stress from dead load can be used to offset axial tension."

Cost Impact: The code change proposal will increase the cost of construction

The code change proposal will increase the cost of construction for a limited set of buildings that might have perimeter wall foundations that would fall within the height and wall thickness limits in the exception. However, the likelihood of failure of those foundations under anticipated flood loads will be reduced, and thus decreases future costs associated with rebuilding after flood and flood/high wind events.

Proposal # 4440

RB143-19

RB144-19

IRC@: R322.3.2

Proponent: Gregory Wilson, representing Federal Emergency Management Agency (gregory.wilson2@fema.dhs.gov); Rebecca Quinn, RCQuinn Consulting, on behalf of Federal Emergency Management Agency, representing Federal Emergency Management Agency (rcquinn@earthlink.net)

2018 International Residential Code

Revise as follows:

R322.3.2 Elevation requirements.

1. Buildings and structures erected within coastal high-hazard areas and Coastal A Zones shall be elevated so that the bottom of the lowest horizontal structural members supporting the lowest floor, with the exception of piling, pile caps, columns, grade beams and bracing, is elevated to or above the base flood elevation plus 1 foot (305 mm) or the design flood elevation, whichever is higher. Where stem wall foundations in Coastal A Zones meet the requirements of R322.3.3, the bottom of the lowest horizontal structural member supporting the lowest floor is the bottom of the capping slab.
2. Basement floors that are below *grade* on all sides are prohibited.
3. The use of fill for structural support is prohibited.
4. Minor grading, and the placement of minor quantities of fill, shall be permitted for landscaping and for drainage purposes under and around buildings and for support of parking slabs, pool decks, patios and walkways.
5. Walls and partitions enclosing areas below the design flood elevation shall meet the requirements of Sections R322.3.5 and R322.3.6.

Reason: Section R322.3.2 requires the bottom of the lowest horizontal structural member supporting the lowest floor to be at or above a specific elevation. The basic foundation requirement, in Section R322.3.3, specifies pilings or columns, which minimize obstructions and allow floodwater to pass under elevated buildings. When Coastal A Zones, where designated, were added to Section R322.3 in recognition of the damage even moderate waves can cause, along with scour, the exception to permit backfilled stem wall foundations was added to Section R322.3.3. Unlike open piling and column foundations, it is not clear where the lowest horizontal structural member is to be measured on a stem wall foundation. This proposal clarifies the bottom of the lowest horizontal structural member is the bottom of the capping slab.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal provides clarification to an existing requirement.

Proposal # 4446

RB144-19

RB145-19

IRC@: R322.3.3

Proponent: Gregory Wilson, representing Federal Emergency Management Agency (gregory.wilson2@fema.dhs.gov); Rebecca Quinn, RCQuinn Consulting, on behalf of Federal Emergency Management Agency, representing Federal Emergency Management Agency (rcquinn@earthlink.net)

2018 International Residential Code

Revise as follows:

R322.3.3 Foundations. Buildings and structures erected in coastal high-hazard areas and Coastal A Zones shall be supported on pilings or columns and shall be adequately anchored to such pilings or columns and shall comply with the following:

- ~~1. columns.~~The space below the elevated building shall be either free of obstruction or, if enclosed with walls, the walls shall meet the requirements of Section R322.3.5.
- Pilings shall have adequate soil penetrations to resist the combined wave and wind loads (lateral and uplift) ~~. Water loading values used shall be those associated with the design flood. Wind loading values shall be those required by this code.~~ Pile and pile embedment shall include consideration of decreased resistance capacity caused by scour of soil strata surrounding the piling.
- Columns and their supporting foundations shall be designed to resist combined wave and wind loads, lateral and uplift, and shall include consideration of decreased resistance capacity caused by scour of soil strata surrounding the columns. Pile systems design and installation shall be certified in accordance with Section R322.3.9. Spread footing, mat, raft or other foundations that support columns shall not be permitted where soil investigations that are required in accordance with Section R401.4 indicate that soil material under the spread footing, mat, raft or other foundation is subject to scour or erosion from wave-velocity flow conditions. If permitted, spread footing, mat, raft or other foundations that support columns shall be designed in accordance with ASCE 24.
- Flood and wave loads shall be those associated with the design flood. Wind loads shall be those required by this code.
- Foundation designs and construction documents shall be prepared and sealed in accordance with Section R322.3.9.

Exception: In Coastal A Zones, stem wall foundations supporting a floor system above and backfilled with soil or gravel to the underside of the floor system shall be permitted provided that the foundations are designed to account for wave action, debris impact, erosion and local scour. Where soils are susceptible to erosion and local scour, stem wall foundations shall have deep footings to account for the loss of soil.

Reason: Section R322.3.3 allows the use of pilings or columns, but the way the requirements are phrased makes it appear they apply only to pilings, without equivalent specificity for columns. Columns must also be designed to account for wave and wind loads and the effects of scour. The primary object of this proposal is to provide that specificity. Second, the current text is long, so the proposal breaks it into distinct numbered items which makes it easier to read.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. No cost impact associated with the added text for columns because the text is clarifying only and column foundations already are required to be designed by registered design professionals who should always evaluate whether sites have erodible soils subject to scour as part of the design process.

Proposal # 4443

RB145-19

RB146-19

IRC®: 202 (New), R106.1.5 (New), SECTION R323, R323.1, R323.1.1 (New)

Proponent: Marc Levitan, representing the ICC 500 Storm Shelter Development Committee; Benchmark Harris representing the National Storm Shelter Association (NSSA) (bharris@huckabee-inc.com)

2018 International Residential Code

Add new definition as follows:

STORM SHELTER. A building, structure or portion thereof, constructed in accordance with ICC 500 and designated for use during a severe wind storm event, such as a hurricane or tornado.

Add new text as follows:

R106.1.5 Information on storm shelters. Construction documents for storm shelters shall include the information required in ICC 500.

SECTION R323 STORM SHELTERS

Revise as follows:

R323.1 General. This section applies to storm shelters where constructed as separate detached buildings or where constructed as safe rooms within buildings for the purpose of providing refuge from storms that produce high winds, such as tornados and hurricanes. In addition to other applicable requirements in this code, storm shelters shall be constructed in accordance with ICC ~~NSSA~~-500.

Add new text as follows:

R323.1.1 Sealed documentation. The construction documents for all structural components and impact-protective systems of the storm shelter shall be prepared and sealed by a *registered design professional* indicating that the design meets the criteria of ICC-500.

Exception: Storm shelters, structural components and impact-protective systems that are *listed* and *labeled* to indicate compliance with ICC-500.

Reason: This proposal is submitted by the National Storm Shelter Association (NSSA) and the ICC 500 Storm Shelter Standard Development committee.

The ICC 500 Standards Development committee is responsible for the development of the ICC/NSSA Standard for the Design and Construction of Storm Shelters. The committee is currently working on the development of the 2020 edition. In 2017 the ICC 500 committee held 7 open conference calls. In addition, there were numerous Working Group meetings and conference calls, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/standards-development/is-stm>.

NSSA was responsible for the development of the original standard for storm shelters in 2001, which ICC 500 replaced through an agreement between ICC and NSSA. Representing General, User and Producer interest categories, NSSA is a technical organization that is committed to promoting consistent quality in both residential and community storm shelters.

The term “storm shelter” is used throughout ICC-500 and is defined in the IBC but is not defined in the IRC. The definition proposed in this code change matches the definition in the IBC.

This proposed modification removes the words “as safe rooms” because that language is not necessary and is not defined.

The standard is ICC-500, not ICC/NSSA-500.

Currently, IRC R323.1 requires designs of storm shelters comply with ICC/NSSA-500. However, the National Storm Shelter Association (NSSA) has received reports of failures around the country and even a death in Mayflower, Arkansas associated with residential storm shelters that are not designed in accordance with ICC/NSSA-500. Impact-protective systems of non-engineered systems that builders call residential storm shelters have failed prematurely when they did not meet the testing requirements of ICC/NSSA-500. Additionally, non-engineered systems that builders call residential storm shelters have floated above ground (**Figure 2**) when they aren't designed for the required load and resistance factors defined by ASCE 7, which is referenced by ICC/NSSA-500. It is important to note that the NSSA indicates that none of these failures have occurred in residential shelters manufactured by NSSA producer members, which have their shelters engineered before NSSA will provide them with a seal for their residential storm shelter. The provisions of ICC/NSSA-500 cannot be met by any prescriptive methods in the IRC and therefore require the expertise of a registered design professional.



Figure 1: Photograph of the residential shelter after a tornado caused a death in Mayflower, Arkansas



Figure 2: Failure of an underground residential “storm shelter” not designed per ICC/NSSA-500

As an example of where the IRC has a similar requirement that a registered design professional provide documentation indicating compliance with a standard in a similar circumstance: The current language in the IRC requires that “the construction documents shall include documentation that is prepared and sealed by a registered design professional” indicating that the design complies with certain criteria in R322.3.9 for coastal high-hazard areas.

The proposed exception allows building officials to waive the requirement for a design professional to provide documentation indicating compliance with the design requirements of ICC/NSSA-500 where an approved agency has listed a product such as an entire storm shelter (e.g. an underground shelter with stated conditions for where it can be used) or portions of a storm shelter (e.g. a prefabricated shelter that is to be bolted onto a garage floor with a foundation to be designed by a design professional).

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This does not change construction requirements.

Proposal # 4846

RB146-19

RB147-19

IRC@: R324.3, R324.6

Proponent: Joseph H. Cain, Solar Energy Industries Association (SEIA), representing Solar Energy Industries Association (SEIA) (JoeCainPE@gmail.com); Kevin Reinertson, Riverside County Fire Department, representing California Fire Chiefs Association (kevin.reinertson@fire.ca.gov)

2018 International Residential Code

Revise as follows:

R324.3 Photovoltaic systems. Photovoltaic systems shall be designed and installed in accordance with Sections R324.3.1 through R324.7.1, ~~NFPA 70~~ and the manufacturer's installation instructions. The electrical portion of solar PV systems shall be designed and installed in accordance with NFPA 70.

R324.6 Roof access and pathways. Roof access, pathways and setback requirements shall be provided in accordance with Sections R324.6.1 through R324.6.2.1. Access and minimum spacing shall be required to provide emergency access to the roof, to provide pathways to specific areas of the roof, provide for smoke ventilation opportunity areas, and to provide emergency egress from the roof.

Exceptions:

1. Detached, nonhabitable structures, including but not limited to detached garages, parking shade structures, carports, solar trellises and similar structures, shall not be required to provide roof access.
2. Roof access, pathways and setbacks need not be provided where the code official has determined that rooftop operations will not be employed.
3. These requirements shall not apply to roofs with slopes of two units vertical in 12 units horizontal (17-percent slope) or less.
4. Building integrated photovoltaic (BIPV) systems listed in accordance with Section 690.12(B)(2) of NFPA 70, where the removal or cutting away of portions of the BIPV system during firefighting operations have been determined to not expose a firefighter to electrical shock hazards.

Reason: This proposal correlates sections of the IRC with proposals that were approved by the IFC Committee for the 2021 International Fire Code under Group A.

The change to Section R324.3 is editorial only, and correlates the reference to NFPA 70 with the language from IFC Section 1204.1.

New Exception 4 in IRC Section R324.6 is based on new Exception 3 for 2021 IFC Section 1204.2, as created under Proposal F197-18 approved unanimously by the IFC Committee in Group A.

The technology of solar roofs has been advancing with new materials and methods, particularly in the area of BIPV. Unlike conventional PV panel systems mounted above the roof surface, BIPV systems are integrated into the finished roof surface, and do not present significant trip hazards or physical obstacles to equipment such as ladders that typically exist with other systems. Portions of these systems, and soon the entire roof system, may be listed to meet the NEC safety thresholds for firefighters upon rapid shutdown activation. There are BIPV systems available today that have been shown through testing to not present electrical hazards to firefighters even when cutting into them during ventilation operations. In order to build confidence in the safety features and performance of these systems an evaluation by a NRTL should be required.

These systems eliminate the hazard to firefighters for large portions of the roof, or in some cases the entire roof where BIPV is installed, eliminating the need to provide for access and pathways.

This proposal is intended to provide recognition of those safety levels by adding exceptions to the access and pathways portion of the IFC PV requirements.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal correlates with Group A language changes and will not increase or decrease cost of construction.

Proposal # 5056

RB147-19

RB148-19

IRC@: R324.3.1

Proponent: Jonathan Roberts, representing UL LLC (jonathan.roberts@ul.com)

2018 International Residential Code

Revise as follows:

R324.3.1 Equipment listings. Photovoltaic panels and modules shall be listed and labeled in accordance with UL 1703. Inverters shall be *listed* and *labeled* in accordance with UL 1741. Systems connected to the utility grid shall use inverters *listed* for utility interaction. Mounting systems *listed* and *labeled* in accordance with UL 2703 shall be installed in accordance with the manufacturer's installation instructions and their listings.

Reason: This proposal provides direction on the use of mounting systems listed and labeled in accordance with UL 2703. These specially designed systems provide an alternative method for mounting.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. There are numerous listed mounting systems available, and provides an alternative method for mounting the PV panels.

Proposal # 4884

RB148-19

RB149-19

IRC@: R324.5, R324.5.1, R324.5.2, R324.5.3 (New)

Proponent: Jonathan Roberts, UL LLC, representing UL LLC (jonathan.roberts@ul.com)

2018 International Residential Code

Revise as follows:

R324.5 Building-integrated photovoltaic systems. Building-integrated photovoltaic (BIPV) systems that serve as roof coverings shall be designed and installed in accordance with Section R905.

R324.5.1 Photovoltaic shingles. Photovoltaic shingles shall comply with Section R905.16.

R324.5.2 Fire classification. *Building-integrated photovoltaic systems* shall have a fire classification in accordance with Section R902.3.

Add new text as follows:

R324.5.3 BIPV roof panels. BIPV roof panels shall comply with Section R905.17.

Reason: Section R905.17 was added to the IRC in the last code cycle for BIPV roof panels, but a specific pointer to that section was not included in Section R324. This proposal provides that pointer and this is similar to what is being done for photovoltaic shingles in Section 324.5.1.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. There is no cost impact as this is only adding a specific pointer to a section within the code.

Proposal # 4268

RB149-19

RB150-19

IRC@: R324.5.3 (New)

Proponent: Joseph H. Cain, Solar Energy Industries Association (SEIA), representing Solar Energy Industries Association (SEIA) (JoeCainPE@gmail.com); Kevin Reinertson, Riverside County Fire Department, representing California Fire Chiefs Association (kevin.reinertson@fire.ca.gov)

2018 International Residential Code

Add new text as follows:

R324.5.3 Markings at BIPV roof coverings. Where Building Integrated Photovoltaic (BIPV) roof coverings are installed in a manner that creates areas with electrical hazards to be hidden from view, markings shall be provided to identify the hazardous areas to avoid. The markings shall be reflective and shall be visible from grade.

Exception: BIPV systems listed in accordance with Section 690.12(B)(2) of NFPA 70, where the removal or cutting away of portions of the BIPV system during firefighting operations have been determined to not expose a firefighter to electrical shock hazards.

Reason: This proposal intends to correlate provisions in the IRC with the successful proposal F200-18 in the IFC.

When Building Integrated Photovoltaic (BIPV) Systems are installed as the roof covering, the areas containing electrical hazards can be hidden from view of firefighters and other responders seeking to access the roof for emergency operations. With at least one manufacturer the entire roof surface has the same appearance -- photovoltaic and non-photovoltaic tiles have the same finish, preventing any awareness of where the system is located.

The purpose of this proposal is to require markings warning firefighters and others that access the roof of where the areas are they must avoid for safety purposes. The marking must be readily visible day and night and visible from grade to avoid ground ladder placement at an area with an electrical hazard.

The exception for this requirement is consistent with the language approved by the IFC Committee in proposal F200-18.

Cost Impact: The code change proposal will increase the cost of construction. The increase of cost of construction is specific to BIPV systems and only includes additional marking or labeling.

Proposal # 5091

RB150-19

RB151-19

IRC@: R324.6.2.2

Proponent: Joseph H. Cain, Solar Energy Industries Association (SEIA), representing Solar Energy Industries Association (SEIA) (JoeCainPE@gmail.com); Kevin Reinertson, Riverside County Fire Department, representing California Fire Chiefs Association (kevin.reinertson@fire.ca.gov)

2018 International Residential Code

Revise as follows:

~~R324.6.2.2~~ **R324.6.3 Emergency escape and rescue opening-openings.** Panels and modules installed on dwellings shall not be placed on the portion of a roof that is below an emergency escape and rescue opening. A pathway not less than 36 inches (914 mm) wide shall be provided to the emergency escape and rescue opening.

Exception: BIPV systems listed in accordance with Section 690.12(B)(2) of NFPA 70, where the removal or cutting away of portions of the BIPV system during firefighting operations have been determined to not expose a firefighter to electrical shock hazards.

Reason: The technology of solar roofs has been advancing with new materials and methods, particularly in the area of BIPV. Unlike conventional PV panel systems mounted above the roof surface, BIPV systems are integrated into the finished roof surface, and do not present significant trip hazards or physical obstacles to equipment such as ladders that typically exist with other systems. Portions of these systems, and soon the entire roof system, may be listed to meet the NEC safety thresholds for firefighters upon rapid shutdown activation. There are BIPV systems available today that have been shown through testing to not present electrical hazards to firefighters even when cutting into them during ventilation operations. In order to build confidence in the safety features and performance of these systems an evaluation by a NRTL should be required.

These systems eliminate the hazard to firefighters for large portions of the roof, or in some cases the entire roof where BIPV is installed, eliminating the need to provide for access and pathways.

This proposal is intended to provide recognition of those safety levels by adding exceptions to the access and pathways portion of the IFC PV requirements.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal only provides a BIPV exception to access pathways to emergency escape & rescue openings, and will not increase or decrease the cost of construction.

Proposal # 5088

RB151-19

RB152-19

IRC@: R325.6

Proponent: Jeffrey Hinderliter, New York State Department of State, representing New York State Department of State (Jeffrey.Hinderliter@dos.ny.gov); Gerard Hathaway, New York State Department of State, representing New York State Department of State (gerard.hathaway@dos.ny.gov)

2018 International Residential Code

Revise as follows:

R325.6 Habitable attic. A habitable attic shall ~~not be considered~~ to be a story above grade plane. ~~a story~~ where complying with all of the following requirements:

- ~~1. The occupiable floor area is not less than 70 square feet (17 m²), in accordance with Section R304.~~
- ~~2. The occupiable floor area has a ceiling height in accordance with Section R305.~~
- ~~3. The occupiable space is enclosed by the roof assembly above, knee walls (if applicable) on the sides and the floor-ceiling assembly below.~~
- ~~4. The floor of the occupiable space shall not extend beyond the exterior walls of the floor below.~~

Reason: The topic of habitable attics in the International Residential Code was discussed at length in previous hearings. During our code development process in New York State (which is based on the I-Codes), we have realized that allowing a habitable level above the third story above grade plane that is not considered a “story”, creates both an inconsistency between the IRC and the IBC and a potential threat to the life and safety of occupants living in dwellings regulated under this code. This same change has been proposed to the New York State Uniform Building Code Council for consideration.

1. The current allowance for a “habitable attic” in the IRC creates an inconsistency within the I-Codes.

In its introduction, the IRC states the IRC is “fully compatible with all the International Codes® (I-Codes®) published by the International Code Council® (ICC)®, including the International Building Code®.” The IRC also states in the section entitled “Effective Use of the International Residential Code” the following:

“All buildings within the scope of the IRC are limited to three stories above grade plane. For example, a four-story single-family house would fall within the scope of the International Building Code® (IBC®), not the IRC.”

Traditionally, the scope of the Residential Code has been limited to three-stories. The IRC currently allows additional habitable spaces within one- and two-family dwellings and townhouses that enlarge the size of a dwelling while still considering it a “three-story”: a habitable attic and story below grade plane (a basement). With a habitable attic not considered a story, a dwelling can now have 5 habitable levels, which we believe conflicts with the scope and intent of the Residential Code. It should be noted that there is no limit to the area of a habitable attic. The occupiable floor area and ceiling height requirements in Items 1 and 2 of Section R325.6 are just minimums required for habitable space. For example, a modest footprint three story dwelling with a cape cod style roof, could easily accommodate two bedrooms and a bathroom on the fourth habitable level above grade plane. A larger estate size dwelling could have as much space on that fourth habitable attic level as a small ranch style house.

As justification for this position, consider that the 2015 International Building Code® Illustrated Handbooks contains the following definition of an attic:

ATTIC. *Several provisions apply to the attic area of a building, such as those relating to ventilation of the attic space. In order to fully clarify that portion of a building defined as an attic, Chapter 2 identifies an attic as that space between the ceiling beams at the top story and the roof rafters. An attic designation is appropriate only if*

the area is not considered occupiable. Where this area has a floor, it would be defined as a story. A common misuse of IBC terminology is the designation of a space as a habitable or occupiable attic. Such a designation is inappropriate insofar as once such a space is utilized for some degree of occupancy; it is no longer deemed an attic.

(Source: "2015 International Building Code® Illustrated Handbook" by The International Code Council® (ICC®), Douglas W. Thornburg, AIA, C.B.O., John R. Henry, P.E. Published by McGraw-Hill Education. Accessed through Access Engineering, a service of McGraw-Hill Education)

While this handbook is not enforceable, it acts as a commentary on the IBC and provides guidance as to how the IBC views individual provisions and definitions. As stated above, the IBC considers a space an attic when it "is not considered occupiable". When a space becomes "habitable or occupiable" it is considered a story in the IBC. Hence, a three story one-family dwelling with a habitable attic would be considered a four-story building in the IBC.

There appears to be a conflict between how the IBC and the IRC views the same space. This conflict is allowing the creation of a space under the IRC which would require additional safety measures if built under the IBC. The IBC currently does not have a definition for a "habitable attic" nor any provisions that would allow this space to not be considered a story. Historically, the I-Codes have treated an attic that is habitable as a story.

2. Allowing the creation of a habitable attic, but not considering it an additional story, is allowing a structure that potentially creates unmitigated life-safety hazards.

The IRC currently restricts one- and two-family dwellings and townhouses to be three-stories above grade plane with an unlimited area. For comparison purposes, this is consistent with the R-3 occupancy classification of the IBC. The Tables 504.3 and 504.4 of the 2018 IBC limit the building heights on R-3 occupancies to 40 feet or three stories for buildings equipped with a NFPA 13D automatic sprinkler system and 60 feet or four-stories for buildings equipped with a NFPA 13R automatic sprinkler system, respectively. It is noted that these tables were updated in the 2018 version of the IBC by a Code Action Committee of the ICC to address the consistency of the IBC (Refer to Code Change Proposal G133-15).

For a three-story, one-family dwelling with habitable space in the attic, the maximum story height is limited to 11'-7" in both the IRC and the IBC. Using both a typical story height (8'-0" ceiling height with a 1'-0" structural space) and the maximum story height, the following figures illustrate some possible building heights that can be achieved. Along with this comparison, Table 1 highlights some life-safety features that would result when these structures are constructed under either the IRC or the IBC. It should also be noted that the code currently does not bring into consideration habitable attics that include dormers or various roof styles (such as a mansard roof) that could easily blur the lines of the current definitions and create spaces that appear to miss the intentions of the original code change proposal.

Typical Story Height

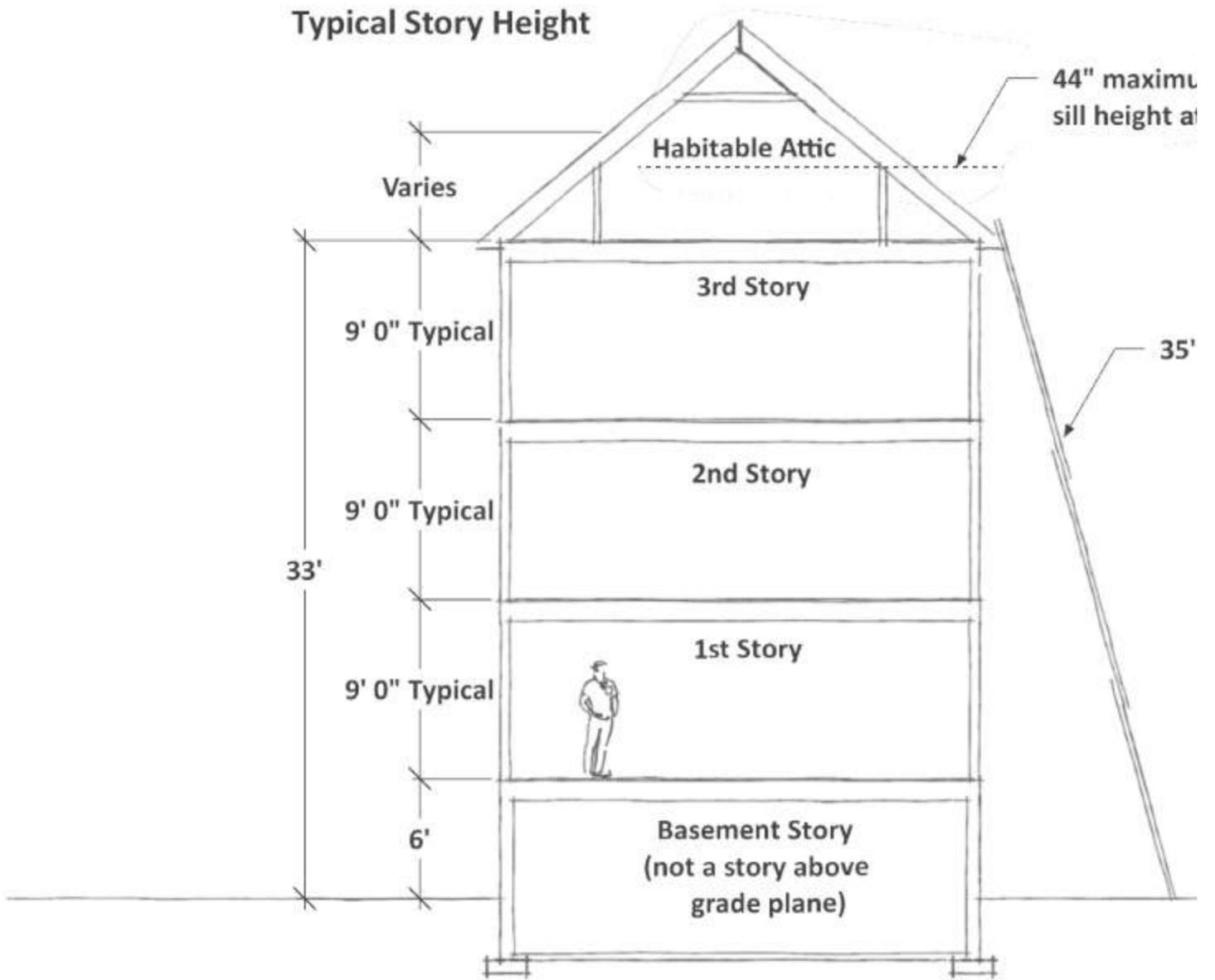


Figure 1

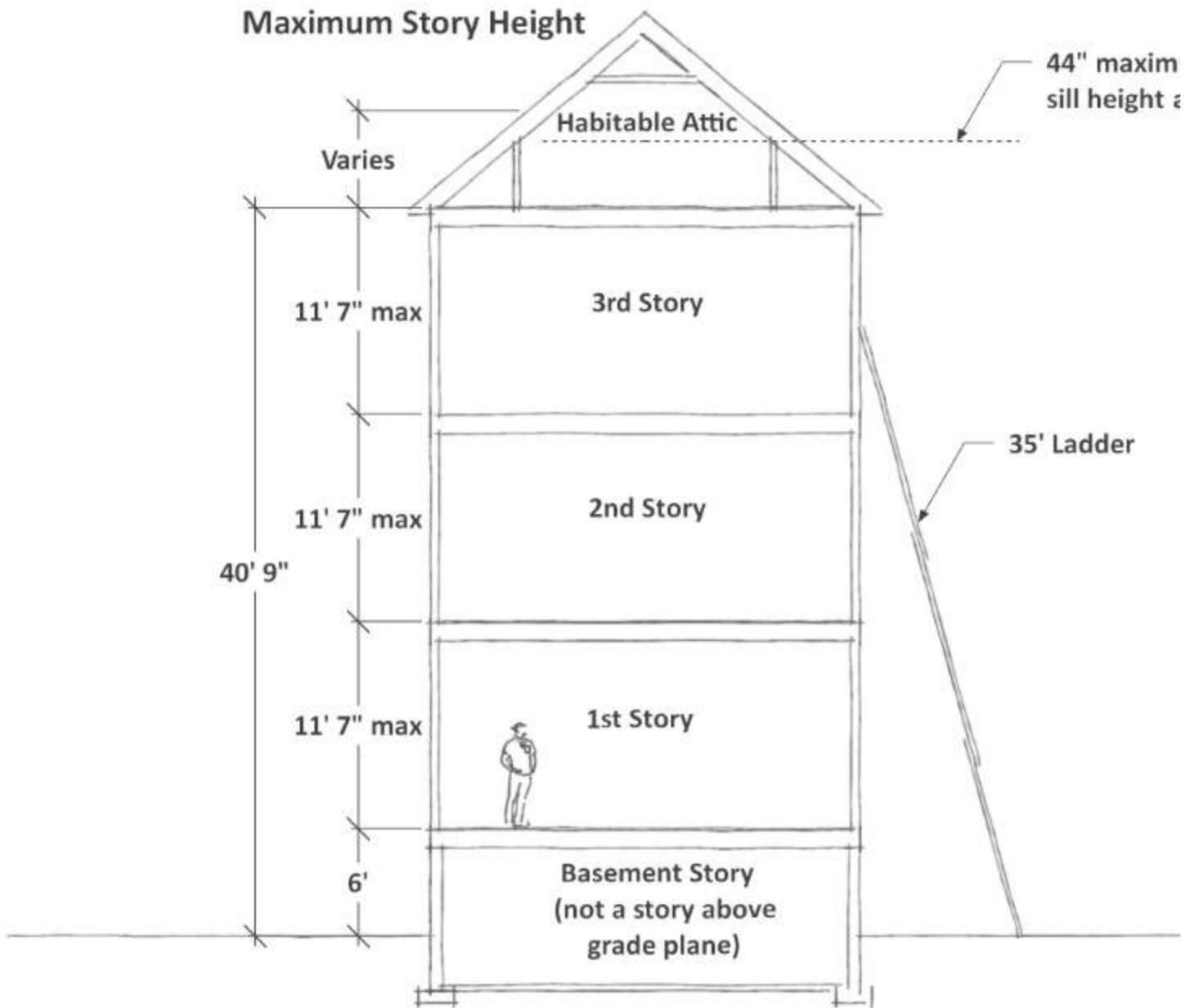


Figure 2

Table 1

Comparison of IRC Requirements to IBC Requirements for Figure 1 and Figure 2

IRC Requirements	IBC Requirements
One-Family Dwelling	Occupancy Group R-3
<ul style="list-style-type: none"> • 2018 IRC considers this a 3-Story Dwelling with a Habitable Attic • 2018 IRC Section R313.2 requires a Section P2904 or NFPA 13D sprinkler system, which results in a 10-minute sprinkler duration (P2904.5.2) • EERO required in the Habitable Attic (R310.1) 	<ul style="list-style-type: none"> • 4-story Dwelling • IBC Table 504.4 would require a NFPA 13R sprinkler system, with a minimum 30-minute sprinkler duration for 4-stories (NFPA 13R Section 9.2) <p>o Alternative: Type IV or higher rated construction with</p>

- 35' ladder reaches 3rd story EERO, but may fail to reach the Habitable Attic (4th Level) EERO in Fig. 1, and fails to reach the Habitable Attic (4th Level) EERO in Fig. 2

an NFPA 13D system

- EERO not required above the 3rd story due to their ineffectiveness at that height (IBC Section 1030.1)
- 35' ladder reaches 3rd story EERO, but may fail to reach the Habitable Attic (4th Level) EERO in Fig. 1, and fails to reach the Habitable Attic (4th Level) EERO in Fig. 2

As is shown in Table 1, the result of applying either the IRC or the IBC would result in different safety levels for the same structure.

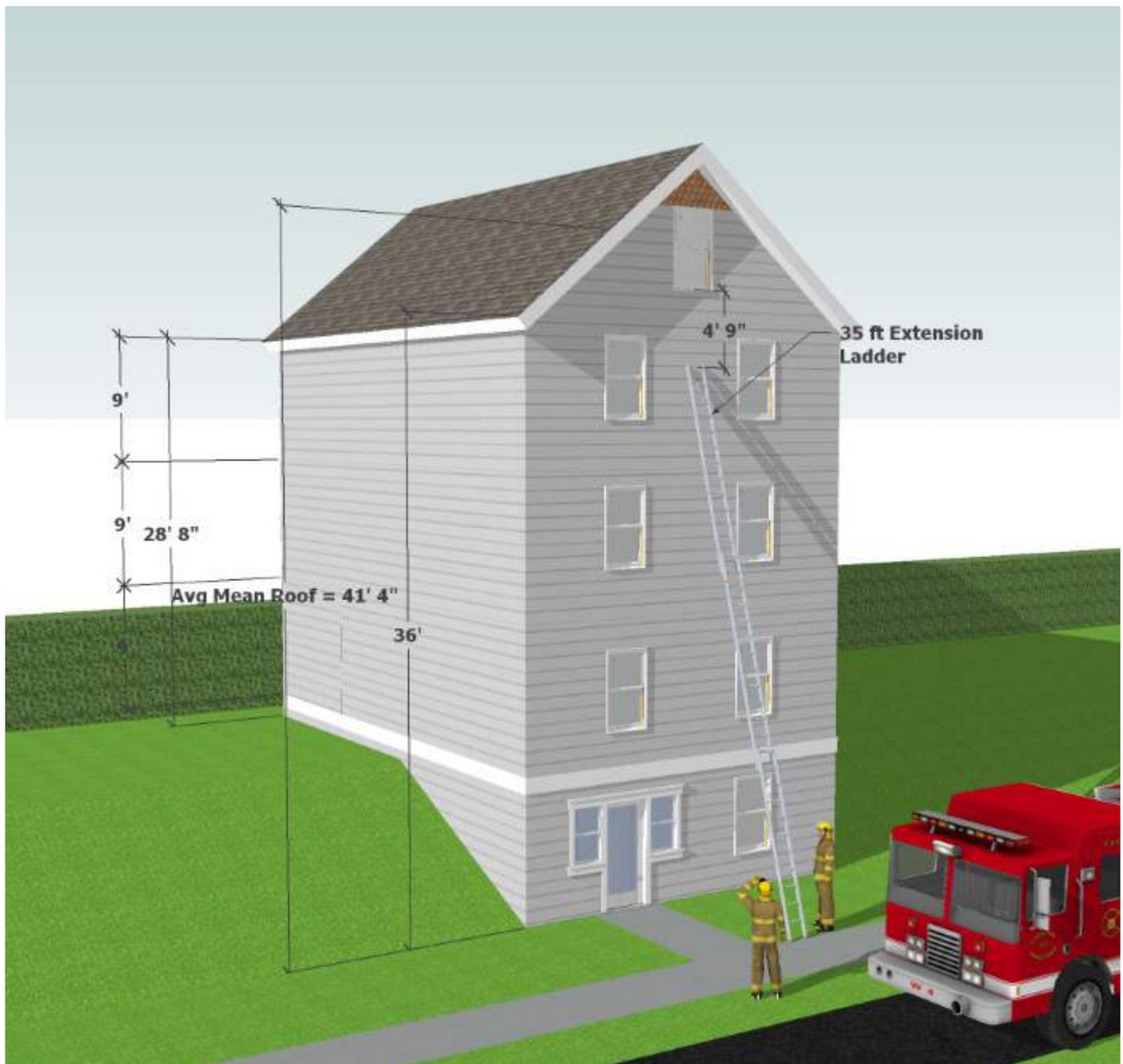


Figure 3: Walkout basement (not considered a story above grade plane) with typical story height, floor-to-floor, of 9'-0"

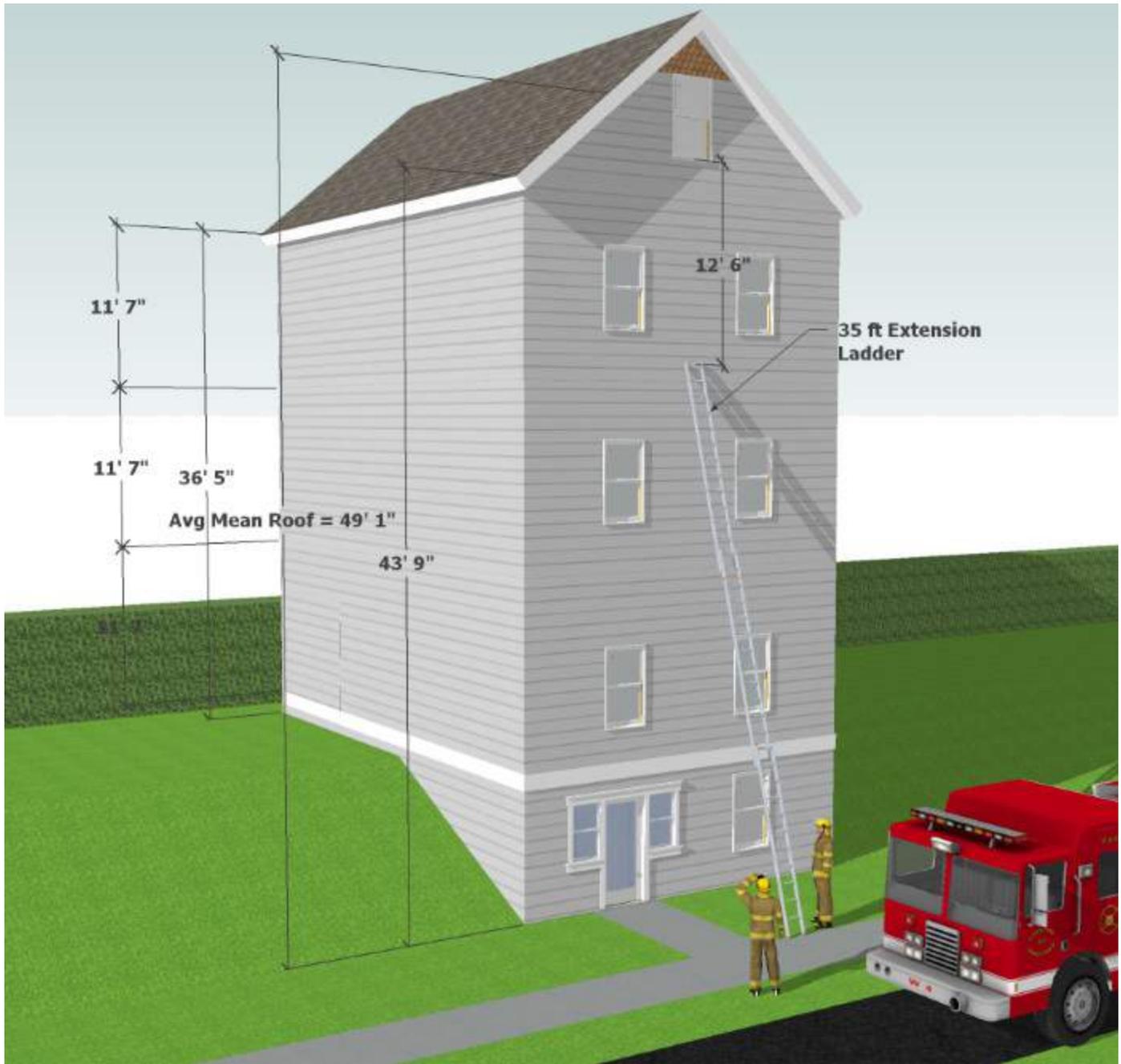


Figure 4: Walkout basement (not considered a story above grade plane) with maximum prescriptive story height, floor-to-floor, of 11'-7"

To correct this inconsistency, we recommend altering the IRC to consider a habitable attic a story above grade plane, as has been the historical interpretation of the IRC, and is the current practice of the IBC. The change would require new dwellings that exceed the three-story limit permitted under the IRC to be constructed to meet the structural and life-safety standards of the IBC. This will increase the safety of these tall dwellings and bring greater consistency across the I-Codes. We also recommend deleting the qualifying Items 1 through 4 because, once the habitable attic level is considered a story above grade plane, the qualifiers are not necessary.

We recommend the definition of, "Attic, Habitable" should remain unchanged because it differentiates that area of a building which contains "habitable space" from a typical "attic" as defined. The definition stating that a habitable attic can be finished or unfinished takes away the arguments made by those who would seek to disqualify the area in question because it is unfinished in some way. If the area is being used as habitable

space, all other requirements necessary for a space to be considered habitable must be provided.

On the other hand, if the area is being used for non-habitable space such as for equipment or storage, then the owner should not be required to provide EEROs, egress stairs and other items required for habitable space, just because it has the minimum area and ceiling height requirements of a habitable space. Code enforcement officers could condition the Certificate of Occupancy for such a dwelling as a three-story structure with attic storage not approved for use as habitable space.

Bibliography: "2018 International Residential Code for one- and two-family dwellings" by The International Code Council® (ICC®). (2017). Country Club Hills, IL: International Code Council.

"2015 International Building Code® Illustrated Handbook" by The International Code Council® (ICC®), Douglas W. Thornburg, AIA, C.B.O., John R. Henry, P.E. Published by McGraw-Hill Education. Accessed through Access Engineering, a service of McGraw-Hill Education

Cost Impact: The code change proposal will increase the cost of construction

This code change, by returning to the historical interpretation and application of the IRC, would increase the cost of construction only when a habitable attic is above a third story, creating a fourth-story above grade plane. This change would potentially force some dwellings to be constructed under the IBC rather than the IRC, which would trigger height limitations and the need for higher types of construction and additional life-safety measures, including the potential to install a NFPA 13R system rather than a NFPA 13D system. This cost increase reflects the need to offset the increased risk of these structures.

Proposal # 5299

RB152-19

RB153-19

IRC@: SECTION R202, [RB] 202, 202 (New), SECTION R327, R327.1, R327.2, R327.3, R327.4, R327.5, R327.6 (New), R327.6.1 (New), R327.6

Proponent: Robert Davidson, Davidson Code Concepts, LLC, representing Tesla, USA (rjd@davidsoncodeconcepts.com); Kevin Reinertson, representing Riverside County Fire Department (kevin.reinertson@fire.ca.gov); Jack Applegate, Northwest Code Professionals, representing City of Clatskanie, Oregon (jacka@nwcodepros.com)

2018 International Residential Code

SECTION R202 DEFINITIONS

Delete without substitution:

~~**[RB] BATTERY SYSTEM, STATIONARY STORAGE.** A rechargeable energy storage system consisting of electrochemical storage batteries, battery chargers, controls and associated electrical *equipment* designed to provide electrical power to a building. The system is typically used to provide standby or emergency power, an uninterruptable power supply, load shedding, load sharing or similar capabilities.~~

Add new definition as follows:

[RB] Energy Storage Systems (ESS). One or more devices, assembled together, capable of storing energy in order to supply electrical energy at a future time.

Revise as follows:

SECTION R327 STATIONARY ENERGY STORAGE BATTERY SYSTEMS

R327.1 General. ~~Stationary storage battery system~~ ESS shall comply with the provisions of this section.

R327.2 Equipment listings. ~~Stationary storage battery systems~~ ESS shall be *listed* and *labeled* for residential use in accordance with UL 9540.

Exceptions:

1. Where *approved*, repurposed unlisted battery systems from electric vehicles are allowed to be installed outdoors or in detached sheds located not less than 5 feet (1524 mm) from exterior walls, property lines and public ways.
2. *Battery systems* that are an integral part of an electric vehicle are allowed provided that the installation complies with Section 625.48 of NFPA 70.
3. Battery systems less than 1 kWh (3.6 megajoules).

R327.3 Installation. ~~Stationary storage battery systems~~ ESS shall be installed in accordance with the manufacturer's instructions and their *listing*, if applicable, and shall not be installed within the habitable space of a dwelling unit.

R327.4 Electrical installation. ~~Stationary storage battery systems~~ ESS shall be installed in accordance with

NFPA 70. Inverters shall be *listed* and *labeled* in accordance with UL 1741 or provided as part of the UL 9540 listing. Systems connected to the utility grid shall use inverters listed for utility interaction.

R327.5 Ventilation. Indoor installations of ~~stationary storage battery systems~~ ESS that include batteries that produce hydrogen or other flammable gases during charging shall be provided with ventilation in accordance with Section M1307.4.

Add new text as follows:

R327.6 Commissioning. ESS shall be commissioned as follows:

1. Verify that the system is installed in accordance with the approved plans and manufacturer's instructions and is operating properly.
2. Provide a copy of the manufacturer's installation, operation, maintenance, and decommissioning instructions provided with the listed system.
3. Provide training on the proper operation and maintenance of the system to the system owner.
4. Provide a label on the installed system containing the contact information for the qualified maintenance and service providers.

R327.6.1 Installation prior to closing. Where the system is installed in a one- or two-family dwelling or townhouse that is owned by the builder and has yet to be sold, commissioning shall be conducted as outlined in Section R327.6, and the builder shall then transfer the required information in Section R327.6 to the home owner when the property is transferred to the owner at the closing.

Revise as follows:

R327.6 R327.7 Protection from impact. ~~Stationary storage battery systems~~ ESS installed in a location subject to vehicle damage shall be protected by approved barriers.

Reason: The purpose of this proposal is two fold. First it replaces the term Stationary Battery Storage System with Energy Storage Systems (ESS) throughout the document. The existing term is from older editions of the IFC and legacy codes and based on older concepts. The new term suggested is the industry recognized term and is what both the IFC and NFPA 855 Energy Storage Systems use to identify these systems. The second item is the addition of R327.6 for commissioning requirements as part of the installation of ESS. These systems are new technology and intricate. Commissioning is necessary to ensure a proper installation and proper operation of the systems once installed. This requirement is consistent with requirements added to the IFC for R-3 and R-4 Group occupancies and NFPA 855 requirements for one- and two-family homes and townhouses.

Usually these systems are added to an existing dwelling by the current owner. In the rare case a system is installed as part of construction of a custom home, new Section R327.6.1 provides for the nadoff of the commissioning paperwork to the new owner after closing. This is consistent with what is done for the manufacturer's paperwork for other appliances and for fire alarms systems.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposed change does not impact the cost of construction of one- or two-family dwellings and townhouses. ESS are specialty systems typically installed in an existing dwelling by the current owner. In the rare case that a new custom home owner desires installation of ESS as part of the construction of the custom home, these requirements impact the cost of the ESS portion of the installation not the home itself. These requirements will increase the cost of installation of ESS.

RB154-19

IRC@: SECTION R202, [RB] 202, 202 (New), SECTION R327, R327.1, R327.2, R327.3, R327.3.1 (New), 327.3.2 (New), R327.3.3 (New), R327.4, R327.5, R327.6, R327.3.7 (New), Table R327.3.7 (New), R327.3.7.1 (New), R327.3.7.2 (New), R327.3.8 (New), R327.4 (New), R327.5 (New), R327.5.1 (New)

Proponent: Robert Davidson, Davidson Code Concepts, LLC, representing Tesla, USA (rjd@davidsoncodeconcepts.com); Kevin Reinertson, representing Riverside County Fire Department (kevin.reinertson@fire.ca.gov); Jack Applegate, representing City of Clatskanie, Oregon (jacka@nwcodepros.com)

2018 International Residential Code

SECTION R202 DEFINITIONS

Delete without substitution:

~~[RB] BATTERY SYSTEM, STATIONARY STORAGE.~~ A rechargeable energy storage system consisting of electrochemical storage batteries, battery chargers, controls and associated electrical *equipment* designed to provide electrical power to a building. The system is typically used to provide standby or emergency power, an uninterruptable power supply, load shedding, load sharing or similar capabilities.

Add new definition as follows:

[RB] ENERGY STORAGE SYSTEM (ESS). One or more devices, assembled together, capable of storing energy in order to supply electrical energy at a future time.

Revise as follows:

SECTION R327 STATIONARY ENERGY STORAGE BATTERY SYSTEMS

R327.1 General. ~~Stationary storage battery system~~ shall comply with the provisions of this section. ESS shall be installed and maintained in accordance with Sections R327.2 through R327.4. The temporary use of an owner or occupant's electric powered vehicle as an ESS shall be in accordance with Section R327.5.

R327.2 Equipment listings. ~~Stationary storage battery systems~~ ESS 1 kWh or greater in maximum stored energy shall be listed and labeled for residential use in accordance with UL 9540.

Exceptions:

1. Where *approved*, repurposed unlisted battery systems from electric vehicles are allowed to be installed outdoors or in detached sheds located not less than 5 feet (1524 mm) from exterior walls, property lines and public ways.
2. ~~Battery systems that are an integral part of an electric vehicle are allowed provided that the installation complies with Section 625.48 of NFPA 70.~~ ESS listed and labeled in accordance with UL 9540 solely for utility or commercial use installed in accordance with Section 1206 of the *International Fire Code*.
3. ~~Battery systems less than 1 kWh (3.6 megajoules).~~

R327.3 Installation. ~~Stationary storage battery systems~~ ESS shall be installed in accordance with the

manufacturer's instructions and their *listing*, if applicable, and shall not be installed within the living space or habitable space of a dwelling unit.

Add new text as follows:

R327.3.1 Spacing. Individual units shall be separated from each other by at least three feet of spacing unless smaller separation distances are documented to be adequate as approved by the code official based on large scale fire testing complying with Section 1206.1.5 of the International Fire Code.

327.3.2 Location. ESS shall only be installed in the locations listed in items 1 through 4.

1. Detached garages and detached accessory structures.
2. Attached garages separated from the dwelling unit living space and sleeping units in accordance with Section R302.6.
3. Outdoors on exterior walls or on the ground located a minimum 3 ft. from doors and windows.
4. Enclosed utility closets or spaces, or enclosed storage closets within dwelling units.

R327.3.3 Energy ratings. Individual ESS units shall have a maximum stored energy of 20 kWh. The aggregate rating within or outside the structure shall not exceed:

1. 40 kWh within utility closets and storage or utility spaces.
2. 80 kWh in attached or detached garages and detached accessory structures.
3. 80 kWh on exterior walls.
4. 80 kWh outdoors on the ground.

ESS installations exceeding the permitted individual or aggregate ratings shall be installed in accordance with Section 1206 of the International Fire Code

Revise as follows:

R327.4 R327.3.4 Electrical installation. ~~Stationary storage battery systems~~ ESS shall be installed in accordance with NFPA 70. Inverters shall be *listed* and *labeled* in accordance with UL 1741 or provided as part of the UL 9540 listing. Systems connected to the utility grid shall use inverters listed for utility interaction.

R327.5 R327.3.5 Ventilation. Indoor installations of ~~stationary storage battery systems~~ ESS that include batteries that produce hydrogen or other flammable gases during ~~charging~~ normal operation shall be provided with ventilation in accordance with Section ~~M1307.4.~~ M1307.4.2.

R327.6 R327.3.6 Protection from impact. ~~Stationary storage battery systems~~ ESS installed in a location subject to vehicle damage shall be protected by approved barriers.

Add new text as follows:

R327.3.7 Fire separation When located within a garage, utility closet or space, or storage closet, the garage, room or space shall be separated as required by Table R327.3.7. Attachment of gypsum board shall comply with Table R702.3.5. The wall separation provisions of Table R327.3.7 shall not apply to garage walls that are perpendicular to the adjacent dwelling unit wall.

Table R327.3.7
ESS Fire Separation

<u>SEPARATION</u>	<u>MATERIAL</u>
<u>From the residence and attics</u>	<u>Not less than 1/2-inch gypsum board or equivalent applied to the garage, room or space side</u>

<u>From habitable rooms above the garage, room or space</u>	<u>Not less than 5/8-inch Type X gypsum board or equivalent</u>
<u>Structure(s) supporting floor/ceiling assemblies used for separation required by this section</u>	<u>Not less than 1/2-inch gypsum board or equivalent</u>
<u>Garages located less than 3 feet from a dwelling unit on the same lot</u>	<u>Not less than 1/2-inch gypsum board or equivalent applied to the interior side of exterior walls that are within this area</u>

R327.3.7.1 Openings. Openings from a garage, room or space directly into a room used for sleeping purposes shall be prohibited.

R327.3.7.2 Penetrations. Penetration protection shall be provided at openings in walls, ceilings and floors around vents, pipes, ducts, cables and wires, with an approved material to resist the free passage of flame and products of combustion. The material filling this annular space shall not be required to meet the ASTM E136 requirements.

R327.3.8 Fire detection. Interconnected smoke alarms shall be installed throughout the dwelling in accordance with Section R314, including in the room or area within the dwelling or attached garage in which the ESS are installed. A heat detector listed and interconnected to the smoke alarms shall be installed in the room or area within the dwelling or attached garage in which the ESS is installed where smoke alarms cannot be installed based on their listing.

R327.4 Toxic and highly toxic gas. ESS that have the potential to release toxic or highly toxic gas during charging, discharging and normal use conditions shall be installed outdoors.

R327.5 Electric vehicle use. The temporary use of an owner or occupant's electric powered vehicle to power a dwelling unit while parked in an attached or detached garage or outside shall comply with the vehicle manufacturer's instructions and NFPA 70. The batteries on electric vehicles shall not contribute to the aggregate energy limitations in Section R327.4.3.

R327.5.1 Temporary. The temporary use of the dwelling unit owner's or occupant's electric-powered vehicle to power the dwelling while parked in an attached or detached garage or outside shall not exceed 30 days.

Reason: Last cycle the portion of the International Fire Code dealing with Stationary Battery Storage Systems was heavily rewritten by the Energy Storage Work Group of the ICC Fire Code Action Committee to address changes in technology and application of battery storage systems. When that work was accepted by the IFC Committee and the voting membership, new Section R327 was added to the International Residential Code to provide for some core requirements when the systems are installed in one- and two-family dwellings and townhouses.

Simultaneous to that work, NFPA created a new NFPA 855 Energy Storage Systems Standard for a comprehensive document addressing the hazards of energy storage systems. The ICC FCAC Energy Storage Work Group continued to work on the topic in coordination with the work being done by the NFPA 855 committee to keep the technical details of the documents as coordinated as possible. As a result, the new requirements in the 2018 edition of the IFC have been heavily updated as to structure and the topics covered.

This proposal is an outgrowth of work done by the NFPA 855 Committee specific to one- and two-family dwellings and townhouses as well as new language added to the IFC for the 2021 edition addressing R-3 and R-4 Group Occupancies.

The concerns identified for one and two-family dwellings and townhouses dealt with:

- Where the ESS units could be located.

- Energy rating maximum of individual units.
- Aggregate energy ratings when more than one unit is installed.
- Linkage to the fire code when energy limitations are exceeded.
- Fire separation.
- Fire detection.
- ESS that may produce toxic or highly toxic gases during operation.
- Temporary use of electric vehicle as ESS for the dwelling.

The breakdown of the suggested changes are as follows:

New definition: The definition for Energy Storage Systems (ESS) from the IFC has been brought over to the IRC for consistency of terminology between the IFC and NFPA 855.

R327 generally: The term Energy Storage Systems has replaced the term Stationary Storage Battery Systems.

R327.1: Has been modified to identify the sections ESS shall comply with and to add a separate pointer for the section applicable to the temporary use of an electric vehicle as an ESS.

R327.2: Has been modified to pull the exception for the systems with less than 1 kWh and provide it as the energy rating level trigger for cleaner application of the requirements. Exception 2 has been deleted since the use of electric vehicles is covered by the new section R327.5. In its place language has been added providing for the installation of utility or commercial listed systems (not listed for residential use) to be outside the dwelling and to be in accordance with the IFC. Exception 3 is deleted since that topic is now covered by the initial language at the start of R327.2.

R327.3: Has been modified to replace the current terminology with ESS, and a restriction against installation in “living space” has been added to address concerns that there are other locations such as hallways that are not covered by the existing restriction for habitable spaces. That addition provides consistency with language added to NFPA 855.

New R327.3.1: Adds a separation requirement of 3 feet between ESS units unless large scale testing has documented that an event in one unit will not propagate to the next unit.

New R327.3.2: Adds a listing of specific installation locations consistent with the IFC R-3 and R-4 locations and NFPA 855.

New R327.3.3: Provides a limitation on the maximum energy rating of an individual unit as well as an aggregate energy rating for specific installation locations. The size of an event is directly correlated to the amount of energy stored. It then provides that if increased energy above these limits is desired the installation shall be done in accordance with the IFC.

R327.3.4 (Prior R327.4): Has been modified to replace the current terminology with ESS.

R327.3.5 (Prior R327.5): Has been modified to replace the current terminology with ESS. The term “charging” has been replaced with the phrase “normal operation”. It doesn’t matter at what point the gases are produced, they need to be exhausted. Section M1307.4 was changed to Section 1307.4.2 to clarify this is a mechanical exhaust system that is required.

R327.3.6 (Prior R327.6): Has been modified to replace the current terminology with ESS.

New R327.3.7: This section has been added to address the need for fire separation. When an event occurs, it cannot always be extinguished with water. Exposures would be wetted while the unit burns itself out. For that reason, separation is needed to assist in preventing fire spread. The language from existing Section 302.6 was taken for consistency and editorially modified slightly to fit this area of the code.

New R327.3.7.1: Adds the first sentence of existing Section R302.5.1 to keep rooms or spaces with ESS from opening into areas for sleeping purposes. (The remainder of R302.5.1 concerning doors and closures is part of a separate proposal).

New R327.3.7.2: Adds language from existing Section R302.11, Item 4, (as referenced by existing R302.5.3), with editorial changes to fit this application.

New R327.3.8: Adds a requirement that when ESS is installed the dwelling must have an interconnected smoke alarm system with a smoke alarm installed in the room or space the ESS is located for early warning of an event. If the space is not conducive to the installation of a smoke alarm a listed heat alarm can be installed and interconnected to the smoke alarm system.

New R327.4: Provides that an ESS that has the potential to release toxic or highly toxic gases during normal use shall be installed outdoors.

New R327.5: Provides for the temporary use of an electric vehicle as an ESS to power the dwelling provide it is done in compliance with the NEC and the manufacturer's instructions. The requirement for the manufacturer's instruction compliance ensures that only electric vehicles designed and manufactured for use as an ESS are utilized as compared to someone adding non-approved electrical connections to an existing electric vehicle not designed for this purpose. Temporary is further defined as 30 days with new Section R327.5.1.

These changes will provide for correlation with the new language added to the IFC as well as enhancements made when the language was added to NFPA 855. This correlation provides for consistency or requirements across codes and standards.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposed change does not impact the cost of construction of one- or two-family dwellings and townhouses. ESS are specialty systems typically installed in an existing dwelling by the current owner. In the rare case that a new custom home owner desires installation of ESS as part of the construction of the custom home, these requirements impact the cost of the ESS portion of the installation not the home itself. The separation requirements were intentionally matched to the existing private garage separation requirements for correlation with construction of the home. These requirements will increase the cost of installation of ESS.

Proposal # 4820

RB154-19

RB155-19

IRC®: SECTION R202, 202 (New), SECTION R327, R327.1, R327.2, R327.3, R327.3.1 (New), R327.4, R327.5, R327.6

Proponent: Sharon Bonesteel, representing Salt River Project (sharon.bonesteel@srpnet.com); Matt Paiss, Energy Response Solutions, Inc., representing International Association of Fire Fighters (mpaiss@gmail.com)

2018 International Residential Code

SECTION R202 DEFINITIONS

Add new definition as follows:

ENERGY STORAGE SYSTEM (ESS). One or more devices that are assembled together and capable of storing electric energy for future use.

Revise as follows:

SECTION R327 ~~STATIONARY ENERGY STORAGE BATTERY SYSTEMS~~

R327.1 General. ~~Stationary Energy storage battery system systems~~ shall comply with the provisions of this section.

R327.2 Equipment listings. ~~Stationary Energy storage battery systems~~ shall be *listed* and *labeled* for residential use in accordance with UL 9540.

Exceptions:

1. Where *approved*, repurposed unlisted battery systems from electric vehicles are allowed to be installed outdoors or in detached sheds located not less than 5 feet (1524 mm) from exterior walls, property lines and public ways.
2. *Battery systems* that are an integral part of an electric vehicle are allowed provided that the installation complies with Section 625.48 of NFPA 70.
3. Battery systems less than 1 kWh (3.6 megajoules).

R327.3 Installation. ~~Stationary Energy storage battery systems~~ shall be installed in accordance with the manufacturer's instructions and their *listing*, if applicable, and shall not be installed within the habitable space of a dwelling unit.

Add new text as follows:

R327.3.1 Opening protection. Openings from a garage or energy storage system room or space directly into a room used for sleeping purposes shall not be permitted. Other openings between the garage, or between a room or space containing an energy storage system and the living space or habitable space of a dwelling unit shall be equipped with solid wood doors not less than 1 3/8 inches (35 mm) in thickness, solid or honeycombcore steel doors not less than 1 3/8 inches (35 mm) thick, or 20-minute fire-rated doors. Such doors shall be equipped with a self-closing or automatic-closing device.

Revise as follows:

R327.4 R327.3.2 Electrical installation. ~~Stationary~~*Energy storage battery systems* shall be installed in accordance with ~~NFPA 70. Chapters 34 through 43.~~ Inverters shall be *listed* and *labeled* in accordance with UL 1741 or provided as part of the UL 9540 listing. Systems connected to the utility grid shall use inverters listed for utility interaction.

R327.5 R327.3.3 Ventilation. Indoor installations of ~~stationary energy storage battery systems~~ that include batteries that produce hydrogen or other flammable gases during charging shall be provided with ventilation in accordance with Section ~~M1307.4. M1307.4.2.~~

R327.6 R327.3.4 Protection from impact. ~~Stationary~~*Energy storage battery systems* installed in a location subject to vehicle damage shall be protected by approved barriers.

R327.3 Installation. *Stationary storage battery systems* shall be installed in accordance with the manufacturer's instructions and their *listing*, if applicable, and shall not be installed within the habitable space of a dwelling unit.

Reason: This proposal addresses three items.

1 - The proposal brings over the definition of Energy Storage Systems from the International Fire Code and the term Stationary Battery Storage Systems has been modified to instead use the Energy Storage Systems term. This will provide consistency with the fire code and the current industry terminology for such systems.

2 - A new section R327.3.1 on openings is added. The proposed language restricts openings from spaces where ESS are installed to protect the dwelling and occupants if a thermal runaway event occurs and applies the same requirements for door type and closure that is utilized for attached private garages. The language was obtained from existing section R302.5.1 with minor editorial modification to fit this new location.

R302.5.1 Opening protection.

Openings from a private garage directly into a room used for sleeping purposes shall not be permitted. Other openings between the garage and residence shall be equipped with solid wood doors not less than 1 3/8 inches (35 mm) in thickness, solid or honeycombcore steel doors not less than 1 3/8 inches (35 mm) thick, or 20-minute fire-rated doors, equipped with a self-closing or automatic-closing device.

3 - The section numberings have been modified clarifying that existing Sections R327.4 thru R327.6 are installation requirement subsections.

Cost Impact: The code change proposal will increase the cost of construction. The additional requirement of a door or closure will minimally increase the overall cost of ESS installations.

Proposal # 4828

RB155-19

RB156-19

IRC®: R327.3

Proponent: Marcelo Hirschler, GBH International, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Revise as follows:

R327.3 Installation. *Stationary storage battery systems* shall be listed and installed in accordance with the manufacturer's instructions and their *listing*, if applicable, and shall ~~not be installed within the habitable space~~ only in the following locations of a dwelling unit.

1. In attached garages separated from the dwelling unit living and sleeping spaces in accordance with Section R302.6.
2. In detached garages.
3. In detached accessory structures.
4. Outdoors on exterior walls and located at a distance of not less than 3 ft. from doors and windows.

Reason: This revision corrects a problem with the existing code that allows the installation of ESS units in closets and other storage spaces without any special precautions, which is unsafe. The definition of habitable space in the IRC (A space in a building for living, sleeping, eating or cooking. Bathrooms, toilet rooms, closets, halls, storage or utility spaces and similar areas are not considered habitable spaces.) specifically points out that closets and storage spaces are not habitable spaces. This revision also requires ESS units to be listed.

Cost Impact: The code change proposal will increase the cost of construction
This proposal may require special provisions for installation of ESS units.

Proposal # 5157

RB156-19

RB157-19

IRC@: R327.3, R327.3.1 (New)

Proponent: Jonathan Roberts, UL LLC, representing UL LLC (jonathan.roberts@ul.com)

2018 International Residential Code

Revise as follows:

R327.3 Installation. *Stationary storage battery systems* shall be installed in accordance with the manufacturer's instructions and their *listing*, if applicable, ~~and shall not be installed within the habitable space of a dwelling unit.~~

Add new text as follows:

R327.3.1 Locations. Stationary storage battery systems installed in a dwelling unit shall be *listed* and marked "For use in residential dwelling units".

Exceptions:

1. Stationary storage battery systems installed in an attached garage, that is separated from the dwelling unit in accordance with Section R302.6.
2. Stationary storage battery systems installed in a detached garage or detached accessory structure.
3. Stationary storage battery systems installed in an enclosed utility room.

Reason: R327.2 already requires stationary battery storage systems covered by this code to be listed for residential use in accordance with UL 9540. This proposal clarifies that stationary battery storage systems installed within the dwelling unit itself shall comply with new UL 9540 listing requirements being developed and clarifies locations where the additional listing requirements do not apply.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This does not increase the cost of construction. It merely provides closer correlation with listing requirements.

Proposal # 4829

RB157-19

RB158-19

IRC@: 202 (New), [RB] 202, SECTION R327, R327.1, R327.2, R327.3, R327.4, R327.5, R327.6

Proponent: Jonathan Roberts, UL LLC, representing UL LLC (jonathan.roberts@ul.com)

2018 International Residential Code

Add new definition as follows:

[RB] ENERGY STORAGE SYSTEM (ESS). One or more devices, assembled together, that are capable of storing energy for supplying electrical energy at a future time.

Delete without substitution:

~~**[RB] BATTERY SYSTEM, STATIONARY STORAGE.** A rechargeable energy storage system consisting of electrochemical storage batteries, battery chargers, controls and associated electrical *equipment* designed to provide electrical power to a building. The system is typically used to provide standby or emergency power, an uninterruptable power supply, load shedding, load sharing or similar capabilities.~~

Revise as follows:

SECTION R327 ~~STATIONARY ENERGY STORAGE BATTERY SYSTEMS (ESS)~~

R327.1 General. ~~Stationary storage battery system~~ Energy Storage Systems (ESS) shall comply with the provisions of this section.

R327.2 Equipment listings. ~~Stationary storage battery systems~~ ESS shall be *listed* and *labeled* for residential use in accordance with UL 9540.

Exceptions:

1. Where *approved*, repurposed unlisted battery systems from electric vehicles are allowed to be installed outdoors or in detached sheds located not less than 5 feet (1524 mm) from exterior walls, property lines and public ways.
2. *Battery systems* that are an integral part of an electric vehicle are allowed provided that the installation complies with Section 625.48 of NFPA 70.
3. Battery systems less than 1 kWh (3.6 megajoules).

R327.3 Installation. ~~Stationary storage battery systems~~ ESS shall be installed in accordance with the manufacturer's instructions and their *listing*, if applicable, and shall not be installed within the habitable space of a dwelling unit.

R327.4 Electrical installation. ~~Stationary storage battery systems~~ ESS shall be installed in accordance with NFPA 70. Inverters shall be *listed* and *labeled* in accordance with UL 1741 or provided as part of the UL 9540 listing. Systems connected to the utility grid shall use inverters listed for utility interaction.

R327.5 Ventilation. Indoor installations of ~~stationary storage battery systems~~ that include batteries ~~ESS~~ that produce hydrogen or other flammable gases during charging shall be provided with ventilation in accordance with Section M1307.4.

R327.6 Protection from impact. ~~Stationary storage battery systems~~ ESS installed in a location subject to

vehicle damage shall be protected by approved barriers.

Reason: This proposal is strictly editorial and only changes the term “stationary storage battery systems” to “energy storage systems”. It also replaces the current definition of Stationary Storage Battery System with an Energy Storage System (ESS) definition approved for the 2021 IFC. Energy storage system is the common industry term and is used in the IFC and the IBC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is an editorial change only.

Proposal # 4833

RB158-19

RB159-19

IRC@: SECTION R328 (New), R328.1 (New), R328.2 (New)

Proponent: Jonathan Roberts, UL LLC, representing UL LLC (jonathan.roberts@ul.com)

2018 International Residential Code

Add new text as follows:

SECTION R328 STATIONARY ENGINE GENERATORS

R328.1 General. Stationary engine generators shall be *listed* and labeled in accordance with UL 2200 and shall comply with this section. The connection of stationary engine generators to the premise wiring system shall be by means of a *listed* transfer switch.

R328.2 Installation. The installation of stationary engine generators shall be in an *approved* location and in accordance with the *listing*, the manufacturer's installation instructions, and Chapters 34 through 43..

Reason: Stationary generators are becoming a more common standby source of electrical power for one and two family dwellings. This proposal provides basic safety requirements for these installations, and the requirements are consistent with those included in Section 915 of the 2018 IMC and Section 616 of the 2018 IFGC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. There are numerous stationary engine generators on the market that are listed to UL 2200, and they are typically installed in accordance with NFPA 70 and the manufacturer's instructions.

Proposal # 4261

RB159-19

RB160-19

IRC®: SECTION R202, 202 (New), SECTION R328 (New), R328.1 (New), R328.2 (New), R328.3 (New), R328.3.1 (New)

Proponent: Robert Davidson, Davidson Code Concepts, LLC, representing Toyota, USA
(rjd@davidsoncodeconcepts.com)

2018 International Residential Code

SECTION R202 DEFINITIONS

Add new definition as follows:

[RB] FUEL CELL POWER SYSTEM, STATIONARY. A stationary energy generation system that converts the chemical energy of a fuel and oxidant to electric energy (DC or AC electricity) by an electrochemical process.

Field-fabricated fuel cell power system. A stationary fuel cell power system that is assembled at the job site and is not a preengineered or prepackaged factory-assembled fuel cell power system.

Preengineered fuel cell power system. A stationary fuel cell power system consisting of components and modules that are produced in a factory, and shipped to the job site for assembly.

Prepackaged fuel cell power system. A stationary fuel cell power system that is factory assembled as a single, complete unit and shipped as a complete unit for installation at the job site.

Add new text as follows:

SECTION R328 STATIONARY FUEL CELL POWER SYSTEMS

R328.1 General. *Stationary fuel cell power systems* in new and existing buildings and structures shall comply with this section and Section 1205.1 of the *International Fire Code*.

Exception: The temporary use of a fuel cell powered electric vehicle to power a dwelling unit while parked shall comply with Section R328.3.

R328.2 Residential Listing. *Stationary fuel cell power systems* shall not be installed in dwelling units unless they are specifically listed for residential use.

R328.3 Fuel Cell Vehicle ESS Use. The temporary use of the dwelling unit owner's or occupant's fuel cell powered electric vehicle to power a dwelling while parked in an attached or detached garage or outdoors shall comply with the vehicle manufacturer's instructions and NFPA 70.

R328.3.1 Temporary. The temporary use of the dwelling unit owner's or occupant's fuel cell powered electric vehicle to power the dwelling while parked in an attached or detached garage or outdoors shall not exceed 30 days.

Reason: This proposal builds on work done during last cycle with both the International Fire Code and this code relative to Energy Storage Systems (ESS) and work in the current cycle to update the IFC and this code. Last cycle the International Fire Code was updated with new requirements for ESS and a basic set of requirements

were added to this code last cycle as well. This cycle the IFC requirements for ESS were updated and there is a companion proposal submitted to this code to update the IRC as well.

Part of the work last cycle involved adding a new Section 1205 Stationary Fuel Cell Power Systems to the IFC with core requirements for the installation of fuel cell power systems. This cycle that section was updated to recognize the temporary use of fuel cell powered electric vehicles as ESS to power the dwelling unit on a temporary basis.

This proposal is intended to delete the existing limited language at M1903 and to provide needed guidance in this code for the installation of fuel cells that to correlate the updated language on ESS in the IRC with the IFC. It is important to note that these systems are designated by the USDOE as ESS, not simply mechanical systems. The same holds true for both the IFC and NFPA 855 Energy Storage Systems. Since these fuel cell power systems are utilized for ESS the code language pertaining to them should directly follow the requirements for ESS in the IRC as they do in the IFC for improved usability.

It should be noted that fuel cell power systems are being actively marketed and installed for one- and two-family homes. This has been occurring for over a decade. Fuel cell powered electric vehicles are also now being marketed with the capability to be used as an ESS for a dwelling unit.

To better address these specialty systems the following is proposed:

Definition: The definition and subdefinitions for stationary fuel cell power systems has been brought over from the IFC.

New R328.1: Requires compliance with this section of the IRC and Section 1205 of the IFC where the bulk of the requirements are located. For temporary use of fuel cell powered vehicles as ESS it points to Section R328.3.

New R328.2: Identifies that only residential use listed fuel cell power systems can be installed in dwelling units.

New R328.3: Provides for the temporary use of the fuel cell powered electric vehicles to power the dwelling. It is limited to the owner or occupant's vehicle. This is an important distinction as mobile ESS providers are regulated by the IFC.

New R328.3.1: Defines how long the 'temporary' use is.

The language added is intentionally not extensive. The core requirements for these specialty systems are already built into the IFC and the referenced standards of that document. When installed as ESS the requirements for ESS in this code will also apply. The language proposed is enough to ensure proper installation and to address the temporary use of fuel cell powered vehicles as ESS.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposed change does not impact the cost of construction of one- or two-family dwellings and townhouses. Stationary fuel cell power systems are specialty systems typically installed in an existing dwelling by the current owner. In the rare case that a new custom home owner desires installation of a stationary fuel cell power system as part of the construction of the custom home, these requirements impact the cost of the stationary fuel cell power system portion of the installation, not the cost of construction of the home itself.

Proposal # 5546

RB160-19

RB161-19

IRC@: R328 (New), R328.1 (New), R328.1.1 (New), R328.2 (New), R328.2.1 (New), R328.2.2 (New), R328.2.3 (New), R328.2.4 (New), R328.2.5 (New), R328.3 (New), R328.3.1 (New), R328.3.2 (New), R328.4 (New), R328.5 (New), R328.5.1 (New), R328.5.2 (New), R328.5.3 (New), R328.5.4 (New), R328.5.5 (New), R328.6 (New)

Proponent: Eirene Knott, BRR Architecture, representing Metropolitan Kansas City Chapter of the ICC (Eirene.Knott@brrarch.com); David Allen (davidallen89@att.net); Ron Olberding (ronolberding@sbcglobal.net)

2018 International Residential Code

Add new text as follows:

R328 Physical Security

R328.1 Purpose. The purpose of this section is to establish minimum standards that incorporate physical security to make dwelling units resistant to unlawful entry.

R328.1.1 Scope. The provisions of this section shall apply to all new structures and to additions and alterations made to existing buildings.

R328.2 Doors. All exterior swinging doors of residential dwelling units and attached garages, including doors leading from the garage area into the dwelling unit, shall comply with Sections R328.2.1 through R328.2.5 based on the type of door installed.

Exception: Vehicular access doors

R328.2.1 Wood doors. Exterior wood doors shall be of solid core construction such as high-density particleboard, solid wood, or wood block core with a minimum thickness of 1-3/4 inches (45 mm) at any point. Doors with panel inserts shall be solid wood with the insert being a minimum of 1-inch (25.4 mm) in thickness.

R328.2.2 Steel doors. Exterior steel doors shall be a minimum thickness of 24 gauge and have reinforcement material at the location of the deadbolt.

R328.2.3 Fiberglass doors. Fiberglass doors shall have a minimum skin thickness of one-sixteenth inch and have reinforcement material at the location of the deadbolt.

R328.2.4 Double doors. The inactive leaf of an exterior double door shall be provided with flush bolts having an engagement of not less than 1-inch (25.4 mm) into the head and threshold of the doorframe, or by other approved methods.

R328.2.5 Sliding doors. Exterior sliding doors shall be installed to prevent the removal of the panels from the exterior.

R328.3 Door frames. The exterior door frames shall be installed prior to the rough-in inspection. Horizontal blocking shall be placed between studs at the door lock height for three stud spaces or equivalent bracing on each side of the door opening. Door frames shall comply with Sections R328.3.1 through R328.3.2 based on the type of door installed.

R328.3.1 Wood frames. Wood frame doors shall be set in frame openings constructed of double studding or equivalent construction. Door frames, including those with sidelights, shall be reinforced in accordance with ASTM F476 Grade 40 bolt and hinge impact only.

R328.3.2 Steel frames. Steel door frames shall be constructed of 18 gauge or heavier steel and reinforced at the hinges and strikes. Doors are to be anchored to the wall in accordance with the manufacturer's instructions.

R328.4 Door jambs. Door jambs on wooden jambs for in-swinging doors shall be of one-piece construction.

R328.5 Door hardware. Exterior door hardware shall comply with Sections R328.5.1 through R328.5.5.

R328.5.1 Hinges. Hinges for exterior swinging doors shall comply with the following:

1. At least two screws, 3 inches (76 mm) in length, penetrating at least 1-inch (25.4 mm) into the wall structure shall be used. Solid wood fillers or shims shall be used to eliminate any space between the wall structure and the door frame behind each hinge.
2. Hinges for out-swinging doors shall be equipped with mechanical interlock to prevent removal of the door from the exterior.

R328.5.2 Escutcheon plates. All exterior doors shall have escutcheon plates protecting the door's edge.

R328.5.3 Locks. Exterior doors shall be provided with a deadbolt with a minimum grade 2 as determined by ANSI/BHMA.

R328.5.4 Entry vision and glazing. All main or front entry doors to dwelling units shall be arranged so that the occupant has a view of the area immediately outside the door without opening the door. The view may be provided by a door viewer having a field of view of not less than 180 degrees, through windows or through view ports.

R328.5.5 Side light entry doors. Side light doors units shall have framing of double stud construction or equivalent construction complying with Sections R328.3.1 or R328.3.2. The door frame that separates the door opening from the side light, whether on the latch side or the hinge side, shall be double stud construction or equivalent construction complying with Sections R328.3.1 or R328.3.2. Double stud construction or equivalent construction shall exist between the glazing unit of the side light and the wall structure of the dwelling.

R328.6 Alternate materials and methods of construction. The provisions of this section are not intended to prevent the use of any material or method of construction not specifically prescribed by this section, provided any such alternate has been approved. Nor is it the intention of this section to exclude any sound method of structural design or analysis not specifically provided for in this section. The materials, method of construction and structural design limitations provided for in this section shall be used, unless otherwise approved. Compliance with ASTM F476 will be deemed to be in compliance with this section.

Reason: In the summer of 1996, Overland Park, Kansas, experienced a series of home invasions resulting in the sexual assault of several women. For the victims of a home invasion, it's more than a property crime; it scares the victim into thinking that the criminal will return only to commit a more violent or heinous crime. To have an emotional investment in their residence is priceless.

As a result of these home invasions, the City's Police Department conducted hundreds of surveys of residents in an effort to develop a solution to the home invasions. The results of the surveys lead the City to develop a building code that makes home more safe and secure. You may ask, why secure the front door? What about installing an alarm? Communities across the country continue to report a growing increase in false alarms. In an effort to provide physical security to the homeowner, there needs to be a more reliable option available.

The longer a criminal spends trying to gain access to a home, the greater the risk of detection. In addition, most home invaders will not attempt to break a window, as that makes noise that neighbors could potentially hear. Rather than face these risks, the invader is more likely to try to kick in an exterior door, where they can easily gain access without being detected.

This code change will provide for minimal provisions to be made to a new home under construction that will give

the homeowner safety and peace of mind, while delaying and frustrating the criminal. Since this proposal is not dependent on electrical power, these provisions will always be available to the homeowner and will require no further action after installation. There is no on-going cost to the homeowner and these provisions will not affect the overall aesthetics of the home.

Cost Impact: The code change proposal will increase the cost of construction

The cost to secure a single door ranges from \$40-\$60 for a single door unit and between \$140 and \$180 for a double sidelite unit.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM F476, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 4863

RB161-19

RB162-19

IRC®: 202 (New), R328.1 (New), AO103.1, AO103.2, ASTM Chapter 44 (New), SECTION AO101, AO101.1, SECTION AO102, 202, SECTION AO103, SECTION AO104

Proponent: Jonathan Roberts, UL LLC, representing UL LLC (jonathan.roberts@ul.com)

2018 International Residential Code

Add new definition as follows:

VEHICULAR GATE. A moveable barrier that is intended for use at a vehicle entrance or exit and not intended for use by pedestrian traffic.

Add new text as follows:

R328.1 General. Automatic vehicular gates shall comply with the requirements of Sections R328.2 and R328.3.

R328.2 Vehicular gates intended for automation. Vehicular gates intended for automation shall be designed, constructed and installed to comply with the requirements of ASTM F2200.

R328.3 Vehicular gate openers. Vehicular gate openers shall be listed in accordance with UL 325.

Add new standard(s) as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428

F2200-14: Standard Specification for Automated Vehicular Gate Construction

Delete without substitution:

~~SECTION AO101- GENERAL~~

~~**AO101.1 General.** The provisions of this appendix shall control the design and construction of automatic vehicular gates installed on the lot of a one or two family dwelling.~~

~~SECTION AO102- DEFINITION~~

~~**VEHICULAR GATE.** A gate that is intended for use at a vehicular entrance or exit to the lot of a one or two family dwelling, and that is not intended for use by pedestrian traffic.~~

~~SECTION AO103- AUTOMATIC VEHICULAR GATES~~

~~**AO103.1 Vehicular gates intended for automation.** Vehicular gates intended for automation shall be designed, constructed and installed to comply with the requirements of ASTM F2200.~~

~~**AO103.2 Vehicular gate openers.** Vehicular gate openers, where provided, shall be listed in accordance with~~

SECTION AO104 REFERENCED STANDARDS

ASTM F2200—14	Standard Specification for Automated Vehicular Gate Construction	AO103.1
UL 325—02	Door, Drapery, Gate, Louver and Window Operations and Systems—with revisions through May 2015	AO103.2

Reason: This proposal recognizes the importance of safety by moving the requirements for automatic vehicular gates from Appendix O to the body of the code. It does not require the use of automated vehicular gates, but where vehicular gates are provided, it requires them to meet the same safety standards that are in the IBC (Section 3110) and the IFC (Sections 503.5 and 503.6.).

In 2018, CPSC launched “Operation Safe Gate” to put an end to preventable tragedies caused by automatic security gates. CPSC estimates that there are about 300 emergency room injuries each year due to automatic gates. Many of the injuries have been serious and resulted in cuts, broken bones, hematomas and amputations. In addition, CPSC has received four tragic reports of fatalities in recent years, including an 8 year old, an 11 year old and a 12 year old.

<https://onsafety.cpsc.gov/blog/2018/08/06/operation-safe-gate-put-an-end-to-automatic-security-gate-tragedies/>

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal does not require vehicular gates to be installed. There are numerous automated vehicular gates that already comply with these safety standards, so when these are used there will be no increase in costs.

Proposal # 4230

RB162-19

RB163-19

IRC®: SECTION R328 (New), R328.1 (New), R328.2 (New), R328.3 (New)

Proponent: Ali Fattah, City of San Diego, representing City of San Diego (afattah@sandiego.gov)

2018 International Residential Code

Add new text as follows:

SECTION R328 ALTERATIONS AND ADDITIONS

R328.1 General. Additions and Alterations to detached one- and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories above grade plane in height with a separate means of egress, and their accessory structures not more than three stories above grade plane in height, shall comply with this code or the *International Existing Building Code*. Where the alteration includes a change of use or occupancy to one not within the scope of the *International Residential Code*, the alteration shall comply with the *International Existing Building Code*.

R328.2 Additions. Additions to buildings within the scope of the *International Residential Code* shall comply with the requirements of the International Residential Code for new construction. Alterations to the existing building or structure shall be such that the existing building or structure together with the addition is not less compliant with the provisions of the *International Residential Code* than the existing building or structure was prior to the addition. An existing building together with its additions shall comply with the height limits of the *International Residential Code*.

R328.3 Alterations. Alterations to any building or structure within the scope of the *International Residential Code* shall comply with the requirements of the *International Residential Code* for new construction. Alterations shall be such that the existing building or structure is not less compliant with the provisions of the *International Residential Code* than the existing building or structure was prior to the alteration.

Reason: This proposed code change is editorial in nature and cross reference the IEBC in similar fashion to the way the IEBC provides the IRC as an option for compliance in the exception to Section 101.2. The code change also fills a gap regarding additions and alterations since the two scopes of work that are defined in Chapter 2 are only used within specific sections such as smoke alarm and carbon monoxide alarm requirements for example. The proposed genral text is extracted from the IEBC prescriptive method sections in chapter 5. The alterations section also calrifies that you only need to go to the IEBC if the alteration changes the occuapancy or use to one not regulated by the IRC.

Chapter 3 was selected in lieu of chapter 1 since some jurisdictions may not adopt Chapter 1 of the IRC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The proposed code change is editorial in nature and does not add new standards.

Proposal # 4839

RB163-19

RB164-19

IRC®: TABLE R403.1(1), TABLE R403.1(2), TABLE R403.1(3), R403.1.1

Proponent: Gary Ehrlich, representing National Association of Home Builders (gehrlich@nahb.org)

2018 International Residential Code

Revise as follows:

TABLE R403.1(1)

**MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS FOR LIGHT-FRAME CONSTRUCTION
(inches)^{a, b, c, d}**

Portions of table not shown remain unchanged.

GROUND SNOW LOAD OR ROOF LIVE LOAD	STORY AND TYPE OF STRUCTURE WITH LIGHT FRAME	LOAD-BEARING VALUE OF SOIL (psf)					
		1500	2000	2500	3000	3500	4000
20 psf roof live load or 25 ground snow load	1 story—slab-on-grade	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—with crawl space	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—plus basement	16 18 x 6	12 14 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	2 story—slab-on-grade	13 12 x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	2 story—with crawl space	15 16 x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	2 story—plus basement	19 22 x 6	14 16 x 6	12 13 x 6	12 x 6	12 x 6	12 x 6
	3 story—slab-on-grade	16 14 x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	3 story—with crawl space	18 x 6 19 x 6	14 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	3 story—plus basement	22 x 7 25 x 8	16 19 x 6	13 15 x 6	12 13 x 6	12 x 6	12 x 6
30 psf	1 story—slab-on-grade	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—with crawl space	13 x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—plus basement	16 19 x 6	12 14 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	2 story—slab-on-grade	13 12 x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	2 story—with crawl space	16 17 x 6	12 13 x 6	12 x 6	12 x 6	12 x 6	12 x 6

	2 story—plus basement	$\frac{1923}{\times 6} \times 6$	$\frac{1417}{\times 6}$	$\frac{1214}{\times 6}$	12 x 6	12 x 6	12 x 6
	3 story—slab-on-grade	$\frac{1615}{\times 6} \times 6$	$\frac{1412}{\times 6}$	12 x 6	12 x 6	12 x 6	12 x 6
	3 story—with crawl space	$\frac{19 \times 20}{\times 6}$	$\frac{1415}{\times 6}$	12 x 6	12 x 6	12 x 6	12 x 6
	3 story—plus basement	$\frac{22 \times 726}{\times 8}$	$\frac{1620}{\times 6}$	$\frac{1316}{\times 6}$	$\frac{1213}{\times 6}$	12 x 6	12 x 6
50 psf	1 story—slab-on-grade	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—with crawl space	$\frac{1416}{\times 6} \times 6$	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—plus basement	$\frac{1821}{\times 6} \times 6$	$\frac{1316}{\times 6}$	$\frac{1213}{\times 6}$	12 x 6	12 x 6	12 x 6
	2 story—slab-on-grade	$\frac{1514}{\times 6} \times 6$	$\frac{1312}{\times 6}$	12 x 6	12 x 6	12 x 6	12 x 6
	2 story—with crawl space	$\frac{1719}{\times 6} \times 6$	$\frac{1314}{\times 6}$	12 x 6	12 x 6	12 x 6	12 x 6
	2 story—plus basement	$\frac{2125}{\times 7} \times 7$	$\frac{1519}{\times 6}$	$\frac{1215}{\times 6}$	12 x 6	12 x 6	12 x 6
	3 story—slab-on-grade	$\frac{1817}{\times 6} \times 6$	13 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	3 story—with crawl space	$\frac{2022}{\times 6} \times 6$	$\frac{1517}{\times 6}$	$\frac{1213}{\times 6}$	12 x 6	12 x 6	12 x 6
	3 story—plus basement	$\frac{24 \times 828}{\times 9}$	$\frac{1821}{\times 6}$	$\frac{1417}{\times 6}$	$\frac{1214}{\times 6}$	12 x 6	12 x 6
70 psf	1 story—slab-on-grade	$\frac{1412}{\times 6} \times 6$	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—with crawl space	$\frac{1618}{\times 6} \times 6$	$\frac{1213}{\times 6}$	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—plus basement	$\frac{19 \times 624}{\times 7}$	$\frac{1418}{\times 6}$	$\frac{1214}{\times 6}$	12 x 6	12 x 6	12 x 6
	2 story—slab-on-grade	$\frac{1716}{\times 6} \times 6$	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	2 story—with crawl space	$\frac{1921}{\times 6} \times 6$	$\frac{1416}{\times 6}$	$\frac{1213}{\times 6}$	12 x 6	12 x 6	12 x 6
	2 story—plus basement	$\frac{22 \times 727}{\times 9}$	$\frac{1720}{\times 6}$	$\frac{1316}{\times 6}$	$\frac{1214}{\times 6}$	12 x 6	12 x 6
	3 story—slab-on-grade	$\frac{20 \times 619}{\times 6}$	$\frac{1514}{\times 6}$	12 x 6	12 x 6	12 x 6	12 x 6
	3 story—with crawl space	$\frac{2225}{\times 7} \times 7$	$\frac{1618}{\times 6}$	$\frac{1315}{\times 6}$	12 x 6	12 x 6	12 x 6
	3 story—plus basement	$\frac{24 \times 830}{\times 10}$	$\frac{1923}{\times 6}$	$\frac{1518}{\times 6}$	$\frac{1315}{\times 6}$	$\frac{1213}{\times 6}$	12 x 6

For SI: 1 inch = 25.4 mm, 1 plf = 14.6 N/m, 1 pound per square foot = 47.9 N/m².

a. ~~Interpolation allowed.~~ Linear interpolation of footing width is permitted between the soil bearing pressures in the table. Extrapolation is not allowed. ~~permitted.~~

b. ~~Based on 32-foot wide house with load-bearing center wall that carries half of the tributary attic, and floor framing. For every 2 feet of adjustment to the width of the house, add or subtract 2 inches of footing width and 1 inch of footing thickness (but not less than 6 inches thick).~~ The table is based on the following conditions and loads: Building width: 32 feet; Wall height: 9 feet; Basement wall height: 8 feet; Dead loads: 15 psf roof and ceiling assembly, 10 psf floor assembly, 12 psf wall assembly; Live loads: Roof and ground snow loads as listed, 40 psf first floor, 30 psf second and third floor. Footing sizes are calculated assuming a clear span roof/ceiling assembly and an interior bearing wall or beam at each floor.

c. Where the building width perpendicular to the wall footing is greater than 32 feet, the footing width shall be increased by 2 inches and footing depth shall be increased by 1 inch for every 4 feet of increase in building width.

d. Where the building width perpendicular to the wall footing is less than 32 feet, a 2 inch decrease in footing width and 1 inch decrease in footing depth is permitted for every 4 feet of decrease in building width.

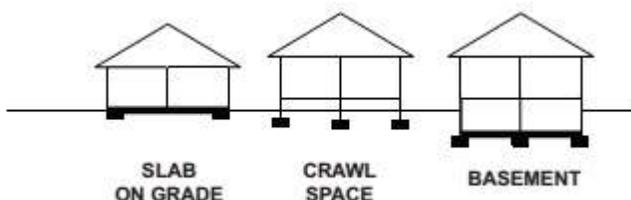


TABLE R403.1(2)

MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS FOR LIGHT-FRAME CONSTRUCTION WITH BRICK VENEER OR LATH AND PLASTER (inches)^{a, b, c, d}

GROUND SNOW LOAD OR ROOF LIVE LOAD	STORY AND TYPE OF STRUCTURE WITH BRICK VENEER	LOAD-BEARING VALUE OF SOIL (psf)					
		1500	2000	2500	3000	3500	4000
20 psf roof live load or 25 psf ground snow load	1 story—slab-on-grade	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—with crawl space	15 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—plus basement	<u>18</u> ² × 6	<u>14</u> ¹ × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story—slab-on-grade	<u>18</u> ¹ × 6	<u>13</u> ² × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story—with crawl space	20 × 6	15 × 6	12 × 6	12 × 6	12 × 6	12 × 6

	2 story—plus basement	$\frac{2326}{6} \times 8$	$\frac{1720}{6} \times$ 6	$\frac{1416}{6} \times$ 6	$\frac{1213}{6} \times$ 6	12 × 6	12 × 6
	3 story—slab-on-grade	$\frac{23 \times 820}{6}$	$\frac{1715}{6} \times$ 6	$\frac{1412}{6} \times$ 6	12 × 6	12 × 6	12 × 6
	3 story—with crawl space	$\frac{25 \times 926}{8}$	19 × 6	$\frac{15}{6} \times$ 6	$\frac{13}{6} \times$ 6	12 × 6	12 × 6
	3 story—plus basement	$\frac{2932}{11} \times$ 11	$\frac{2124}{7} \times$ 7	$\frac{1719}{6} \times$ 6	$\frac{1416}{6} \times$ 6	$\frac{1214}{6} \times$ 6	12 × 6
30 psf	1 story—slab-on-grade	$\frac{1312}{6} \times 6$	12 × 6	$\frac{12}{6} \times$ 6	$\frac{12}{6} \times$ 6	12 × 6	12 × 6
	1 story—with crawl space	$\frac{1516}{6} \times 6$	12 × 6	$\frac{12}{6} \times$ 6	$\frac{12}{6} \times$ 6	12 × 6	12 × 6
	1 story—plus basement	$\frac{1822}{6} \times 6$	$\frac{1416}{6} \times$ 6	$\frac{1213}{6} \times$ 6	12 × 6	12 × 6	12 × 6
	2 story—slab-on-grade	$\frac{1816}{6} \times 6$	$\frac{1412}{6} \times$ 6	$\frac{12}{6} \times$ 6	$\frac{12}{6} \times$ 6	12 × 6	12 × 6
	2 story—with crawl space	$\frac{2022}{6} \times 6$	$\frac{1516}{6} \times$ 6	$\frac{1213}{6} \times$ 6	12 × 6	12 × 6	12 × 6
	2 story—plus basement	$\frac{24 \times 827}{9}$	$\frac{1821}{6} \times$ 6	$\frac{1416}{6} \times$ 6	$\frac{1214}{6} \times$ 6	12 × 6	12 × 6
	3 story—slab-on-grade	$\frac{23 \times 821}{6}$	$\frac{1816}{6} \times$ 6	$\frac{1413}{6} \times$ 6	12 × 6	12 × 6	12 × 6
	3 story—with crawl space	$\frac{26 \times 927}{8}$	$\frac{1920}{6} \times$ 6	$\frac{1516}{6} \times$ 6	$\frac{13}{6} \times$ 6	12 × 6	12 × 6
	3 story—plus basement	$\frac{2933}{11} \times$ 11	$\frac{2224}{7} \times$ 7	$\frac{1720}{6} \times$ 6	$\frac{1416}{6} \times$ 6	$\frac{1214}{6} \times$ 6	12 × 6
50 psf	1 story—slab-on-grade	$\frac{1413}{6} \times 6$	12 × 6	$\frac{12}{6} \times$ 6	$\frac{12}{6} \times$ 6	12 × 6	12 × 6
	1 story—with crawl space	$\frac{1718}{6} \times 6$	$\frac{1314}{6} \times$ 6	$\frac{12}{6} \times$ 6	$\frac{12}{6} \times$ 6	12 × 6	12 × 6
	1 story—plus basement	$\frac{20 \times 624}{7}$	$\frac{1518}{6} \times$ 6	$\frac{1214}{6} \times$ 6	12 × 6	12 × 6	12 × 6
	2 story—slab-on-grade	$\frac{2018}{6} \times 6$	$\frac{1514}{6} \times$ 6	$\frac{12}{6} \times$ 6	$\frac{12}{6} \times$ 6	12 × 6	12 × 6
	2 story—with crawl space	$\frac{2224}{7} \times 7$	$\frac{1718}{6} \times$ 6	$\frac{1314}{6} \times$ 6	12 × 6	12 × 6	12 × 6
	2 story—plus basement	$\frac{25 \times 929}{10}$	$\frac{1922}{6} \times$ 6	$\frac{1518}{6} \times$ 6	$\frac{1315}{6} \times$ 6	$\frac{1213}{6} \times$ 6	12 × 6
	3 story—slab-on-grade	$\frac{25 \times 927}{7}$	$\frac{19}{618} \times$ 6	$\frac{1513}{6} \times$ 6	$\frac{1312}{6} \times$ 6	12 × 6	12 × 6
	3 story—with crawl space	$\frac{27 \times 1029}{9}$	$\frac{21}{722} \times$ 6	$\frac{1617}{6} \times$ 6	$\frac{14}{6} \times$ 6	12 × 6	12 × 6
	3 story—plus basement	$\frac{3135}{12} \times$ 12	$\frac{2326}{8} \times$ 8	$\frac{1821}{6} \times$ 6	$\frac{1517}{6} \times$ 6	$\frac{1315}{6} \times$ 6	$\frac{1213}{6} \times$ 6

70 psf	1 story—slab-on-grade	$\frac{1415}{6} \times 6$	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—with crawl space	$\frac{1720}{6} \times 6$	$\frac{1415}{6} \times 6$	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—plus basement	$\frac{22 \times 726}{8} \times 8$	$\frac{1620}{6} \times 6$	$\frac{1316}{6} \times 6$	$\frac{1213}{6} \times 6$	12 x 6	12 x 6
	2 story—slab-on grade	$\frac{21 \times 720}{6} \times 6$	$\frac{1615}{6} \times 6$	$\frac{1312}{6} \times 6$	12 x 6	12 x 6	12 x 6
	2 story—with crawl space	$\frac{2426}{8} \times 8$	$\frac{1819}{6} \times 6$	$\frac{1415}{6} \times 6$	$\frac{1213}{6} \times 6$	12 x 6	12 x 6
	2 story—plus basement	$\frac{27 \times 1032}{11} \times 11$	$\frac{20 \times 624}{7} \times 7$	$\frac{1619}{6} \times 6$	$\frac{1316}{6} \times 6$	$\frac{1214}{6} \times 6$	12 x 6
	3 story—slab-on-grade	$\frac{27 \times 1026}{8} \times 8$	$\frac{2019}{6} \times 6$	$\frac{1615}{6} \times 6$	13 x 6	12 x 6	12 x 6
	3 story—with crawl space	$\frac{2931}{11} \times 11$	$\frac{2223}{7} \times 7$	$\frac{1719}{6} \times 6$	$\frac{1516}{6} \times 6$	$\frac{1213}{6} \times 6$	12 x 6
	3 story—plus basement	$\frac{32 \times 1237}{13} \times 13$	$\frac{24 \times 828}{9} \times 9$	$\frac{1922}{6} \times 6$	$\frac{1618}{6} \times 6$	$\frac{1416}{6} \times 6$	$\frac{1214}{6} \times 6$

For SI: 1 inch = 25.4 mm, 1 plf = 14.6 N/m, 1 pound per square foot = 47.9 N/m².

a. ~~Interpolation allowed.~~ Linear interpolation of footing width is permitted between the soil bearing pressures in the table. Extrapolation is not allowed. ~~permitted.~~

b. ~~Based on 32-foot wide house with load-bearing center wall that carries half of the tributary attic, and floor framing. For every 2 feet of adjustment to the width of the house, add or subtract 2 inches of footing width and 1 inch of footing thickness (but not less than 6 inches thick).~~ The table is based on the following conditions and loads: Building width: 32 feet; Above-grade wall height: 9 feet; Slab-on-grade stem wall height: 1 foot; Crawlspace wall height: 4 feet; Dead loads: 15 psf roof and ceiling assembly, 10 psf floor assembly, 45 psf wall assembly; Live loads: Roof and ground snow loads as listed, 10 psf attic floor; 40 psf first floor, 30 psf second and third floor. Footing sizes are calculated assuming a clear span roof/ceiling assembly and an interior bearing wall or beam at each floor.

c. Where the building width perpendicular to the wall footing is greater than 32 feet, the footing width shall be increased by 2 inches and footing depth shall be increased by 1 inch for every 4 feet of increase in building width.

d. Where the building width perpendicular to the wall footing is less than 32 feet, a 2 inch decrease in footing width and 1 inch decrease in footing depth is permitted for every 4 feet of decrease in building width.

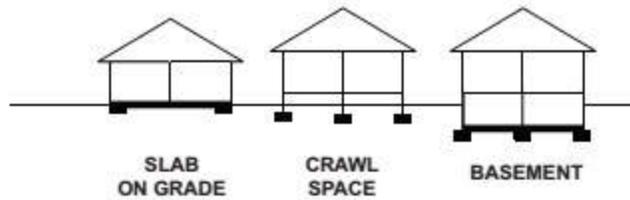


TABLE R403.1(3)
MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS WITH CAST-IN-PLACE CONCRETE OR FULLY-PARTIALLY GROUTED MASONRY WALL CONSTRUCTION (inches)^{a, b, c, d}

GROUND SNOW LOAD OR ROOF LIVE LOAD	STORY AND TYPE OF STRUCTURE WITH CMU OR CONCRETE	LOAD-BEARING VALUE OF SOIL (psf)					
		1500	2000	2500	3000	3500	4000
20 psf roof live load or 25 psf ground snow load	1 story—slab-on-grade	$\frac{1314}{6} \times$	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—with crawl space	$\frac{1619}{6} \times$	$\frac{1214}{6} \times$	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—plus basement	$\frac{19}{625} \times 8$	$\frac{1419}{6}$	$\frac{1215}{6}$	$\frac{1213}{6}$	12 x 6	12 x 6
	2 story—slab-on-grade	$\frac{19}{623} \times 7$	$\frac{1418}{6}$	$\frac{1214}{6}$	12 x 6	12 x 6	12 x 6
	2 story—with crawl space	$\frac{22}{729} \times 9$	$\frac{1622}{6}$	$\frac{1317}{6}$	$\frac{1214}{6}$	12 x 6	12 x 6
	2 story—plus basement	$\frac{25}{935} \times 12$	$\frac{19}{626} \times 8$	$\frac{1521}{6}$	$\frac{1217}{6}$	$\frac{1215}{6}$	$\frac{1213}{6}$
	3 story—slab-on-grade	$\frac{25}{932} \times 11$	$\frac{19}{624} \times 7$	$\frac{1519}{6}$	$\frac{1316}{6}$	$\frac{1214}{6}$	12 x 6
	3 story—with crawl space	$\frac{28}{1038} \times 14$	$\frac{21}{728} \times 9$	$\frac{1723}{6}$	$\frac{1419}{6}$	$\frac{1216}{6}$	$\frac{1214}{6}$
	3 story—plus basement	$\frac{31}{1243} \times 17$	$\frac{23}{833} \times 11$	$\frac{18}{626} \times 8$	$\frac{1522}{6}$	$\frac{1319}{6}$	$\frac{1216}{6}$
	1 story—slab-on-grade	$\frac{1315}{6} \times$	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—with crawl space	$\frac{1620}{6} \times$	$\frac{1215}{6} \times$	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—plus basement	$\frac{19}{726} \times 8$	$\frac{1420}{6}$	$\frac{1216}{6}$	$\frac{1213}{6}$	12 x 6	12 x 6
	2 story—slab-on-grade	$\frac{19}{624} \times 7$	$\frac{1518}{6}$	$\frac{1215}{6}$	12 x 6	12 x 6	12 x 6

30 psf	2 story—with crawl space	$\frac{22 \times}{730 \times}$ +10	$\frac{1622 \times}{6}$	$\frac{1318 \times}{6}$	$\frac{1215 \times}{6}$	$\frac{1213}{\times 6}$	$\frac{12 \times}{6}$
	2 story—plus basement	$\frac{25 \times}{936 \times}$ +13	$\frac{19 \times}{627 \times}$ 8	$\frac{1521 \times}{6}$	$\frac{1318 \times}{6}$	$\frac{1215}{\times 6}$	$\frac{1213}{\times 6}$
	3 story—slab-on-grade	$\frac{26 \times}{933 \times}$ +12	$\frac{19 \times}{625 \times}$ 7	$\frac{1520 \times}{6}$	$\frac{1317 \times}{6}$	$\frac{1214}{\times 6}$	$\frac{12 \times}{6}$
	3 story—with crawl space	$\frac{28 \times}{1039 \times}$ +14	$\frac{21 \times}{729 \times}$ 9	$\frac{17 \times}{623 \times}$ 7	$\frac{1419 \times}{6}$	$\frac{1217}{\times 6}$	$\frac{1214}{\times 6}$
	3 story—plus basement	$\frac{31 \times}{1244 \times}$ +17	$\frac{23 \times}{833 \times}$ +12	$\frac{19 \times}{627 \times}$ 8	$\frac{1622 \times}{6}$	$\frac{1319}{\times 6}$	$\frac{1217}{\times 6}$
50 psf	1 story—slab-on-grade	$\frac{1517 \times}{6}$	$\frac{1213 \times}{6}$	$\frac{12 \times}{6}$	$\frac{12 \times}{6}$	$\frac{12 \times}{6}$	$\frac{12 \times}{6}$
	1 story—with crawl space	$\frac{1822 \times}{6}$	$\frac{1317 \times}{6}$	$\frac{1213 \times}{6}$	$\frac{12 \times}{6}$	$\frac{12 \times}{6}$	$\frac{12 \times}{6}$
	1 story—plus basement	$\frac{21 \times}{728 \times}$ 9	$\frac{1621 \times}{6}$	$\frac{1217 \times}{6}$	$\frac{1214 \times}{6}$	$\frac{12 \times}{6}$	$\frac{12 \times}{6}$
	2 story—slab-on-grade	$\frac{21 \times}{727 \times}$ 8	$\frac{1620 \times}{6}$	$\frac{1316 \times}{6}$	$\frac{1213 \times}{6}$	$\frac{12 \times}{6}$	$\frac{12 \times}{6}$
	2 story—with crawl space	$\frac{24 \times}{832 \times}$ +11	$\frac{18 \times}{624 \times}$ 7	$\frac{1419 \times}{6}$	$\frac{1216 \times}{6}$	$\frac{1214}{\times 6}$	$\frac{12 \times}{6}$
	2 story—plus basement	$\frac{27 \times}{1038 \times}$ +14	$\frac{20 \times}{628 \times}$ 9	$\frac{1623 \times}{6}$	$\frac{1319 \times}{6}$	$\frac{1216}{\times 6}$	$\frac{1214}{\times 6}$
	3 story—slab-on-grade	$\frac{27 \times}{1035 \times}$ +13	$\frac{20 \times}{627 \times}$ 8	$\frac{1621 \times}{6}$	$\frac{1418 \times}{6}$	$\frac{1215}{\times 6}$	$\frac{1213}{\times 6}$
	3 story—with crawl space	$\frac{30 \times}{1141 \times}$ +15	$\frac{22 \times}{731 \times}$ +10	$\frac{18 \times}{624 \times}$ 7	$\frac{1520 \times}{6}$	$\frac{1317}{\times 6}$	$\frac{1215}{\times 6}$
3 story—plus basement	$\frac{33 \times}{1347 \times}$ +18	$\frac{25 \times}{935 \times}$ +12	$\frac{20 \times}{628 \times}$ 9	$\frac{16 \times}{623 \times}$ 7	$\frac{1420}{\times 6}$	$\frac{1217}{\times 6}$	
	1 story—slab-on-grade	$\frac{1719 \times}{6}$	$\frac{1314 \times}{6}$	$\frac{12 \times}{6}$	$\frac{12 \times}{6}$	$\frac{12 \times}{6}$	$\frac{12 \times}{6}$
	1 story—with crawl space	$\frac{19 \times}{625 \times}$ 7	$\frac{1418 \times}{6}$	$\frac{1215 \times}{6}$	$\frac{12 \times}{6}$	$\frac{12 \times}{6}$	$\frac{12 \times}{6}$
	1 story—plus basement	$\frac{22 \times}{730 \times}$ +10	$\frac{1723 \times}{6}$	$\frac{1318 \times}{6}$	$\frac{1215 \times}{6}$	$\frac{1213}{\times 6}$	$\frac{12 \times}{6}$

70 psf	2 story—slab-on-grade	$\frac{23 \times}{829 \times 9}$	$\frac{1722 \times}{6}$	$\frac{1417 \times}{6}$	$\frac{1214 \times}{6}$	$\frac{12 \times}{6}$	$\frac{12 \times}{6}$
	2 story—with crawl space	$\frac{25 \times}{934 \times 12}$	$\frac{19 \times}{626 \times 8}$	$\frac{1521 \times}{6}$	$\frac{1217 \times}{6}$	$\frac{1215}{\times 6}$	$\frac{1213}{\times 6}$
	2 story—plus basement	$\frac{28 \times}{1040 \times 15}$	$\frac{21 \times}{730 \times 10}$	$\frac{17 \times}{624 \times 7}$	$\frac{1420 \times}{6}$	$\frac{1217}{\times 6}$	$\frac{1215}{\times 6}$
	3 story—slab-on-grade	$\frac{29 \times}{1138 \times 14}$	$\frac{22 \times}{728 \times 9}$	$\frac{1723 \times}{6}$	$\frac{1419 \times}{6}$	$\frac{1216}{\times 6}$	$\frac{1214}{\times 6}$
	3 story—with crawl space	$\frac{31 \times}{1243 \times 16}$	$\frac{23 \times}{832 \times 11}$	$\frac{19 \times}{626 \times 8}$	$\frac{1621 \times}{6}$	$\frac{1318}{\times 6}$	$\frac{1216}{\times 6}$
	3 story—plus basement	$\frac{34 \times}{1349 \times 19}$	$\frac{26 \times}{937 \times 13}$	$\frac{21 \times}{729 \times 10}$	$\frac{17 \times}{624 \times 7}$	$\frac{1521}{\times 6}$	$\frac{1318}{\times 6}$

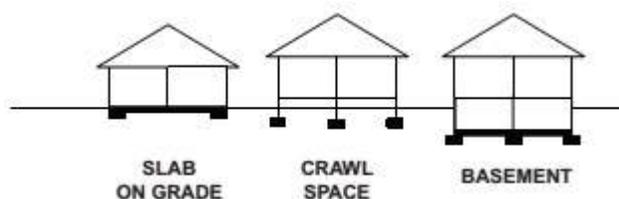
For SI: 1 inch = 25.4 mm, 1 plf = 14.6 N/m, 1 pound per square foot = 47.9 N/m².

a. ~~Interpolation allowed.~~ Linear interpolation of footing width is permitted between the soil bearing pressures in the table. Extrapolation is not allowed. ~~permitted.~~

b. ~~Based on 32-foot wide house with load-bearing center wall that carries half of the tributary attic, and floor framing. For every 2 feet of adjustment to the width of the house add or subtract 2 inches of footing width and 1 inch of footing thickness (but not less than 6 inches thick).~~ The table is based on the following conditions and loads: Building width: 32 feet; Above-grade wall height: 9 feet; Slab-on-grade stem wall height: 1 foot; Crawlspace wall height: 4 feet; Dead loads: 15 psf roof and ceiling assembly, 10 psf floor assembly, 100 psf wall assembly; Live loads: Roof and ground snow loads as listed, 10 psf attic floor, 40 psf first floor, 30 psf second and third floor. Footing sizes are calculated assuming a clear span roof/ceiling assembly and an interior bearing wall or beam at each floor.

c. Where the building width perpendicular to the wall footing is greater than 32 feet, the footing width shall be increased by 2 inches and footing depth shall be increased by 1 inch for every 4 feet of increase in building width.

d. Where the building width perpendicular to the wall footing is less than 32 feet, a 2 inch decrease in footing width and 1 inch decrease in footing depth is permitted for every 4 feet of decrease in building width.



R403.1.1 Minimum size. The minimum width, W, and thickness, T, for concrete footings shall be in accordance with Tables R403.1(1) through R403.1(3) and Figure R403.1(1) or R403.1.3, as applicable but not less than 12 inches (305 mm) in width and 6 inches (152 mm) in depth. The footing width shall be based on the load-bearing value of the soil in accordance with Table R401.4.1. Footing projections, P, shall be not less than 2 inches (51 mm) and shall not exceed the thickness of the footing. Footing thickness and projection for fireplaces shall be in accordance with Section R1001.2. The size of footings supporting piers and columns shall be based on the tributary load and allowable soil pressure in accordance with Table R401.4.1. Footings for wood foundations shall be in accordance with the details set forth in Section R403.2, and Figures R403.1(2) and R403.1(3). Footings for precast foundations shall be in accordance with the details set forth in Section R403.4, Table R403.4, and Figures R403.4(1) and R403.4(2).

Reason: Builders using the new footing tables introduced in the 2015 IRC have found the footing widths required by the table are significantly larger than those required by previous editions of Table R403.1, which dated back to the CABO codes. In many cases they were wider than an engineering analysis would suggest. A careful review of the calculations underlying the 2015 IRC tables found a number of cases where load assumptions and determinations were overly conservative, and a few cases where the calculations were actually unconservative. Problems with the assumptions and calculations included the following:

- The original calculations apply the full ground snow load to the roof. The actual roof snow load per ASCE 7, unadjusted by any other factors, is 70% of the ground snow load or 20 pounds per square foot, whichever is greater. Consistent with the Chapter 8 rafter tables, a thermal factor of 1.1 per ASCE 7 is applied to the calculation of the snow load.
- The original calculations apply a 100 pound per square foot weight for above-grade concrete or masonry walls, representing a solid or fully-grouted 8" CMU wall. Such walls are more likely to be either 8" CMU with reinforcing @ 48" o.c. or 8" insulated concrete forms, both of which have a 55 pound per square foot weight.
- The original calculations use only the ASCE 7 load combination that applies a 0.75 factor for concurrent roof/snow and floor live loads, ignoring the load combinations that apply just the roof/attic LL, just the snow load, or just the total floor live loads.
- The original calculations are based on tributary width, yet Footnote #2 adds 2 inches of footing width for every 2 feet of additional **building width**. As a result of confusing building and tributary width, the footnote adds twice as much footing width as is necessary based on the loads!

Other key changes in the revised code text and footing tables include:

- The original footnote allowing footing width and depth to be adjusted is converted into two footnotes. One footnote requires an increase in footing width and depth when the building width perpendicular to a wall footing exceeds 32 feet. The second footnote permits, but does not require, a decrease in footing width and depth for a building width of 32 feet or narrower.
- The charging text is revised to clarify the minimum width of a footing shall not be less than 12 inches and depth shall not be less than 6 inches. Previously, the limitation on depth was buried in a footnote.

These revised tables correct the inconsistencies in the load assumptions and calculations. The result in many cases is footing widths for one- and two-family dwellings that are more in line with historic practice, while still technically justified under engineering standards and accepted practices. However, it is noted there are cases for houses on weaker soils (1500 and 2000 psf soil bearing strength) as well as for slab-on-grade and crawlspace houses, where corrections to the calculations, the assumption of clear-spanning roof trusses, and other changes to the assumptions increase the loads sufficiently to increase the footing widths.

Cost Impact: The code change proposal will increase the cost of construction

The revised tables increase footing sizes and depths for houses on weaker soils and slab-on-grade or crawlspace houses due to the revised calculations imposing larger loads on the footings. In other cases,

correcting overly conservative assumptions result in modest reductions in footing size. Also, this proposal improves clarity regarding the base assumptions, which may allow more dwellings to be constructed using the table rather than having to rely on engineered design or other, more conservative, engineering-based prescriptive standards, thus some builders may save on both footing size and avoid engineering design fees.

Proposal # 4940

RB164-19

RB165-19

IRC@: TABLE R403.1(1), TABLE R403.1(2), TABLE R403.1(3)

Proponent: Gary Ehrlich, National Association of Home Builders, representing National Association of Home Builders (gehrlich@nahb.org)

2018 International Residential Code

Revise as follows:

TABLE R403.1(1)

MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS FOR LIGHT-FRAME CONSTRUCTION (inches)^{a, b}

Portions of table not shown remain unchanged.

SNOW LOAD OR ROOF LIVE LOAD	STORY AND TYPE OF STRUCTURE WITH LIGHT FRAME	LOAD-BEARING VALUE OF SOIL (psf)					
		1500	2000	2500	3000	3500	4000

For SI: 1 inch = 25.4 mm, 1 plf = 14.6 N/m, 1 pound per square foot = 47.9 N/m².

- a. Interpolation allowed. Extrapolation is not allowed.
- b. Based on 32-foot-wide house with load-bearing center wall that carries half of the tributary attic, and floor framing. For every ± 4 feet of adjustment to the width of the house, add or subtract 2 inches of footing width and 1 inch of footing thickness (but not less than 6 inches thick).



TABLE R403.1(2)

MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS FOR LIGHT-FRAME CONSTRUCTION WITH BRICK VENEER (inches)^{a, b}

Portions of table not shown remain unchanged.

SNOW LOAD OR ROOF LIVE LOAD	STORY AND TYPE OF STRUCTURE WITH BRICK VENEER	LOAD-BEARING VALUE OF SOIL (psf)					
		1500	2000	2500	3000	3500	4000

For SI: 1 inch = 25.4 mm, 1 plf = 14.6 N/m, 1 pound per square foot = 47.9 N/m².

- a. Interpolation allowed. Extrapolation is not allowed.
- b. Based on 32-foot-wide house with load-bearing center wall that carries half of the tributary attic, and floor framing. For every ± 4 feet of adjustment to the width of the house, add or subtract 2 inches of footing width and 1 inch of footing thickness (but not less than 6 inches thick).



TABLE R403.1(3)

MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS WITH CAST-IN-PLACE CONCRETE OR FULLY GROUTED MASONRY WALL CONSTRUCTION (inches)^{a, b}

Portions of table not shown remain unchanged.

SNOW LOAD OR ROOF LIVE LOAD	STORY AND TYPE OF STRUCTURE WITH CMU	LOAD-BEARING VALUE OF SOIL (psf)					
		1500	2000	2500	3000	3500	4000

For SI: 1 inch = 25.4 mm, 1 plf = 14.6 N/m, 1 pound per square foot = 47.9 N/m².

- a. Interpolation allowed. Extrapolation is not allowed.
- b. Based on 32-foot-wide house with load-bearing center wall that carries half of the tributary attic, and floor framing. For every ± 4 feet of adjustment to the width of the house add or subtract 2 inches of footing width and 1 inch of footing thickness (but not less than 6 inches thick).



Reason: Builders using the new footing tables introduced in the 2015 IRC have found the footing widths required by the table are significantly larger than those required by previous editions of Table R403.1, which dated back to the CABO codes. In many cases they were wider than an engineering analysis would suggest for a house of the same size, configuration, and foundation conditions. In particular, footing sizes for houses greater than 32 feet in width generated using footnote (b) calling for the footing to be increased by 2 inches in width and 1 inch in depth for every 2 feet of increase in building width were significantly higher than those obtained from the traditional table or by an engineering analysis.

A careful review of the calculations underlying the 2015 IRC tables found a number of cases where load assumptions and determinations were overly conservative, and a few cases where the calculations were actually unconservative. As part of this review, it was noted the spreadsheet used to generate the tables for the 2015 IRC is based on entering the **tributary** width, or half the distance between the exterior bearing wall and an interior bearing wall or ridge board, yet footnote (b) specifies 2 inches of footing width shall be added for every 2 feet of additional **building** width. It was clear from the spreadsheet that increasing the **tributary** width by 2 feet did generally increase the footing width by 2 inches and in many cases the depth by 1 inch. However, a 2 foot increase in **tributary** width actually translates to a 4 foot increase in **building** width. As a result, the footnote leads to users increasing the footing width and depth at twice the rate that is necessary based on the actual increase in loads.

If no other adjustment is made to the tables, changing the footnote to reflect the correct rate at which the footing size and depth increases with **building** width will reduce the overly conservative size of footings generated by the current footnote for houses of portions of houses wider than 32 feet.

Cost Impact: The code change proposal will decrease the cost of construction

The code change will decrease the cost of construction for dwellings or portions thereof larger than 32 feet in width where the current footnote increases footing widths and depths at twice the rate that would be required based on the underlying engineering calculations, let alone the footing width and depth that would be determined based on a dwelling-specific engineering analysis. If code users were taking advantage of the footnote for dwellings narrower than 32 feet costs may increase as the footing size would also be reduced at a slower rate. However, it is not known how many users are refining the footing size to that degree.

Proposal # 4810

RB165-19

RB166-19

IRC@: R403.1.6, R404.1.3.3.6

Proponent: Samuel Steele, representing Seattle Department of Construction and Inspection (SDCI)
(samuel.steele@seattle.gov)

2018 International Residential Code

Revise as follows:

R403.1.6 Foundation anchorage. Wood sill plates and wood walls supported directly on continuous foundations shall be anchored to the foundation in accordance with this section.

Cold-formed steel framing shall be anchored directly to the foundation or fastened to wood sill plates in accordance with Section R505.3.1 or R603.3.1, as applicable. Wood sill plates supporting cold-formed steel framing shall be anchored to the foundation in accordance with this section.

Wood sole plates at all exterior walls on monolithic slabs, wood sole plates of *braced wall panels* at building interiors on monolithic slabs and all wood sill plates shall be anchored to the foundation with minimum $\frac{1}{2}$ -inch-diameter (12.7 mm) anchor bolts spaced not greater than 6 feet (1829 mm) on center or *approved* anchors or anchor straps spaced as required to provide equivalent anchorage to $\frac{1}{2}$ -inch-diameter (12.7 mm) anchor bolts. Bolts shall extend not less than 7 inches (178 mm) into concrete or grouted cells of concrete masonry units. The bolts shall be located in the middle third of the width of the plate. A nut and washer shall be tightened on each anchor bolt. There shall be not fewer than two bolts per plate section with one bolt located not more than 12 inches (305 mm) or less than seven bolt diameters from each end of the plate section. Interior bearing wall sole plates on monolithic slab foundation that are not part of a *braced wall panel* shall be positively anchored with *approved* fasteners. Sill plates and sole plates shall be protected against decay and termites where required by Sections R317 and R318. Anchor bolts shall be located after the concrete is placed and before it has set in accordance with ACI 332.

Exceptions:

1. Walls 24 inches (610 mm) total length or shorter connecting offset braced wall panels shall be anchored to the foundation with not fewer than one anchor bolt located in the center third of the plate section and shall be attached to adjacent braced wall panels at corners as shown in Item 9 of Table R602.3(1).
2. Connection of walls 12 inches (305 mm) total length or shorter connecting offset *braced wall panels* to the foundation without anchor bolts shall be permitted. The wall shall be attached to adjacent braced wall panels at corners as shown in Item 9 of Table R602.3(1).

R404.1.3.3.6 Form materials and form ties. Forms shall be made of wood, steel, aluminum, plastic, a composite of cement and foam insulation, a composite of cement and wood chips, or other *approved* material suitable for supporting and containing concrete. Forms shall be accurately positioned and secured before placing concrete and shall provide sufficient strength to contain concrete during the concrete placement operation.

Form ties shall be steel, solid plastic, foam plastic, a composite of cement and wood chips, a composite of cement and foam plastic, or other suitable material capable of resisting the forces created by fluid pressure of fresh concrete.

Reason: ACI 332 Residential Code Requirements for Structural Concrete and Commentary is a standard used for residential concrete construction. Many residential foundation installations include “wet-set” anchor bolts to attach wood sills to foundations. This code change will codify a common practice that is not recognized as an

accepted practice in ACI 318 Building Code Requirements for Structural Concrete and Commentary but is allowed in ACI 332. In some cases, “wet-setting” the anchor bolt is the only method by which the bolt can be placed. Insulated concrete forms (ICF’s) as well as Concrete Masonry Units (CMU) allow this type of installation. The code change is limited to the wet setting of the anchor bolt connection to the wood sill. Forms that are to be embedded would need to be tied down or secured prior to the concrete pour.

Cost Impact: The code change proposal will decrease the cost of construction. It will reduce the labor and time in foundation construction in one and two family dwellings.

Proposal # 4452

RB166-19

RB167-19

IRC®: R403.1.6

Proponent: Terry Kozlowski, representing Southern Nevada Chapter; Cassidy Wilson, representing SN-ICC Member; Amanda Moss, representing SN-ICC Member; Valarie Evans, representing Southern Nevada Chapter

2018 International Residential Code

Revise as follows:

R403.1.6 Foundation anchorage. Wood sill plates and wood walls supported directly on continuous foundations shall be anchored to the foundation in accordance with this section.

Cold-formed steel framing shall be anchored directly to the foundation or fastened to wood sill plates in accordance with Section R505.3.1 or R603.3.1, as applicable. Wood sill plates supporting cold-formed steel framing shall be anchored to the foundation in accordance with this section.

Wood sole plates at all exterior walls on monolithic slabs, wood sole plates of *braced wall panels* at building interiors on monolithic slabs and all wood sill plates shall be anchored to the foundation with minimum $\frac{1}{2}$ -inch-diameter (12.7 mm) anchor bolts spaced not greater than 6 feet (1829 mm) on center or *approved* anchors or anchor straps spaced as required to provide equivalent anchorage to $\frac{1}{2}$ -inch-diameter (12.7 mm) anchor bolts. Bolts shall extend not less than 7 inches (178 mm) into concrete or grouted cells of concrete masonry units. The bolts shall be located in the middle third of the width of the plate. A nut and washer shall be tightened on each anchor bolt. There shall be not fewer than two bolts per plate section with one bolt located not more than 12 inches (305 mm) or less than seven bolt diameters from each end of the plate section. Interior bearing wall sole plates on monolithic slab foundation that are not part of a *braced wall panel* shall be positively anchored with *approved* fasteners. Sill plates and sole plates shall be protected against decay and termites where required by Sections R317 and R318.

Exceptions:

1. Walls 24 inches (610 mm) total length or shorter connecting offset braced wall panels shall be anchored to the foundation with not fewer than one anchor bolt located in the center third of the plate section and shall be attached to adjacent braced wall panels at corners as shown in Item 9 of Table R602.3(1).
2. Connection of walls 12 inches (305 mm) total length or shorter connecting offset *braced wall panels* to the foundation without anchor bolts shall be permitted. The wall shall be attached to adjacent braced wall panels at corners as shown in Item 9 of Table R602.3(1).
3. Where field conditions prohibit the placement of the minimum required bottom plate anchors, a registered design professional shall provide a design for the attachment in accordance with accepted engineering practice.

Reason: Bottom plate is preferentially referenced in lieu of sill plate to match that same evolution in the IBC and AF&PA references. In residential construction many times there are short length wall framing for door openings, exterior built-up columns and post framing and similar construction where it is impractical to comply with the R403.1.6 completely. The exception is provided to explicitly allow a design professional the ability to design appropriate attachment for these conditions. Insertion within the “Foundation anchorage” requirements, section R403.1.6 is to clarify that this change also applies to prescriptive design requirements.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal simply adds an additional accepted method of attachment by allowing a registered design professional to determine placement of foundation anchorage based on field conditions.

RB168-19

IRC®: TABLE R404.1.1(1), TABLE R404.1.1(2), TABLE R404.1.1(3), TABLE R404.1.1(4), TABLE R404.1.2(1), TABLE R404.1.2(8)

Proponent: Stephanie Young, representing National Council of Structural Engineers Associations (stephanie@mattsonmacdonald.com)

2018 International Residential Code

Revise as follows:

**TABLE R404.1.1(1)
PLAIN MASONRY FOUNDATION WALLS^f**

Portions of table not shown remain unchanged.

MAXIMUM UNSUPPORTED WALL HEIGHT (feet)	MAXIMUM UNBALANCED BACKFILL HEIGHT^c (feet)	PLAIN MASONRY^a MINIMUM NOMINAL WALL THICKNESS (inches)		
		Soil classes^b		
		GW, GP, SW and SP	GM, GC, SM, SM-SC and ML	SC, MH, ML-CL and inorganic CL

**TABLE R404.1.1(2)
8-INCH MASONRY FOUNDATION WALLS WITH REINFORCING WHERE $d \geq 5$ INCHES^{a, c, f}**

Portions of table not shown remain unchanged.

MAXIMUM UNSUPPORTED WALL HEIGHT	HEIGHT OF UNBALANCED BACKFILL^e	MINIMUM VERTICAL REINFORCEMENT AND SPACING (INCHES)^{b, c}		
		Soil classes and lateral soil load^d (psf per foot below grade)		
		GW, GP, SW and SP soils 30	GM, GC, SM, SM-SC and ML soils 45	SC, ML-CL and inorganic CL soils 60

**TABLE R404.1.1(3)
10-INCH MASONRY FOUNDATION WALLS WITH REINFORCING WHERE $d \geq 6.75$ INCHES^{a, c, f}**

Portions of table not shown remain unchanged.

MAXIMUM UNSUPPORTED WALL HEIGHT	HEIGHT OF UNBALANCED BACKFILL^e	MINIMUM VERTICAL REINFORCEMENT AND SPACING (INCHES)^{b, c}		
		Soil classes and later soil load^d (psf per foot below grade)		
		GW, GP, SW and SP soils 30	GM, GC, SM, SM-SC and ML soils 45	SC, ML-CL and inorganic CL soils 60

**TABLE R404.1.1(4)
12-INCH MASONRY FOUNDATION WALLS WITH REINFORCING WHERE $d \geq 8.75$ INCHES^{a, c, f}**

Portions of table not shown remain unchanged.

MAXIMUM UNSUPPORTED WALL HEIGHT	HEIGHT OF UNBALANCED BACKFILL^e	MINIMUM VERTICAL REINFORCEMENT AND SPACING (INCHES)^{b, c}		
		Soil classes and lateral soil load^d(psf per foot below grade)		
		GW, GP, SW and SP soils 30	GM, GC, SM, SM-SC and ML soils 45	SC, ML-CL and inorganic CL soils 60

TABLE R404.1.2(1)

MINIMUM HORIZONTAL REINFORCEMENT FOR CONCRETE BASEMENT WALLS^{a, b}

Portions of table not shown remain unchanged.

MAXIMUM UNSUPPORTED HEIGHT OF BASEMENT WALL HEIGHT (feet)	LOCATION OF HORIZONTAL REINFORCEMENT
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TABLE R404.1.2(8)

MINIMUM VERTICAL REINFORCEMENT FOR 6-, 8-, 10- AND 12-INCH NOMINAL FLAT BASEMENT WALLS^{b, c, d, e, f, h, i, k, n, o}

Portions of table not shown remain unchanged.

MAXIMUM UNSUPPORTED WALL HEIGHT (feet)	MAXIMUM UNBALANCED BACKFILL HEIGHT^g(feet)	MINIMUM VERTICAL REINFORCEMENT-BAR SIZE AND SPACING (inches)											
		Soil classes^a and design lateral soil (psf per foot of depth)											
		GW, GP, SW, SP 30				GM, GC, SM, SM-SC and ML 45				SC, ML-CL and inorganic CL 60			
		Minimum nominal wall thickness (inches)											
		6	8	10	12	6	8	10	12	6	8	10	12

Reason: To add some uniformity to the IRC Code, the following modification is proposed to the Table headers. Section R404.1 applies to foundation walls, which could be constructed with either masonry or concrete. Since the creation of the IRC, the masonry and concrete wall sections have been written and modified by different interest groups. In some instances there has been a lack of coordination between code provisions for the two materials. This is an attempt to bridge some of those differences so that the users of the IRC can see uniform language across the code.

It is proposed that all affected Tables use the header "MAXIMUM UNSUPPORTED WALL HEIGHT" to describe these similar conditions.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. No change in the design requirements, simply an attempt to unify language across material sections.

RB169-19

IRC@: R404.1.2.1

Proponent: Stephanie Young, representing National Council of Structural Engineers Associations
(stephanie@mattsonmacdonald.com)

2018 International Residential Code

Revise as follows:

R404.1.2.1 Masonry foundation walls. Concrete masonry and clay masonry foundation walls shall be constructed as set forth in Table R404.1.1(1), R404.1.1(2), R404.1.1(3) or R404.1.1(4) and shall comply with applicable provisions of Section R606. In buildings assigned to Seismic Design Categories D₀, D₁ and D₂, concrete masonry and clay masonry foundation walls shall also comply with Section R404.1.4.1. Rubble stone masonry foundation walls shall be constructed in accordance with Sections R404.1.8 and R606.4.2. ~~Rubble stone masonry walls shall not be used in Seismic Design Categories D₀, D₁ and D₂.~~

Reason: For rubble stone masonry walls, the limit set forth in this section conflicts with the limitations contained in Section R404.1.8. Section R404.1.8 prohibits rubble stone masonry walls in Seismic Categories D₀, D₁ and D₂, as indicated in this section, but it also prohibits the use in Townhouses in Seismic Design Category C. The intent of this proposal is to align the two code sections. The sentence prior to the struck text already requires the user to refer to Section R404.1.8 for all rubble walls, so there should be no harm in removing the conflicting sentence.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. No changes to the design requirements for rubble stone masonry are proposed.

Proposal # 4606

RB169-19

RB170-19

IRC®: R404.1.3.3.6.2 (New)

Proponent: Felix Zemel, representing ICC Region 6 -- North East Regional Coalition (felix@pracademicsolutions.com); Peter Zvingilas, ICC Region 6- North East Regional Coalition, Town of Groton and Voluntown CT (pzvingilas@voluntown.gov)

2018 International Residential Code

Add new text as follows:

R404.1.3.3.6.2 Removal of form ties Form ties shall be removed from the both faces of the foundation walls which enclose basements or other enclosed habitable and occupiable spaces. Remaining holes shall be parged with hydraulic cement, portland cement, or any other approved material.

Reason: Modern concrete foundation installation practices frequently utilize form ties. When the forms are removed, the ends of the form ties are typically removed, and a cone or hole remains in the place of the old end. The metal form tie is still still remaining in the wall, and may be subject to corrosion due to acidity of the soil and exposure to water. Many builders already implement parging and sealing these holes with cementitious products as a best practice. This proposal will codify a current industry best practice. The requirement is only applicable to areas that may be subject to human contact where items can be damaged due to resulting moisture.

Cost Impact: The code change proposal will increase the cost of construction. This code change proposal may minimally increase the cost of construction by implementing a current best practice. Where the affected holes are so small, the resulting cost increase is expected to be minimal.

Proposal # 4767

RB170-19

RB171-19

IRC@: R404.1.3.3.7.1

Proponent: Stephanie Young, representing National Council of Structural Engineers Associations
(stephanie@mattsonmacdonald.com)

2018 International Residential Code

Revise as follows:

R404.1.3.3.7.1 Steel reinforcement. Steel reinforcement shall comply with the requirements of ASTM A615, A706, or A996. ASTM A996 bars produced from rail steel shall be Type R. In buildings assigned to Seismic Design Category A, B or C, the minimum yield strength of reinforcing steel shall be 40,000 psi (Grade 40) (276 MPa). In buildings assigned to Seismic Design Category D₀, D₁ or D₂, ~~reinforcing steel shall comply with the requirements of ASTM A706 for low alloy steel with a minimum yield strength of~~ shall be 60,000 psi (Grade 60) (414 MPa).

Reason: The proposal is intended to remove the unnecessary requirement for the use of A706 reinforcing steel in non-demand critical residential foundation walls. ASTM A706 reinforcing steel was developed to address the need to have reinforcing steel with controlled tensile properties for earthquake-resisting structures and controlled chemical composition for weldability. When looking at the American Concrete Institute Building Code Requirements for Structural Concrete (ACI 318-14), deformed bars of either A615, A706 or A996 are allowed for foundation walls (ACI 318-14, Section 20.2.1.3). ACI 318-14, Section 20.2.2.5 places requirements on the reinforcing steel grade for longitudinal reinforcement used to resist earthquake-induced forces in special moment frames, special structural walls and components of structural walls. Residential foundation walls, as those specified in IRC Section R404.1.3 are not elements that are expected to experience the inelastic demands that necessitate the need for the ductility that is provided for with A706 reinforcing.

Bibliography: American Concrete Institute Building Code Requirements for Structural Concrete (ACI 318-14), Sections 20.2.1.3 and 20.2.2.5

Cost Impact: The code change proposal will decrease the cost of construction
Will remove requirement for higher grade of reinforcing steel for residential foundations.

Proposal # 4608

RB171-19

RB172-19

IRC: R404.1.10 (New)

Proponent: Josh OConnor, representing Self (joshoc@aol.com)

2018 International Residential Code

Add new text as follows:

R404.1.10 HVAC connection opening. Where a dwelling unit has HVAC equipment or appliances that are located exterior to the dwelling unit and next to the foundation wall, openings through the foundation wall shall be sized so that the supply and return air connections are not reduced in area.

Reason: I have seen that national home builders are only making this opening 32 inches wide, and that is not wide enough for the supply and return air flex ducts to come off of the back of a packaged HVAC unit without having to veer in sharply to enter the foundation opening. This causes pinching which restricts airflow. HVAC manufacturers make the openings/ports on the back of the packaged units further apart than 32 inches. Because the units are forced to sit very close to the house the supply and return air ducts need a straight run off of the unit into the foundation opening, and the opening has to be wide enough to allow this. At a relative's house, I saw the inside of a supply duct pinched to half of its normal diameter because of having to veer off of the unit into a foundation opening that was only 32 inches wide.

Bibliography: .

Cost Impact: The code change proposal will not increase or decrease the cost of construction. There will be no change to construction requirements. This is a coordination issue.

Proposal # 3896

RB172-19

RB173-19

IRC@: R406.2

Proponent: donald sivigny, State of MN, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Residential Code

Revise as follows:

R406.2 Concrete and masonry foundation waterproofing. In areas where a high water table or other severe soil-water conditions are known to exist, exterior foundation walls that retain earth and enclose interior spaces and floors below *grade* shall be waterproofed from the higher of (a) the top of the footing or (b) 6 inches (152 mm) below the top of the basement floor, to the finished *grade*. Walls shall be waterproofed in accordance with one of the following:

1. Two-ply hot-mopped felts.
2. Fifty-five-pound (25 kg) roll roofing.
3. Six-mil (0.15 mm) polyvinyl chloride.
4. ~~Six-mil (0.15 mm) polyethylene.~~
5. ~~Forty-mil (1 mm) polymer-modified asphalt.~~
6. Sixty-mil (1.5 mm) flexible polymer cement.
7. One-eighth-inch (3 mm) cement-based, fiber-reinforced, waterproof coating.
8. Sixty-mil (1.5 mm) solvent-free liquid-applied synthetic rubber.

All joints in membrane waterproofing shall be lapped and sealed with an adhesive compatible with the membrane.

Exception: Organic-solvent-based products such as hydrocarbons, chlorinated hydrocarbons, ketones and esters shall not be used for ICF walls with expanded polystyrene form material. Use of plastic roofing cements, acrylic coatings, latex coatings, mortars and pargings to seal ICF walls is permitted. Cold-setting asphalt or hot asphalt shall conform to Type C of ASTM D449. Hot asphalt shall be applied at a temperature of less than 200°F (93°C).

Reason: Section R406 is amended by deleting Items 3 and 4 from the list of approved products that can be used as a waterproofing material. Both 6 mil poly vinyl chloride and 6 mil polyethylene products, do not have the thickness and strength to be effective and durable waterproofing products, during construction of a foundation, especially during backfilling of the foundations. Waterproofing is the formation of a durable and impervious barrier designed to prevent water from entering a specific section or sections of the building envelope system (i.e. Foundations). To be effective, a waterproofing system consists of a durable and continuous material applied to all areas of the foundation, subject to hydrostatic pressure. Typically, during backfill, other materials are improperly placed along the foundation; materials containing debris, frost, sharp stones, rocks and/or items that will rip and tear the 6 mil products. When the back fill materials are not placed properly, 6 mil poly, used as waterproofing, will create durability issues. These holes allow water to get behind the waterproofing material and trap it there. This creates moisture issues on the interior of the building. The other products as listed in the code allowed as a waterproofing material, are all made of heavy materials that are more resistant to tearing or ripping during backfill, such as 50 pound materials or at a minimum, 40 mil in thickness. It is reasonable to take out a product that is not performing as it is intended. This will increase the cost of construction of the home, but this cost will be offset with savings in the reduction of service calls and repairs for moisture mold and mildew issues.

Cost Impact: The code change proposal will increase the cost of construction

This will increase the cost of construction of the Home by requiring a more durable product be used on the foundation wall, However this cost will be offset with any savings in the reduction of service calls and repairs for moisture mold and mildew issues. The Typical Service call costs a Builder a minimum of \$350 on average. Call backs for wet basements or mold and mildew are frequent and numerous, costing builders of today a lot of time and money to solve the Problem. Removal of these non-durable products will save money in the long run and perform better for the building.

Proposal # 5063

RB173-19

RB174-19

IRC®: R406.2

Proponent: Craig Conner, representing self (craig.conner@mac.com); Joseph Lstiburek, representing self (joe@buildingscience.com)

2018 International Residential Code

Revise as follows:

R406.2 Concrete and masonry foundation waterproofing. In areas where a high water table or other severe soil-water conditions are known to exist, exterior foundation walls that retain earth and enclose interior spaces and floors below *grade* shall be waterproofed from the higher of (a) the top of the footing or (b) 6 inches (152 mm) below the top of the basement floor, to the finished *grade*. Walls shall be waterproofed in accordance with one of the following:

1. Two-ply hot-mopped felts.
2. Fifty-five-pound (25 kg) roll roofing.
3. Six-mil (0.15 mm) polyvinyl chloride.
4. Six-mil (0.15 mm) polyethylene.
5. Forty-mil (1 mm) polymer-modified asphalt.
6. Sixty-mil (1.5 mm) flexible polymer cement.
7. One-eighth-inch (3 mm) cement-based, fiber-reinforced, waterproof coating.
8. Sixty-mil (1.5 mm) solvent-free liquid-applied synthetic rubber.
9. A drainage layer of not less than 4 inches (102 mm) of free draining granular material.
10. A drainage layer that provides equivalent performance to not less than 4 inches (102 mm) of free draining granular material.

All joints in membrane waterproofing shall be lapped and sealed with an adhesive compatible with the membrane.

Exception: Organic-solvent-based products such as hydrocarbons, chlorinated hydrocarbons, ketones and esters shall not be used for ICF walls with expanded polystyrene form material. Use of plastic roofing cements, acrylic coatings, latex coatings, mortars and parings to seal ICF walls is permitted. Cold-setting asphalt or hot asphalt shall conform to Type C of ASTM D449. Hot asphalt shall be applied at a temperature of less than 200°F (93°C).

Reason: Obejective:

Provide more options for foundations waterproofing and dampproofing.

This code change provides additional options for foundation waterproofing and dampproofing.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This provides additional options. Options seldom add costs and sometimes can reduce costs.

Proposal # 5428

RB174-19

RB175-19

IRC: R406.2

Proponent: Craig Conner, representing self (craig.conner@mac.com); Joseph Lstiburek, representing self (joe@buildingsscience.com)

2018 International Residential Code

R406.1 Concrete and masonry foundation damproofing. Except where required by Section R406.2 to be waterproofed, foundation walls that retain earth and enclose interior spaces and floors below *grade* shall be damproofed from the higher of (a) the top of the footing or (b) 6 inches (152 mm) below the top of the basement floor, to the finished grade. Masonry walls shall have not less than $\frac{3}{8}$ -inch (9.5 mm) Portland cement parging applied to the exterior of the wall. The parging shall be damproofed in accordance with one of the following:

1. Bituminous coating.
2. Three pounds per square yard (1.63 kg/m²) of acrylic modified cement.
3. One-eighth-inch (3.2 mm) coat of surface-bonding cement complying with ASTM C887.
4. Any material permitted for waterproofing in Section R406.2.
5. Other *approved* methods or materials.

Exception: Parging of unit masonry walls is not required where a material is approved for direct application to the masonry.

Concrete walls shall be damproofed by applying any one of the listed damproofing materials or any one of the waterproofing materials listed in Section R406.2 to the exterior of the wall.

Revise as follows:

R406.2 Concrete and masonry foundation waterproofing. In areas where a high water table or other severe soil-water conditions are known to exist, exterior foundation walls that retain earth and enclose interior spaces and floors below *grade* shall be waterproofed from the higher of (a) the top of the footing or (b) 6 inches (152 mm) below the top of the basement floor, to the finished *grade*. Walls shall be waterproofed in accordance with one of the following:

1. Two-ply hot-mopped felts.
2. Fifty-five-pound (25 kg) roll roofing.
3. Six-mil (0.15 mm) polyvinyl chloride.
4. Six-mil (0.15 mm) polyethylene.
5. Forty-mil (1 mm) polymer-modified asphalt.
6. Sixty-mil (1.5 mm) flexible polymer cement.
7. One-eighth-inch (3 mm) cement-based, fiber-reinforced, waterproof coating.
8. Sixty-mil (1.5 mm) solvent-free liquid-applied synthetic rubber.

All joints in membrane waterproofing shall be lapped and sealed with an adhesive compatible with the membrane.

~~Exception~~ Exceptions:

1. Organic-solvent-based products such as hydrocarbons, chlorinated hydrocarbons, ketones and es-ters shall not be used for ICF walls with expanded polystyrene form material. Use of plastic roofing cements, acrylic coatings, latex coatings, mortars and pargings to seal ICF

walls is permitted. Cold-setting asphalt or hot asphalt shall conform to Type C of ASTM D449. Hot asphalt shall be applied at a temperature of less than 200°F (93°C).

2. In areas where insulation is installed on the interior side of a foundation wall that extends more than 36 inches (914 mm) below the adjacent exterior ground level, a drainage layer shall be installed adjacent to the exterior surface of the foundation wall in accordance with one of the following:

- 2.1. A drainage layer of not less than 4 inches (102 mm) of free draining granular material.
- 2.2. A drainage layer that provides equivalent performance to not less than 4 inches (102 mm) of free draining granular material.

Reason: Objective: Reduce risk for interior basement insulation.

This code change reduces risk associated with interior insulation strategies in basement foundations. Basement water leakage occurs in 1 in 10 basements. Interior insulation reduces the ability to identify leakage early prior to significant damage occurring.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This code change provides additional options for foundation waterproofing and dampproofing

Proposal # 5429

RB175-19

RB176-19

IRC: R408.1, R408.2, R408.3

Proponent: Ronald Clements Jr, representing Chesterfield County (clementsro@chesterfield.gov)

2018 International Residential Code

SECTION R408 UNDER-FLOOR SPACE

Revise as follows:

R408.1 Ventilation- Moisture Control. ~~The under-floor space between the bottom of the floor joists and the earth under any building (except space occupied by a *basement*) shall have ventilation openings through foundation walls or exterior walls. The minimum net area of ventilation openings shall be not less than 1 square foot (0.0929 m²) for each 150 square feet (14 m²) of under-floor space area, unless the ground surface is covered by a Class 1 vapor retarder material. Where a Class 1 vapor retarder material is used, the minimum net area of ventilation openings shall be not less than 1 square foot (0.0929 m²) for each 1,500 square feet (140 m²) of under-floor space area. One such ventilating opening shall be within 3 feet (914 mm) of each corner of the building.~~ comply with Section R408.2 or Section R408.3.

R408.2 Openings for under-floor ventilation. Ventilation openings through foundation or exterior walls surrounding the under-floor space shall be provided in accordance with this section. The minimum net area of ventilation openings shall be not less than 1 square foot (0.0929 m²) for each 150 square feet (14 m²) of under-floor area. One ventilation opening shall be within 3 feet (915 mm) of each external corner of the ~~building.~~ under-floor space. Ventilation openings shall be covered for their height and width with any of the following materials provided that the least dimension of the covering shall not exceed 1/4 inch (6.4 mm) , and operational louvers are permitted:

1. Perforated sheet metal plates not less than 0.070 inch (1.8 mm) thick.
2. Expanded sheet metal plates not less than 0.047 inch (1.2 mm) thick.
3. Cast-iron grill or grating.
4. Extruded load-bearing brick vents.
5. Hardware cloth of 0.035 inch (0.89 mm) wire or heavier.
6. Corrosion-resistant wire mesh, with the least dimension being 1/8 inch (3.2 mm) thick.

Exception Exceptions:

1. The total area of ventilation openings shall be permitted to be reduced to 1/1,500 of the under-floor area where the ground surface is covered with an *approved* Class I vapor retarder material ~~and the required openings are placed to provide cross ventilation of the space. The installation of operable louvers shall not be prohibited.~~
2. Where the ground surface is covered with an approved class 1 vapor retarder material, ventilation openings are not required to be within 3 feet (915 mm) of each external corner of the under-floor space provided the openings are placed to provide cross ventilation of the space.

R408.3 Unvented crawl space. ~~Ventilation openings in~~ For unvented under-floor spaces specified in Sections R408.1 and R408.2 shall not be required where the following items are ~~shall be provided:~~

1. Exposed earth ~~is~~ shall be covered with a continuous Class I vapor retarder. Joints of the vapor retarder shall overlap by 6 inches (152 mm) and shall be sealed or taped. The edges of the

vapor retarder shall extend not less than 6 inches (152 mm) up the stem wall and shall be attached and sealed to the stem wall or insulation.

2. One of the following ~~is~~ shall be provided for the under-floor space:
 - 2.1. Continuously operated mechanical exhaust ventilation at a rate equal to 1 cubic foot per minute (0.47 L/s) for each 50 square feet (4.7 m²) of *crawl space* floor area, including an air pathway to the common area (such as a duct or transfer grille), and perimeter walls insulated in accordance with Section N1102.2.11 of this code.
 - 2.2. *Conditioned air* supply sized to deliver at a rate equal to 1 cubic foot per minute (0.47 L/s) for each 50 square feet (4.7 m²) of under-floor area, including a return air pathway to the common area (such as a duct or transfer grille), and perimeter walls insulated in accordance with Section N1102.2.11 of this code.
 - 2.3. Plenum in existing structures complying with Section M1601.5, if under-floor space is used as a plenum.
 - 2.4. Dehumidification sized to provide 70 pints (33 liters) of moisture removal per day for every 1,000 square feet (93 m²) of *crawl space* floor area.

Reason: Section R408 was the subject of numerous code changes which resulted in R408.1 and R408.2 being essentially the same code section. R408.1 provides for the 1/1500 vent area provision in the body of the code section and R408.2 provides it in an exception. R408.2 provides for the screening of the openings and R408.1 does not. The provisions in the two sections should be combined into one section. This change accomplishes that and better formats the section for the two methods of treating under-floor spaces: vented and ventless. The code change also addresses some confusion with regards to placement of the vents. R408.1 states to place the vents 3 feet from building corners. The exception to R408.2 allows the vents to be placed to provide cross ventilation, not 3 feet from each corner, when the vapor retarder is used, which was the intent per code change G107.99. When vents are required 3 feet from each corner the current text states corner of the building. The provision for vent placement has been corrected to require the vents 3 feet from the exterior corners of the under-floor space because the current text is confusing to apply when the entire footprint of the dwelling is not on a crawls space.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This code change is not changing the intent, it is a clarification.

Proposal # 5584

RB176-19

RB177-19

IRC: R408.3

Proponent: Craig Conner, representing self (craig.conner@mac.com); Joseph Lstiburek, representing self (joe@buildingsscience.com)

2018 International Residential Code

SECTION R408 UNDER-FLOOR SPACE

Revise as follows:

R408.3 Unvented crawl space. Ventilation openings in under-floor spaces specified in Sections R408.1 and R408.2 shall not be required where the following items are provided:

1. Exposed earth is covered with a continuous Class I vapor retarder. Joints of the vapor retarder shall overlap by 6 inches (152 mm) and shall be sealed or taped. The edges of the vapor retarder shall extend not less than 6 inches (152 mm) up the stem wall and shall be attached and sealed to the stem wall or insulation.
2. One of the following is provided for the under-floor space:
 - 2.1. Continuously operated mechanical exhaust ventilation at a rate equal to 1 cubic foot per minute (0.47 L/s) for each 50 square feet (4.7 m²) of *crawl space* floor area, including an air pathway to the common area (such as a duct or transfer grille), and perimeter walls insulated in accordance with Section N1102.2.11 of this code.
 - 2.2. *Conditioned air* supply sized to deliver at a rate equal to 1 cubic foot per minute (0.47 L/s) for each 50 square feet (4.7 m²) of under-floor area, including a return air pathway to the common area (such as a duct or transfer grille), and perimeter walls insulated in accordance with Section N1102.2.11 of this code.
 - 2.3. Plenum in existing structures complying with Section M1601.5, if under-floor space is used as a plenum.
 - 2.4. Dehumidification sized ~~to provide 70 pints (33 liters) of moisture removal per day for every 1,000 square feet (93 m²) of *crawl space* floor area.~~ in accordance with the manufacturer's specifications.

Reason: Objective: Address dehumidifier sizing

Rating standards for moisture removal per day are changing (DOE) and moisture performance curves differ for different installations and entering air conditions from manufacturer to manufacturer.

Additionally, requirements may vary from climate to climate. Manufacturers update their sizing charts on a regular basis to take these factors into account.

Cost Impact: The code change proposal will decrease the cost of construction
Need for moisture removal is changing.

Proposal # 5431

RB177-19

RB178-19

IRC: R408.8(New)

Proponent: Gary Ehrlich, National Association of Home Builders, representing National Association of Home Builders (gehrlich@nahb.org)

2018 International Residential Code

Add new text as follows:

R408.8 Under-floor vapor retarder. In Climate Zones 1A, 2A, and 3A below the warm-humid line, a continuous Class I or II vapor retarder shall be provided on the exposed face of air permeable insulation installed between the floor joists and exposed to the grade in the under-floor space. The vapor retarder shall have a maximum water vapor permeance of 1.5 perms when tested in accordance with Procedure B of ASTM E96.

Exception: The vapor retarder shall not be required in unvented crawl spaces constructed in accordance with Section R408.3.

Reason: The purpose of this code change is to address issues that have been observed with moisture accumulation in floors above vented and open crawl spaces in hot-humid climates. Water vapor migrating from under-floor spaces in hot-humid climates such as vented crawlspaces or open foundation systems towards cooler and drier indoor spaces is causing mold, mildew, and decay within floor assemblies, especially where an impermeable floor covering or underlayment is used, as moisture can get trapped within the wood subfloor and condense. Such moisture problems have occurred even where crawl spaces are constructed in accordance with the IRC, including the appropriate size and location of ventilation openings and use of Class I vapor retarders on the ground.

This change will require a Class I or Class II vapor retarder between the exposed face of air-permeable insulation materials installed between the floor framing over the crawl space and the under-floor grade. The vapor retarder can be a separate layer of material such as a 6 mil polyethylene sheet, applied over permeable or semi-permeable insulation, or incorporated as part of the insulation, such as a foil facing on fiberglass batts or polyisocyanurate rigid foam, or polypropylene-faced XPS.

An exception is provided for unvented crawl spaces (also referred to as sealed, closed or conditioned crawl spaces) constructed per the IRC. In unvented crawl spaces, mechanical exhaust ventilation, supply ventilation, or dehumidification is provided for the under-floor space to control moisture.

Bibliography: *Floors Above Crawl Spaces: Reducing the Risk of Moisture Accumulation within Wood Floor Assemblies for Residential Buildings in Hot-Humid Climates*, prepared by Home Innovation Research Labs for National Association of Home Builders, June 2014.

Cost Impact: The code change proposal will increase the cost of construction. The code change will increase cost where a sheet polyethylene vapor retarder, foil-faced rigid or batt insulation, or other materials meeting the properties of a Class I or II vapor retarder would now be required. The additional material cost for 6 mil polyethylene sheet is about 6 to 10 cents per square foot. The additional material cost for foil-faced batt insulation is about 15 to 30 cents per square foot.

Proposal # 5058

RB178-19

RB179-19

IRC®: TABLE R502.3.3(1), TABLE R502.3.3(2)

Proponent: Paul Coats, American Wood Council, representing American Wood Council (pcoats@awc.org); Philip Line (pline@awc.org)

2018 International Residential Code

Revise as follows:

TABLE R502.3.3(1)

CANTILEVER SPANS FOR FLOOR JOISTS SUPPORTING LIGHT-FRAME EXTERIOR BEARING WALL AND ROOF ONLY^{a, b, c, f, g, h} (Floor Live Load ≤ 40 psf, Roof Live Load ≤ 20 psf)

MEMBER & SPACING	MAXIMUM CANTILEVER SPAN (uplift force at backspan support in lbs.) ^{d, e}											
	Ground Snow Load											
	≤ 20 psf			30 psf			50 psf			70 psf		
	Roof Width			Roof Width			Roof Width			Roof Width		
	24 ft	32 ft	40 ft	24 ft	32 ft	40 ft	24 ft	32 ft	40 ft	24 ft	32 ft	40 ft
2 × 8 @ 12"	20" (177)	15" (227)	—	18" (209)	—	—	—	—	—	—	—	—
2 × 10 @ 16"	29" (228)	21" (297)	16" (364)	26" (271)	18" (354)	—	20" (375)	—	—	—	—	—
2 × 10 @ 12"	36" (166)	26" (219)	20" (270)	34" (198)	22" (263)	16" (324)	26" (277)	—	—	19" (356)	—	—
2 × 12 @ 16"	—	32" (287)	25" (356)	36" (263)	29" (345)	21" (428)	29" (367)	20" (484)	—	23" (471)	—	—
2 × 12 @ 12"	—	42" (209)	31" (263)	—	37" (253)	27" (317)	36" (271)	27" (358)	17" (447)	31" (348)	19" (462)	—
2 × 12 @ 8"	—	48" (136)	45" (169)	—	48" (164)	38" (206)	—	40" (233)	26" (294)	36" (230)	29" (304)	18" (379)

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

- Tabulated values are for clear-span roof supported solely by exterior bearing walls.
- Spans are based on No. 2 Grade lumber of Douglas fir-larch, ~~Southern pine~~, hem-fir, and spruce-pine-fir for repetitive (three or more) members. ~~No. 1 or better shall be used for Southern pine.~~
- Ratio of backspan to cantilever span shall be not less than 3:1.
- Connections capable of resisting the indicated uplift force shall be provided at the backspan support.
- Uplift force is for a backspan to cantilever span ratio of 3:1. Tabulated uplift values are permitted to be reduced by multiplying by a factor equal to 3 divided by the actual backspan ratio provided (3/backspan ratio).
- See Section R301.2.2.6, Item 1, for additional limitations on cantilevered floor joists for detached one- and two-family dwellings in Seismic Design Category D, D₁, or D₂ and townhouses in Seismic Design Category C, D, D₁ or D₂.
- A full-depth rim joist shall be provided at the unsupported end of the cantilever joists. Solid

blocking shall be provided at the supported end. Where the cantilever length is 24 inches or less and the building is assigned to Seismic Design Category A, B or C, solid blocking at the support for the cantilever shall not be required.

- h. Linear interpolation shall be permitted for building widths and ground snow loads other than shown.

TABLE R502.3.3(2)
CANTILEVER SPANS FOR FLOOR JOISTS SUPPORTING EXTERIOR BALCONY^{a, b, e, f}

MEMBER SIZE	SPACING	MAXIMUM CANTILEVER SPAN (uplift force at backspan support in lbs.) ^{c, d}		
		Ground Snow Load		
		≤ 30 psf	50 psf	70 psf
2 × 8	12"	42" (139)	39" (156)	34" (165)
2 × 8	16"	36" (151)	34" (171)	29" (180)
2 × 10	12"	61" (164)	57" (189)	49" (201)
2 × 10	16"	53" (180)	49" (208)	42" (220)
2 × 10	24"	43" (212)	40" (241)	34" (255)
2 × 12	16"	72" (228)	67" (260)	57" (268)
2 × 12	24"	58" (279)	54" (319)	47" (330)

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kPa.

- Spans are based on No. 2 Grade lumber of Douglas fir-larch, Southern pine, hem-fir, and spruce-pine-fir for repetitive (three or more) members. ~~No.1 or better shall be used for Southern pine.~~
- Ratio of backspan to cantilever span shall be not less than 2:1.
- Connections capable of resisting the indicated uplift force shall be provided at the backspan support.
- Uplift force is for a backspan to cantilever span ratio of 2:1. Tabulated uplift values are permitted to be reduced by multiplying by a factor equal to 2 divided by the actual backspan ratio provided (2/backspan ratio).
- A full-depth rim joist shall be provided at the unsupported end of the cantilever joists. Solid blocking shall be provided at the supported end. Where the cantilever length is 24 inches or less and the building is assigned to Seismic Design Category A, B or C, solid blocking at the support for the cantilever shall not be required.
- Linear interpolation shall be permitted for ground snow loads other than shown.

Reason: In 2012, full-scale testing of visually-graded southern pine lumber was underway and preliminary results indicated that some changes to visually-graded southern pine design values would be required. Unfortunately, the testing and certification of design values were not going to be completed in time to submit new design tables to the 2015 IRC, if required. Several 2012 IRC tables, which had been based on minimum design values for No. 2 grade Hem-Fir or SPF lumber, also applied to No. 2 grade southern pine. As an interim recommendation until new design values could be certified, a sentence was added to those tables restricting the applicability to No.1 grade or better southern pine lumber. Since that time, new design values for southern pine have been certified. Bending design values for No. 2 grade southern pine are slightly less than No. 2 grade Hem-Fir lumber, but Modulus of Elasticity (MOE) and shear design values are higher than those for Hem-Fir. Analysis of the tabulated cantilever spans in Tables R502.3.3(1) and R502.3.3(2) has confirmed that the spans were deflection-controlled based on the MOE of No. 2 grade of Hem-Fir lumber. Since No. 2 grade southern

pine lumber has a higher MOE value than No. 2 grade Hem-Fir lumber, there is no need for the added sentence at the end of footnote “b” in Table R502.3.3(1) and at the end of footnote “a” in Table R502.3.3(2) restricting the applicability to No. 1 or better southern pine lumber.

Cost Impact: The code change proposal will decrease the cost of construction

Cost of construction will usually decrease if No. 2 grade Southern Pine is used instead of No. 1 grade as a result of the current restriction on No. 2 grade being removed.

Proposal # 4279

RB179-19

RB180-19

IRC: R505.1.1.1(New), R603.1.1.1(New). R804.1.1.1(New)

Proponent: Jon-Paul Cardin, American Iron and Steel Institute, representing American Iron and Steel Institute (JCardin@steel.org)

2018 International Residential Code

Add new text as follows:

R505.1.1.1 Alternate Applications Cold-formed steel floor framing for buildings exceeding the applicability limits of Section R505.1.1 are permitted to be designed and constructed in accordance with AISI S230, subject to the limits therein.

R603.1.1.1 Alternate Applications. Cold-formed steel wall framing for buildings exceeding the applicability limits of Section R603.1.1 are permitted to be designed and constructed in accordance with AISI S230, subject to the limits therein.

R804.1.1.1 Alternate Applications Cold-formed steel roof and ceiling framing for buildings exceeding the applicability limits of Section R804.1.1 are permitted to be designed and constructed in accordance with AISI S230, subject to the limits therein.

Reason: The intent of this code change proposal is to direct the user AISI S230 – *Standard for Cold-Formed Steel Framing - Prescriptive Method for One- and Two-Family Dwellings (AISI S230-18)* for cold-formed steel framed buildings and structures exceeding the building size limits of 60 feet long and 40 feet wide as prescribed in the *Applicability Limits* of each section (R603.1.1, R505.1.1, R804.1.1).

The 2018 edition of AISI S230 removed the building dimension limitations (in plan dimension) listed in Table A1-1 and moved to an interior braced wall line approach. Rather than significantly expanding the cold-formed steel framing provisions within the IRC, AISI is proposing to direct the user to AISI S230-18 for conditions utilizing interior braced wall lines. While AISI S230 is already permitted as an alternate standard via Section R301.1.1 – *Alternate Provisions*, the proposed language is intended to provide the user with knowledge that additional prescriptive provisions for expanded conditions are available in the AISI S230 standard. The approach proposed in this code change coincides with the approach of AISI over the past few cycles to streamline the cold-formed steel provisions within the IRC.

There is a concurrent code change proposal to update Chapter 44 to AISI S230-18. A draft version of AISI S230-18 is currently available for review at www.aisistandards.org. AISI anticipates the final published edition of AISI S230-18 will be available at the same website free of charge by March 1, 2019.

Bibliography: AISI (2018), *Standard for Cold-Formed Steel Framing - Prescriptive Method for One- and Two-Family Dwellings*, ANSI/AISI S230-18, American Iron and Steel Institute, Washington D.C.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal does not make technical changes to the provisions of the IRC.

Proposal # 4070

RB180-19

RB181-19

IRC: R505.1.2, FIGURE R505.1.2, R505.1.3, R505.2.2, R505.2.3, TABLE R505.2.3, FIGURE R505.2.3(1), FIGURE R505.2.3(2), R505.2.4, R505.2.5, R505.2.6, R505.2.6.1, FIGURE R505.2.6.1, R505.2.6.2, R505.2.6.3, FIGURE R505.2.6.3, R603.1.2, FIGURE R603.1.2, R603.2.1, R603.2.2, R603.2.3, TABLE R603.2.3, FIGURE R603.2.3(1), FIGURE R603.2.3(2), R603.2.4, R603.2.6, R603.2.6.1, FIGURE R603.2.6.1, R603.2.6.2, R603.2.6.3, FIGURE R603.2.6.3, R804.1.2, FIGURE R804.1.2, R804.2.1, R804.2.2, R804.2.3, TABLE R804.2.3, FIGURE R804.2.3(1), FIGURE R804.2.3(2), R804.2.4, R804.2.5, R804.2.6, R804.2.6.1, FIGURE R804.2.6.1, R804.2.6.2, R804.2.6.3, FIGURE R804.2.6.3, R804.3.6

Proponent: Jon-Paul Cardin, American Iron and Steel Institute, representing American Iron and Steel Institute (JCardin@steel.org)

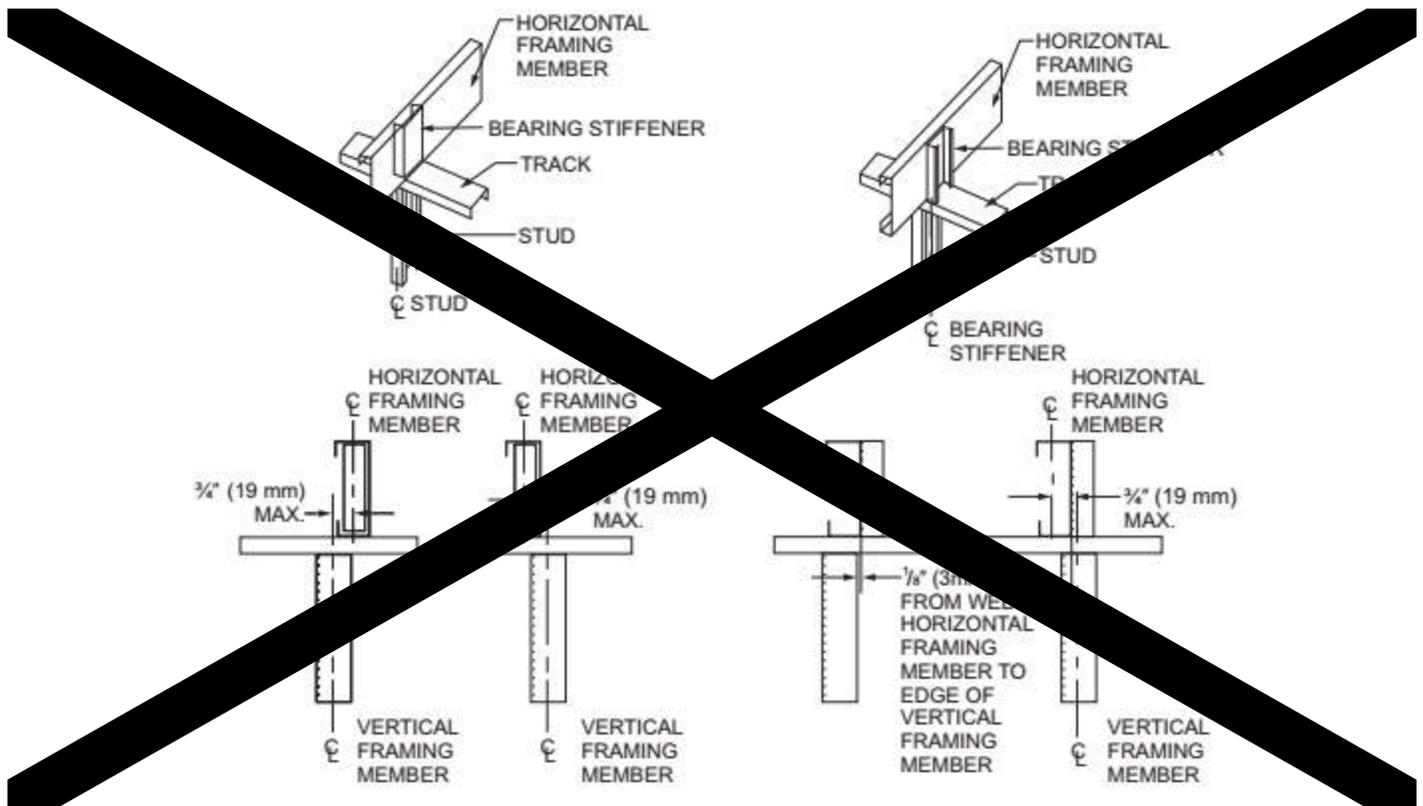
2018 International Residential Code

Revise as follows:

R505.1.2 In-line framing. Where supported by cold-formed steel-framed walls in accordance with Section R603, cold-formed steel floor framing shall be constructed with floor joists located in-line with load-bearing studs located below the joists in accordance with the tolerances specified in AISI S240 Section B1.2.3. Figure R505.1.2 and the tolerances specified as follows:

1. ~~The maximum tolerance shall be $\frac{3}{4}$ inch (19.1 mm) between the centerline of the horizontal framing member and the centerline of the vertical framing member.~~
2. ~~Where the centerline of the horizontal framing member and bearing stiffener are located to one side of the centerline of the vertical framing member, the maximum tolerance shall be $\frac{1}{8}$ inch (3 mm) between the web of the horizontal framing member and the edge of the vertical framing member.~~

Delete without substitution:



For SI: 1 inch = 25.4 mm.

**FIGURE R505.1.2
IN-LINE FRAMING**

Revise as follows:

R505.1.3 Floor trusses. Cold-formed steel trusses shall be designed, braced and installed in accordance with AISI S230 Section D8, S240. In the absence of specific bracing requirements, trusses shall be braced in accordance with accepted industry practices, such as the *SBGA Cold-Formed Steel Building Component Safety Information (GFSBCSI), Guide to Good Practice for Handling, Installing & Bracing of Cold-Formed Steel Trusses*. Truss members shall not be notched, cut or altered in any manner without an *approved* design.

R505.2 Structural framing. Load-bearing cold-formed steel floor framing members shall be in accordance with this section.

Revise as follows:

R505.2.1 Material. Load-bearing cold-formed steel framing members shall be cold formed to shape from structural quality sheet steel complying with the requirements of ASTM A1003: Structural Grades 33 Type H and 50 Type H; AISI S240 Section A3.

R505.2.2 Corrosion protection. Load-bearing cold-formed steel framing shall have a metallic coating complying with AISI S240 Section A4, ASTM A1003 and one of the following:

1. Not less than G-60 in accordance with ASTM A653.
2. Not less than AZ-50 in accordance with ASTM A792.

R505.2.3 Dimension, thickness and material grade. Load-bearing cold-formed steel floor framing members shall comply with Figure R505.2.3(1) and with the dimensional and thickness requirements specified in Table R505.2.3. Additionally, all C-shaped sections shall have a minimum flange width of 1.625 inches (41 mm) and a maximum flange width of 2 inches (51 mm). The minimum lip size for C-shaped sections shall be $\frac{1}{2}$ inch (12.7

mm). Track sections shall comply with Figure R505.2.3(2) and shall have a minimum flange width of 1⁺/₄ inch (32 mm). Minimum Grade 33 ksi steel shall be used wherever 33 mil and 43 mil thicknesses are specified. Minimum Grade 50 ksi steel shall be used wherever 54 and 68 mil thicknesses are specified. AISI S230 Section A4.3 and material grade requirements as specified in AISI S230 Section A4.4.

Delete without substitution:

**TABLE R505.2.3
COLD-FORMED STEEL JOIST SIZES AND THICKNESS**

MEMBER DESIGNATION^a	WEB DEPTH(inches)	MINIMUM BASE STEEL THICKNESSmil (inches)
550S162-t	5.5	33 (0.0329), 43 (0.0428), 54 (0.0538), 68 (0.0677)
800S162-t	8	33 (0.0329), 43 (0.0428), 54 (0.0538), 68 (0.0677)
1000S162-t	10	43 (0.0428), 54 (0.0538), 68 (0.0677)
1200S162-t	12	43 (0.0428), 54 (0.0538), 68 (0.0677)

For SI: 1 inch = 25.4 mm, 1 mil = 0.0254 mm.

- a. The member designation is defined by the first number representing the member depth in 0.01 inch, the letter “S” representing a stud or joist member, the second number representing the flange width in 0.01 inch, and the letter “t” shall be a number representing the minimum base metal thickness in mils.

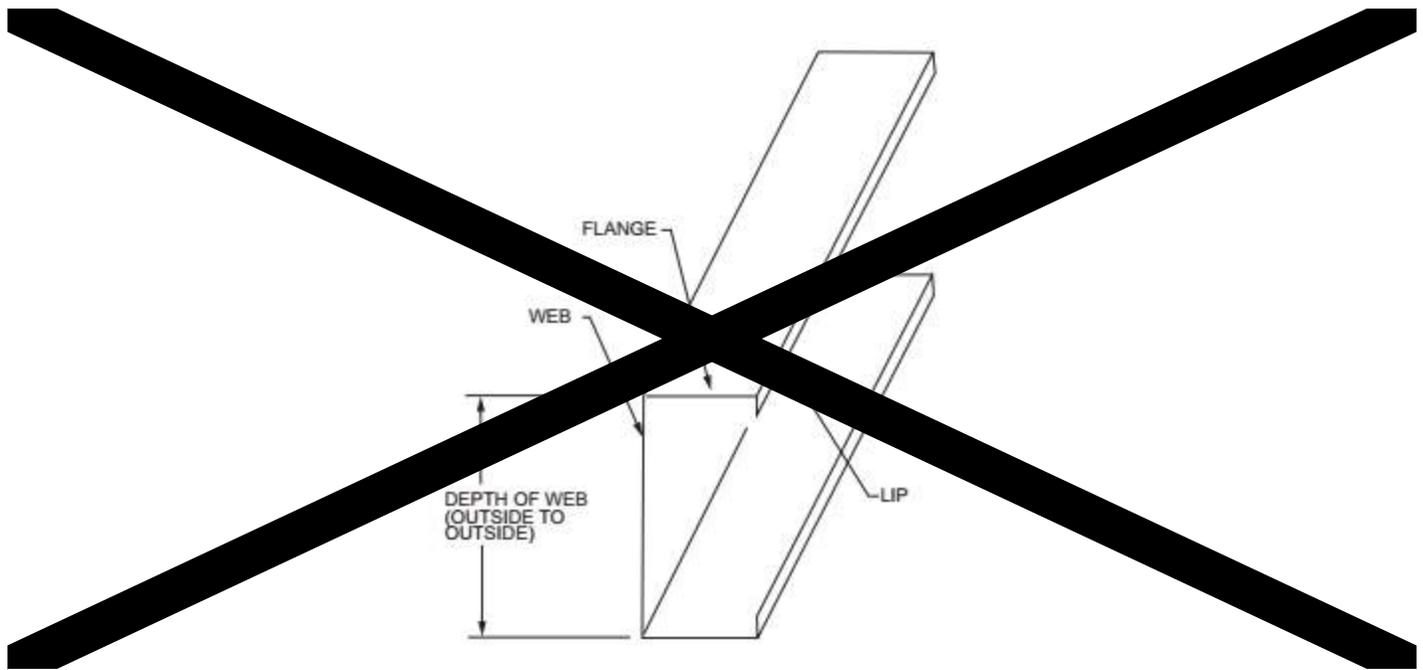


FIGURE R505.2.3(1)
C-SHAPED SECTION

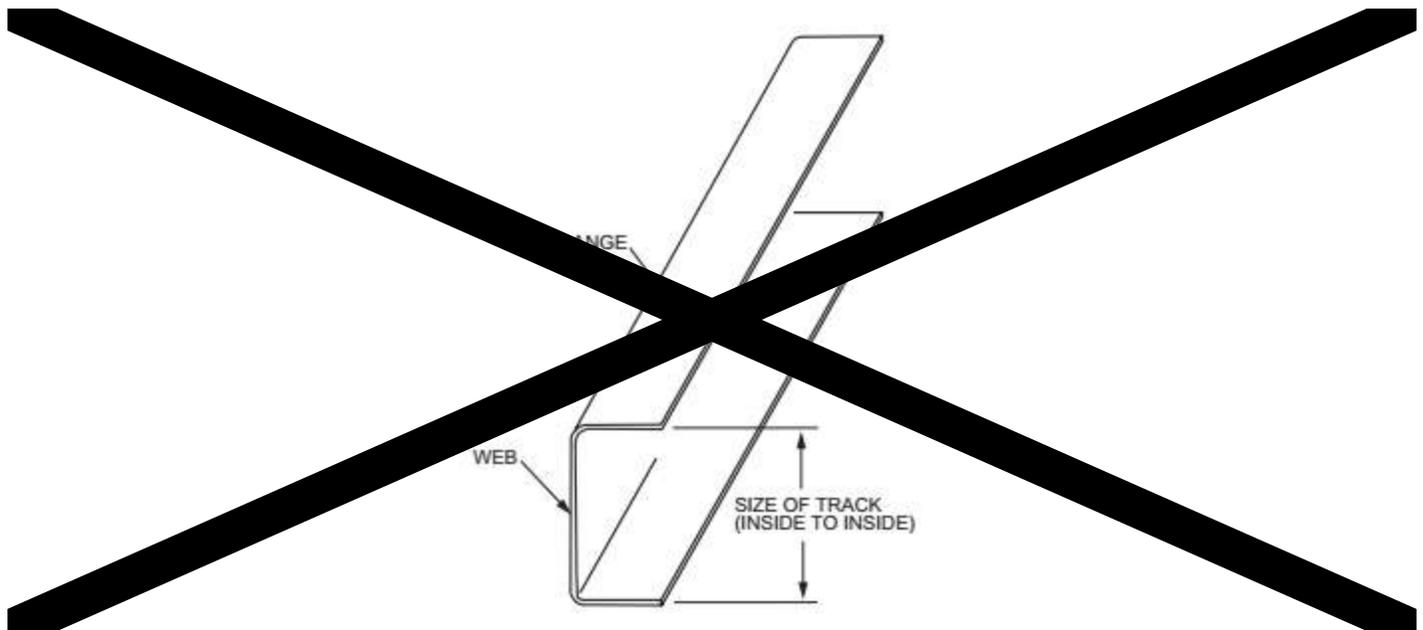


FIGURE R505.2.3(2)
TRACK SECTION

Revise as follows:

R505.2.4 Identification. Load-bearing cold-formed steel framing members shall meet the product identification requirements of AISI S240 Section A5.5. ~~have a legible label, stencil, stamp or embossment with the following information as a minimum:~~

1. ~~Manufacturer's identification.~~
2. ~~Minimum base steel thickness in inches (mm).~~
3. ~~Minimum coating designation.~~
4. ~~Minimum yield strength, in kips per square inch (ksi) (MPa).~~

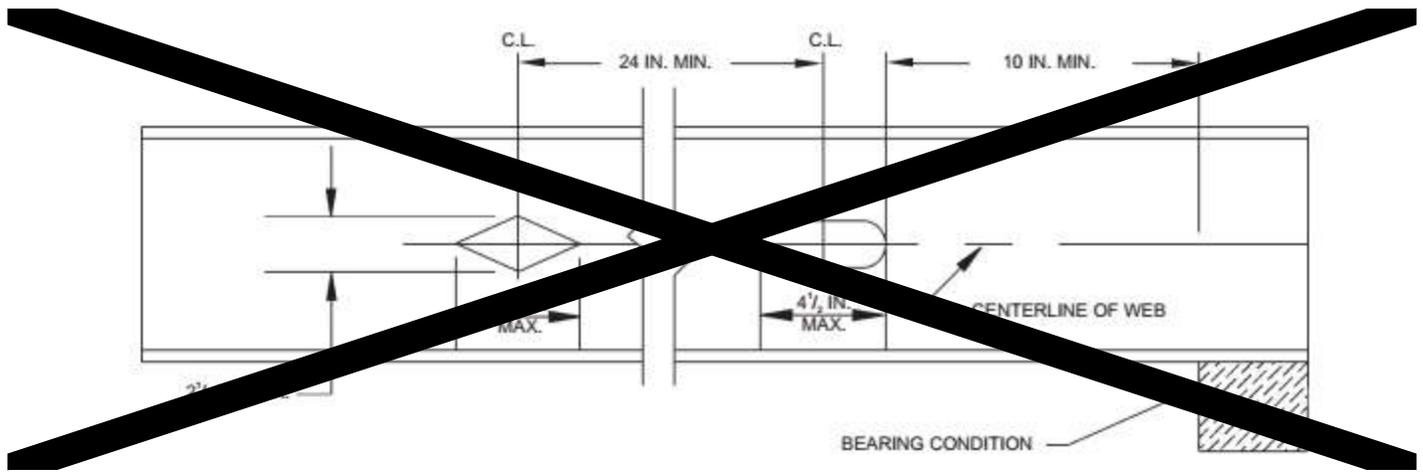
R505.2.6 Web holes, web hole reinforcing and web hole patching. ~~Web holes, web hole reinforcing, and web hole patching shall be in accordance with this section.~~ in floor framing members shall comply with the conditions as prescribed in AISI S230 Section A4.5. ~~Web holes not in conformance with the conditions as prescribed in AISI S230 Section A4.5 shall be reinforced in accordance with the provisions of AISI S230 Section A4.6 or patched in accordance with the provisions of AISI S230 Section A4.7.~~

Delete without substitution:

R505.2.6.1 Web holes. ~~Web holes in floor joists shall comply with all of the following conditions:~~

1. ~~Holes shall conform to Figure R505.2.6.1.~~
2. ~~Holes shall be permitted only along the centerline of the web of the framing member.~~
3. ~~Holes shall have a center-to-center spacing of not less than 24 inches (610 mm).~~
4. ~~Holes shall have a web hole width not greater than 0.5 times the member depth, or $2\frac{1}{2}$ inches (64.5 mm).~~
5. ~~Holes shall have a web hole length not exceeding $4\frac{1}{2}$ inches (114 mm).~~
6. ~~Holes shall have a minimum distance between the edge of the bearing surface and the edge of the web hole of not less than 10 inches (254 mm).~~

~~Framing members with web holes not conforming to these requirements shall be reinforced in accordance with Section R505.2.6.2, patched in accordance with Section R505.2.6.3 or designed in accordance with accepted engineering practices.~~



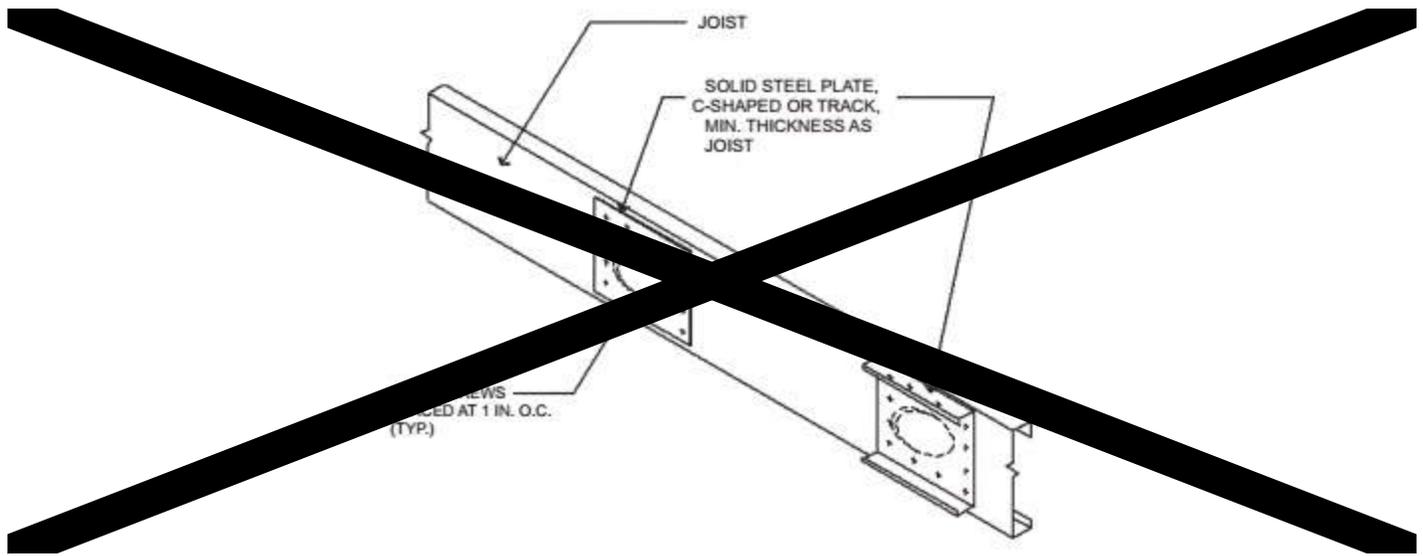
For SI: 1 inch = 25.4 mm.

**FIGURE R505.2.6.1
FLOOR JOIST WEB HOLES**

R505.2.6.2 Web hole reinforcing. Reinforcement of web holes in floor joists not conforming to the requirements of Section R505.2.6.1 shall be permitted if the hole is located fully within the center 40 percent of the span and the depth and length of the hole does not exceed 65 percent of the flat width of the web. The reinforcing shall be a steel plate or C-shaped section with a hole that does not exceed the web hole size limitations of Section R505.2.6.1 for the member being reinforced. The steel reinforcing shall be not thinner than the thickness of the receiving member and shall extend not less than 1 inch (25 mm) beyond all edges of the hole. The steel reinforcing shall be fastened to the web of the receiving member with No. 8 screws spaced not more than 1 inch (25 mm) center-to-center along the edges of the patch with minimum edge distance of $\frac{1}{2}$ inch (12.7 mm).

R505.2.6.3 Hole patching. Patching of web holes in floor joists not conforming to the requirements in Section R505.2.6.1 shall be permitted in accordance with either of the following methods:

1. Framing members shall be replaced or designed in accordance with accepted engineering practices where web holes exceed the following size limits:
 - 1.1. The depth of the hole, measured across the web, exceeds 70 percent of the flat width of the web.
 - 1.2. The length of the hole, measured along the web, exceeds 10 inches (254 mm) or the depth of the web, whichever is greater.
2. Web holes not exceeding the dimensional requirements in Section R505.2.6.3, Item 1, shall be patched with a solid steel plate, stud section or track section in accordance with Figure R505.2.6.3. The steel patch shall, as a minimum, be of the same thickness as the receiving member and shall extend not less than 1 inch (25 mm) beyond all edges of the hole. The steel patch shall be fastened to the web of the receiving member with No. 8 screws spaced not more than 1 inch (25 mm) center-to-center along the edges of the patch with minimum edge distance of $\frac{1}{2}$ inch (12.7 mm).



For SI: 1 inch = 25.4 mm.

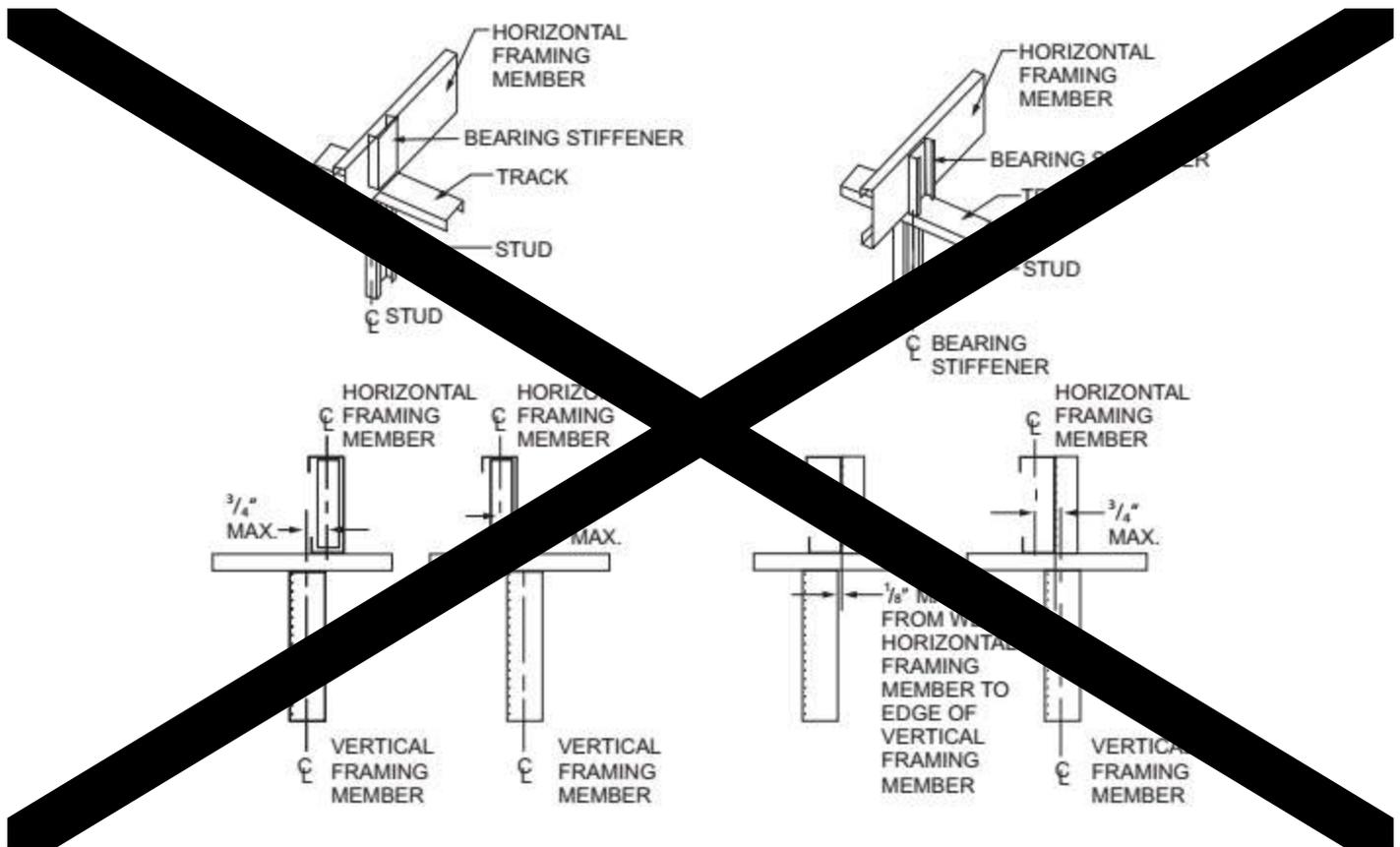
FIGURE R505.2.6.3
FLOOR JOIST WEB HOLE PATCH

Revise as follows:

R603.1.2 In-line framing. Load-bearing cold-formed steel studs constructed in accordance with Section R603 shall be located in-line with joists, trusses and rafters in accordance with the tolerances specified in AISI S240 Section B1.2.3. Figure R603.1.2 and the tolerances specified as follows:

1. The maximum tolerance shall be $\frac{3}{4}$ inch (19 mm) between the centerline of the horizontal framing member and the centerline of the vertical framing member.
2. Where the centerline of the horizontal framing member and bearing stiffener is located to one side of the centerline of the vertical framing member, the maximum tolerance shall be $\frac{1}{8}$ inch (3 mm) between the web of the horizontal framing member and the edge of the vertical framing member.

Delete without substitution:



For SI: 1 inch = 25.4 mm,

**FIGURE R603.1.2
IN-LINE FRAMING**

R603.2 Structural framing. Load-bearing cold-formed steel wall framing members shall be in accordance with this section.

Revise as follows:

R603.2.1 Material. Load-bearing cold-formed steel framing members shall be cold formed to shape from structural-quality sheet steel complying with the requirements of ~~ASTM A1003- Structural Grades 33 Type H and 50 Type H.~~ AISI 240 Section A3.

R603.2.2 Corrosion protection. Load-bearing cold-formed steel framing shall have a ~~metallic-protective~~ coating complying with AISI S240 Section A4. ~~ASTM A1003 and one of the following:~~

1. ~~Not less than G 60 in accordance with ASTM A653.~~
2. ~~Not less than AZ 50 in accordance with ASTM A792.~~

R603.2.3 Dimension, thickness and material grade. Load-bearing cold-formed steel wall framing members shall comply with ~~Figure R603.2.3(1) and with the dimensional and thickness requirements specified in Table R603.2.3.~~ Additionally, C-shaped sections shall have a minimum flange width of $1\frac{5}{8}$ inches (41 mm) and a maximum flange width of 2 inches (51 mm). The minimum lip size for C-shaped sections shall be $\frac{1}{2}$ inch (12.7 mm). Track sections shall comply with ~~Figure R603.2.3(2) and shall have a minimum flange width of $1\frac{1}{4}$ inches (32 mm).~~ Minimum Grade 33 ksi steel shall be used wherever 33 mil and 43 mil thicknesses are specified. Minimum Grade 50 ksi steel shall be used wherever 54 and 68 mil thicknesses are specified. AISI S230 Section A4.3 and material grade requirements as specified in AISI S230 Section A4.4.

Delete without substitution:

**TABLE R603.2.3
LOAD-BEARING COLD-FORMED STEEL STUD SIZES AND THICKNESSES**

MEMBER DESIGNATION^a	WEB DEPTH(inches)	MINIMUM BASE STEEL THICKNESS mil (inches)
350S162-t	3.5	33 (0.0329), 43 (0.0428), 54 (0.0538)
550S162-t	5.5	33 (0.0329), 43 (0.0428), 54 (0.0538), 68 (0.0677)

For SI: 1 inch = 25.4 mm; 1 mil = 0.0254 mm.

- a. The member designation is defined by the first number representing the member depth in hundredths of an inch, "S" representing a stud or joist member, the second number representing the flange width in hundredths of an inch, and the letter "t" shall be a number representing the minimum base metal thickness in mils.

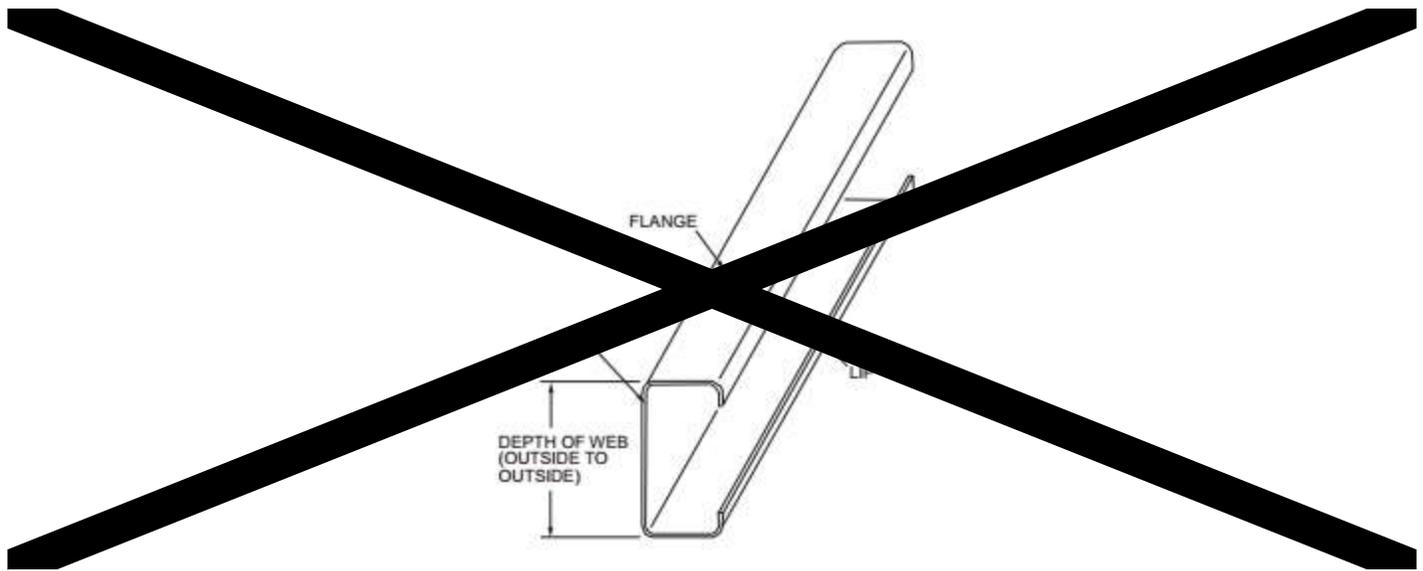
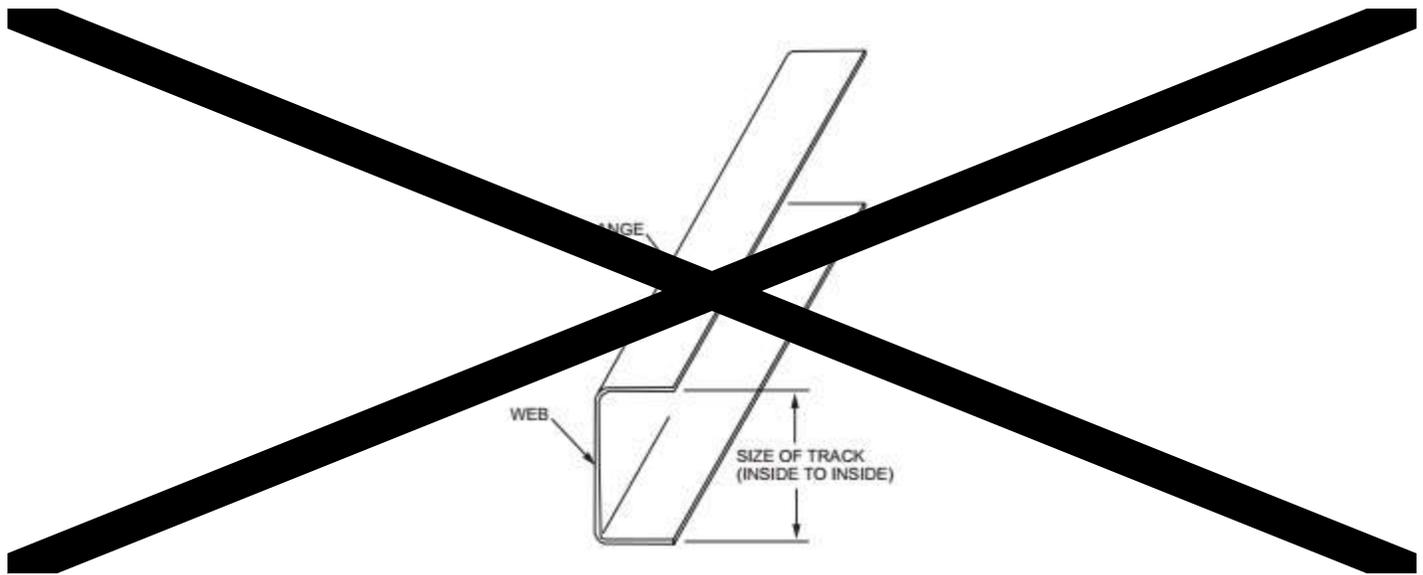


FIGURE R603.2.3(1)
G-SHAPED SECTION



**FIGURE R603.2.3(2)
TRACK SECTION**

Revise as follows:

R603.2.4 Identification. Load-bearing cold-formed steel framing members shall meet the product identification requirements of AISI S240 Section A5.5. have a legible label, stencil, stamp or embossment with the following information as a minimum:

1. ~~Manufacturer's identification.~~
2. ~~Minimum base steel thickness in inches (mm).~~
3. ~~Minimum coating designation.~~
4. ~~Minimum yield strength, in kips per square inch (ksi) (MPa).~~

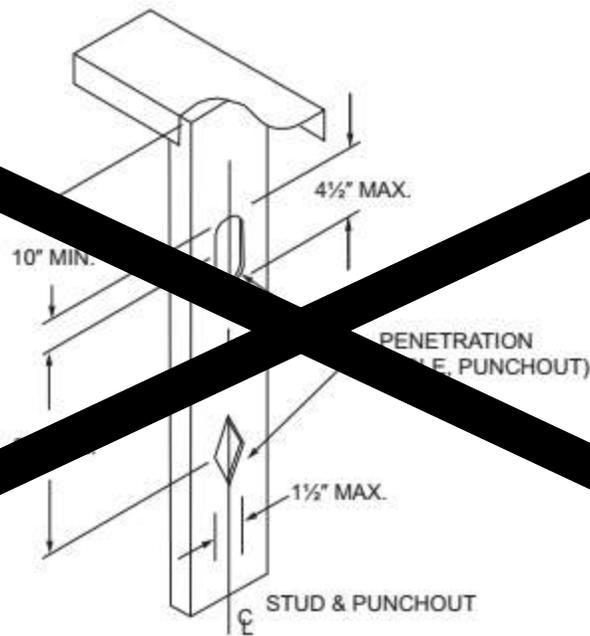
R603.2.6 Web holes, web hole reinforcing and web hole patching. ~~Web holes, web hole reinforcing and web hole patching shall be in accordance with this section. in wall studs shall comply with the conditions a prescribed in AISI S230 Section A4.5. Web holes not in conformance with the conditions as prescribed in AISI S230 Section A4.5 shall be reinforced in accordance with the provisions of AISI S230 Section A4.6 or patched in accordance with the provisions of AISI S230 Section A4.7.~~

Delete without substitution:

R603.2.6.1 Web holes. ~~Web holes in wall studs and other structural members shall comply with all of the following conditions:~~

1. ~~Holes shall conform to Figure R603.2.6.1.~~
2. ~~Holes shall be permitted only along the centerline of the web of the framing member.~~
3. ~~Holes shall have a center-to-center spacing of not less than 24 inches (610 mm).~~
4. ~~Holes shall have a web hole width not greater than 0.5 times the member depth, or 1⁺/₂ inches (38 mm).~~
5. ~~Holes shall have a web hole length not exceeding 4⁺/₂ inches (114 mm).~~
6. ~~Holes shall have a minimum distance between the edge of the bearing surface and the edge of the web hole of not less than 10 inches (254 mm).~~

~~Framing members with web holes not conforming to the above requirements shall be reinforced in accordance with Section R603.2.6.2, patched in accordance with Section R603.2.6.3 or designed in accordance with accepted engineering practice.~~



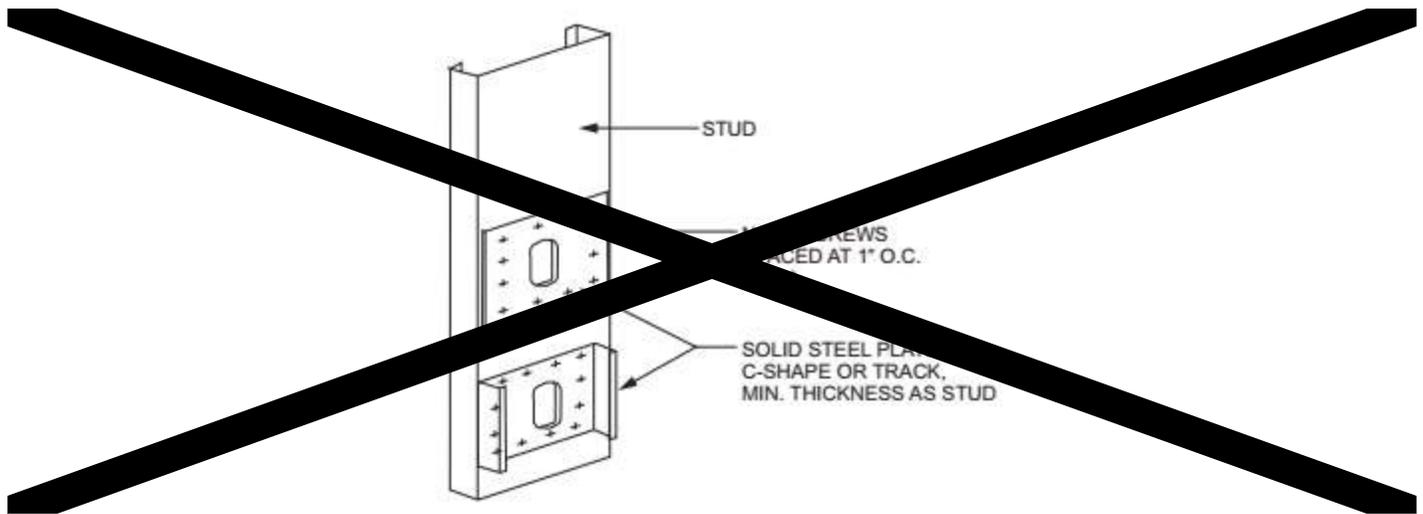
For SI: 1 inch = 25.4 mm.

**FIGURE R603.2.6.1
WALL STUD WEB HOLES**

R603.2.6.2 Web hole reinforcing. Web holes in gable endwall studs not conforming to the requirements of Section R603.2.6.1 shall be permitted to be reinforced if the hole is located fully within the center 40 percent of the span and the depth and length of the hole does not exceed 65 percent of the flat width of the web. The reinforcing shall be a steel plate or C-shaped section with a hole that does not exceed the web hole size limitations of Section R603.2.6.1 for the member being reinforced. The steel reinforcing shall be the same thickness as the receiving member and shall extend not less than 1 inch (25 mm) beyond all edges of the hole. The steel reinforcing shall be fastened to the web of the receiving member with No. 8 screws spaced not more than 1 inch (25 mm) center-to-center along the edges of the patch with minimum edge distance of $1\frac{1}{2}$ inch (12.7 mm).

R603.2.6.3 Hole patching. Web holes in wall studs and other structural members not conforming to the requirements in Section R603.2.6.1 shall be permitted to be patched in accordance with either of the following methods:

1. Framing members shall be replaced or designed in accordance with accepted engineering practice where web holes exceed the following size limits:
 - 1.1. The depth of the hole, measured across the web, exceeds 70 percent of the flat width of the web.
 - 1.2. The length of the hole measured along the web exceeds 10 inches (254 mm) or the depth of the web, whichever is greater.
2. Web holes not exceeding the dimensional requirements in Section R603.2.6.3, Item 1, shall be patched with a solid steel plate, stud section or track section in accordance with Figure R603.2.6.3. The steel patch shall, as a minimum, be the same thickness as the receiving member and shall extend not less than 1 inch (25 mm) beyond all edges of the hole. The steel patch shall be fastened to the web of the receiving member with No. 8 screws spaced not more than 1 inch (25 mm) center-to-center along the edges of the patch with a minimum edge distance of $1\frac{1}{2}$ inch (12.7 mm).



For SI: 1 inch = 25.4 mm.

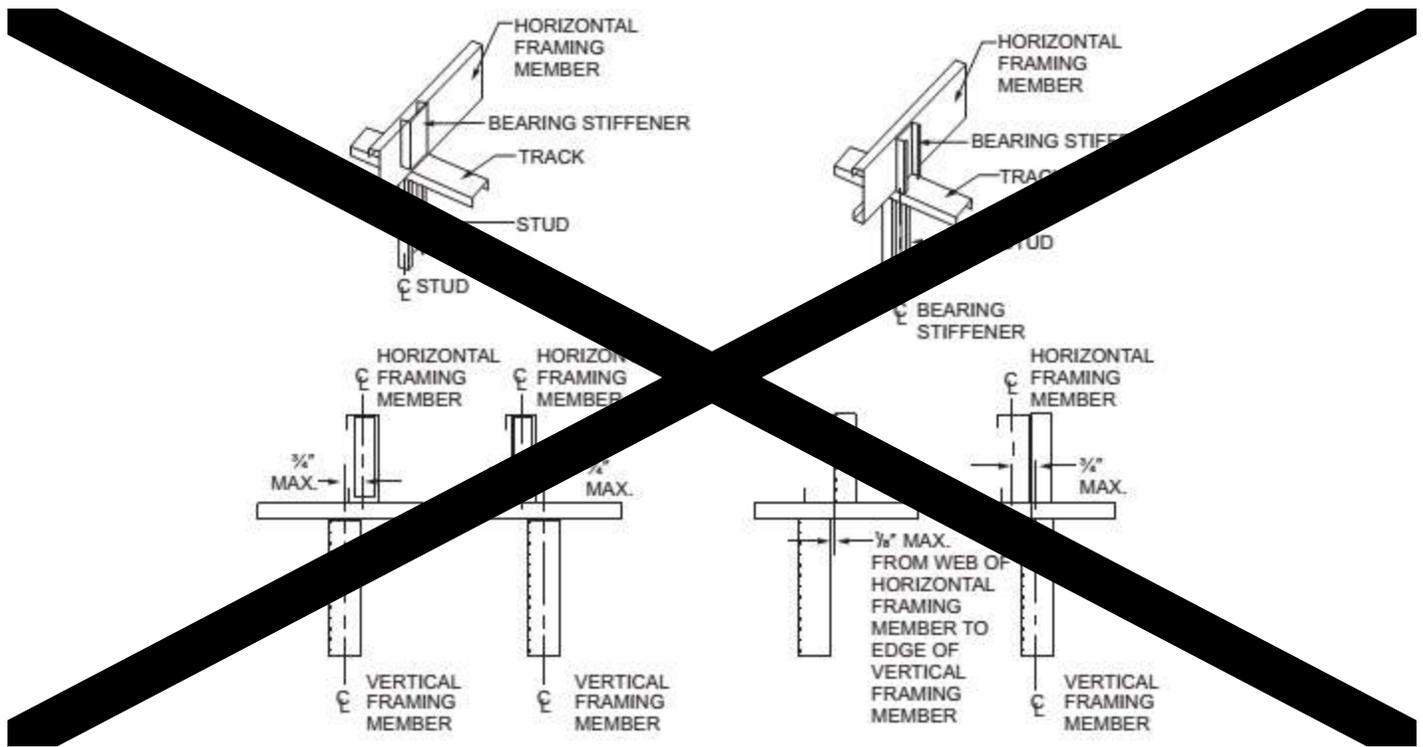
FIGURE R603.2.6.3
WALL STUD WEB HOLE PATCH

Revise as follows:

R804.1.2 In-line framing. Cold-formed steel roof framing constructed in accordance with Section R804 shall be located in line with load-bearing studs in accordance with the tolerances specified in AISI S240 Section B1.2.3. Figure R804.1.2 and the tolerances specified as follows:

1. The maximum tolerance shall be $\frac{3}{4}$ inch (19.1 mm) between the centerline of the horizontal framing member and the centerline of the vertical framing member.
2. Where the centerline of the horizontal framing member and bearing stiffener are located to one side of the centerline of the vertical framing member, the maximum tolerance shall be $\frac{1}{8}$ inch (3.2 mm) between the web of the horizontal framing member and the edge of the vertical framing member.

Delete without substitution:



For SI: 1 inch = 25.4 mm.

**FIGURE R804.1.2
IN-LINE FRAMING**

R804.2 Structural framing. Load-bearing, cold-formed steel roof framing members shall be in accordance with this section.

Revise as follows:

R804.2.1 Material. Load-bearing, cold-formed steel framing members shall be cold formed to shape from structural quality sheet steel complying with the requirements of ASTM A1003, Structural Grades 33 Type H and 50 Type H; AISI S240 Section A3.

R804.2.2 Corrosion protection. Load-bearing, cold-formed steel framing shall have a metallic protective coating complying with AISI S240 Section A4, ASTM A1003 and one of the following:

1. Not less than G-60 in accordance with ASTM A653.
2. Not less than AZ-50 in accordance with ASTM A792.

R804.2.3 Dimension, thickness and material grade. Load-bearing, cold-formed steel roof framing members shall comply with Figure R804.2.3(1) and with the dimensional and thickness requirements specified in Table R804.2.3. Additionally, C-shaped sections shall have a minimum flange width of 1.625 inches (41 mm) and a maximum flange width of 2 inches (51 mm). The minimum lip size for C-shaped sections shall be 1/2 inch (12.7 mm). Tracks shall comply with Figure R804.2.3(2) and shall have a minimum flange width of 1 1/4 inches (32 mm). Minimum Grade 33 ksi steel shall be used wherever 33 mil and 43 mil thicknesses are specified. Minimum Grade 50 ksi steel shall be used wherever 54 and 68 mil thicknesses are specified. AISI S230 Section A4.3 and material grade requirements as specified in AISI S230 Section A4.4.

Delete without substitution:

**TABLE R804.2.3
LOAD-BEARING COLD-FORMED STEEL ROOF FRAMING MEMBER SIZES AND THICKNESSES**

MEMBER DESIGNATION^a	WEB DEPTH (inches)	MINIMUM BASE STEEL THICKNESS mil (inches)
350S162-t	3.5	33 (0.0329), 43 (0.0428), 54 (0.0538)
550S162-t	5.5	33 (0.0329), 43 (0.0428), 54 (0.0538), 68 (0.0677)
800S162-t	8	33 (0.0329), 43 (0.0428), 54 (0.0538), 68 (0.0677)
1000S162-t	10	43 (0.0428), 54 (0.0538), 68 (0.0677)
1200S162-t	12	43 (0.0428), 54 (0.0538), 68 (0.0677)

For SI: 1 inch = 25.4 mm

- a. The member designation is defined by the first number representing the member depth in hundredths of an inch, the letter “s” representing a stud or joist member, the second number representing the flange width in hundredths of an inch and the letter “t” shall be a number representing the minimum base metal thickness in mils.

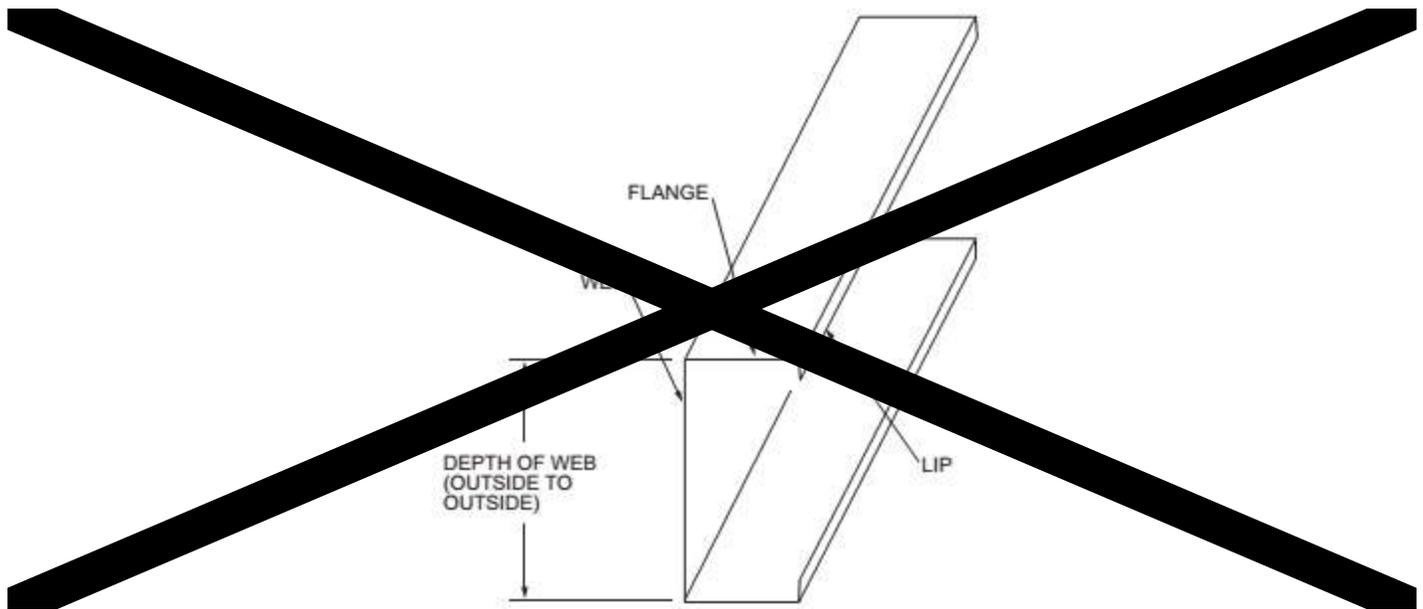
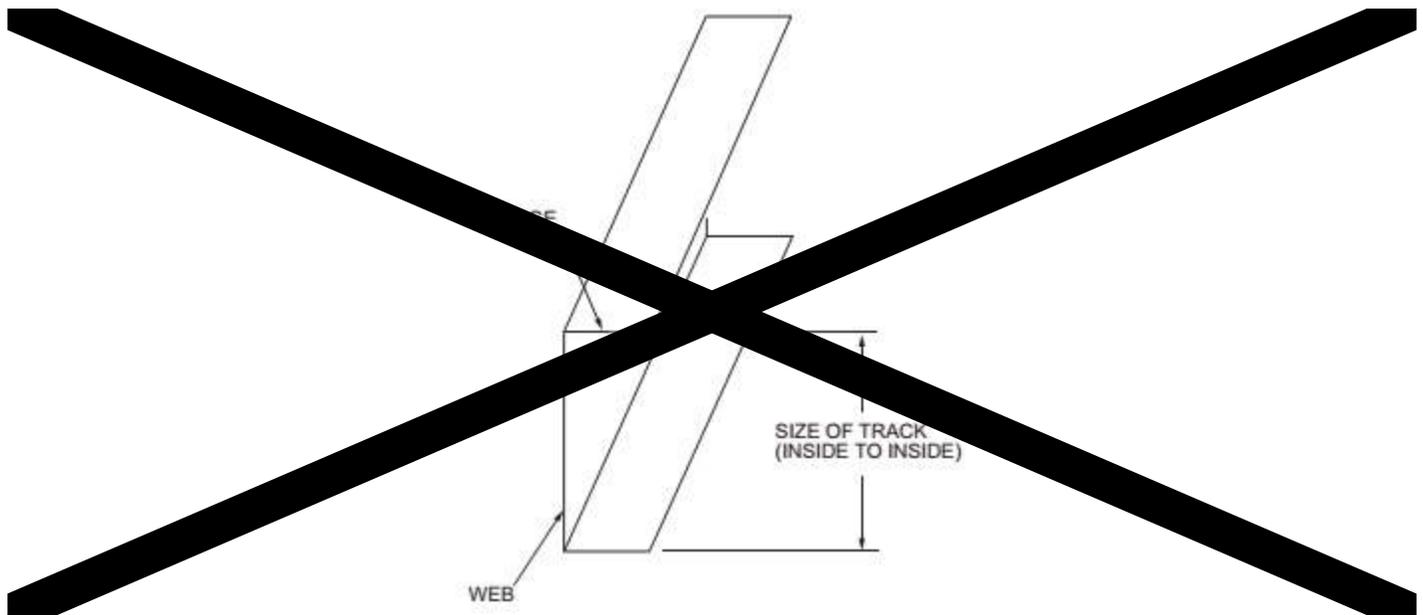


FIGURE R804.2.3(1)
G-SHAPED SECTION



**FIGURE R804.2.3(2)
TRACK SECTION**

Revise as follows:

R804.2.4 Identification. Load-bearing, cold-formed steel framing members shall meet the product identification requirements of AISI S240 Section A5.5. ~~have a legible label,~~ stencil, stamp or embossment with the following information as a minimum:

1. ~~Manufacturer's identification.~~
2. ~~Minimum base steel thickness in inches (mm).~~
3. ~~Minimum coating designation.~~
4. ~~Minimum yield strength, in kips per square inch (ksi) (MPa).~~

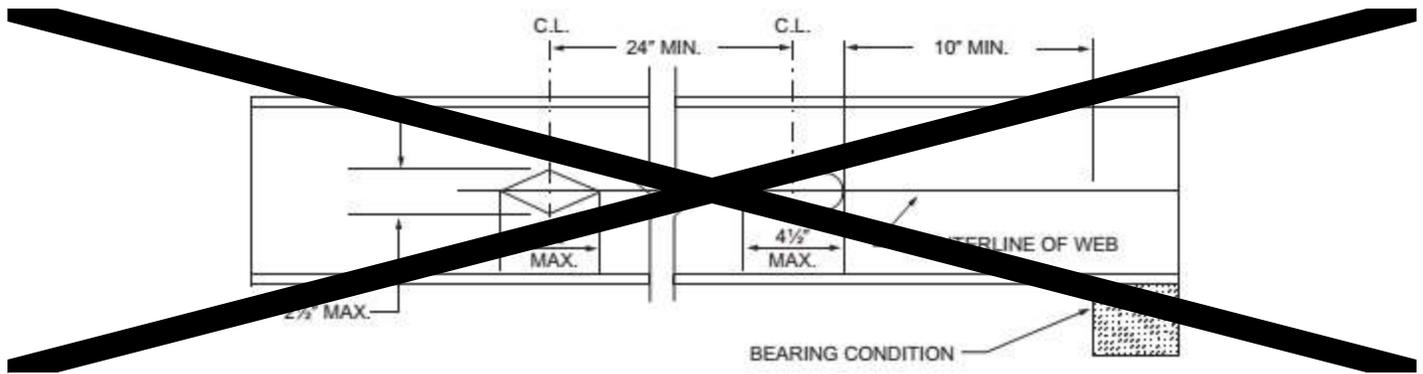
R804.2.6 Web holes, web hole reinforcing and web hole patching. ~~Web holes, web hole reinforcing and web hole patching shall be in accordance with this section.~~ in roof or ceiling joists shall comply with the conditions as prescribed in AISI S230 Section A4.5. ~~Web holes not in conformance with the conditions of AISI S230 Section A4.5 shall be reinforced in accordance with the provisions of AISI S230 Section A4.6 or patched in accordance with the provisions of AISI S230 Section A4.7.~~

Delete without substitution:

R804.2.6.1 Web holes. ~~Web holes in roof framing members shall comply with all of the following conditions:~~

1. ~~Holes shall conform to Figure R804.2.6.1.~~
2. ~~Holes shall be permitted only along the centerline of the web of the framing member.~~
3. ~~Center-to-center spacing of holes shall be not less than 24 inches (610 mm).~~
4. ~~The web hole width shall be not greater than one-half the member depth, or 2¹/₂ inches (64 mm).~~
5. ~~Holes shall have a web hole length not exceeding 4¹/₂ inches (114 mm).~~
6. ~~The minimum distance between the edge of the bearing surface and the edge of the web hole shall be not less than 10 inches (254 mm).~~

~~Framing members with web holes not conforming to Items 1 through 6 shall be reinforced in accordance with Section R804.2.6.2, patched in accordance with Section R804.2.6.3 or designed in accordance with accepted engineering practices.~~



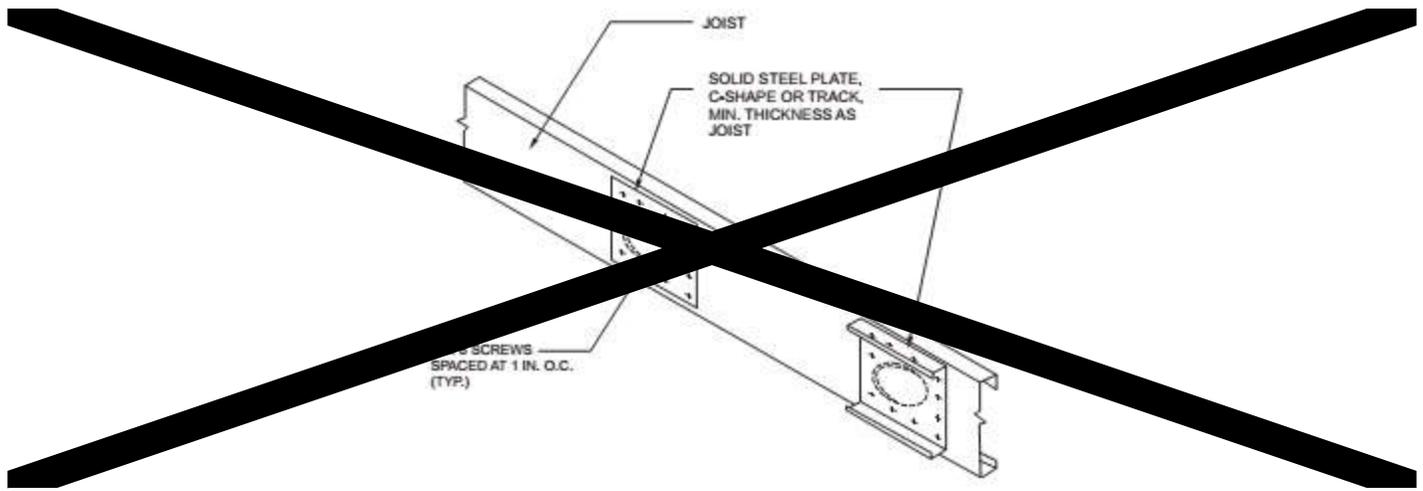
For SI: 1 inch = 25.4 mm.

**FIGURE R804.2.6.1
ROOF FRAMING MEMBER WEB HOLES**

R804.2.6.2 Web hole reinforcing. Reinforcement of web holes in ceiling joists not conforming to the requirements of Section R804.2.6.1 shall be permitted if the hole is located fully within the center 40 percent of the span and the depth and length of the hole do not exceed 65 percent of the flat width of the web. The reinforcing shall be a steel plate or G-shaped section with a hole that does not exceed the web hole size limitations of Section R804.2.6.1 for the member being reinforced. The steel reinforcing shall be the same thickness as the receiving member and shall extend not less than 1 inch (25 mm) beyond all edges of the hole. The steel reinforcing shall be fastened to the web of the receiving member with No. 8 screws spaced not greater than 1 inch (25 mm) center to center along the edges of the patch with minimum edge distance of $\frac{1}{2}$ inch (12.7 mm).

R804.2.6.3 Hole patching. Patching of web holes in roof framing members not conforming to the requirements in Section R804.2.6.1 shall be permitted in accordance with either of the following methods:

1. Framing members shall be replaced or designed in accordance with accepted engineering practices where web holes exceed either of the following size limits:
 - 1.1. The depth of the hole, measured across the web, exceeds 70 percent of the flat width of the web.
 - 1.2. The length of the hole measured along the web, exceeds 10 inches (254 mm) or the depth of the web, whichever is greater.
2. Web holes not exceeding the dimensional requirements in Section R804.2.6.3, Item 1, shall be patched with a solid steel plate, stud section or track section in accordance with Figure R804.2.6.3. The steel patch shall, as a minimum, be the same thickness as the receiving member and shall extend not less than 1 inch (25 mm) beyond all edges of the hole. The steel patch shall be fastened to the web of the receiving member with No. 8 screws spaced not greater than 1 inch (25 mm) center to center along the edges of the patch with minimum edge distance of $\frac{1}{2}$ inch (12.7 mm).



For SI: 1 inch = 25.4 mm.

FIGURE R804.2.6.3
ROOF FRAMING MEMBER WEB HOLE PATCH

Revise as follows:

R804.3.6 Roof trusses. Cold-formed steel trusses shall be designed and installed in accordance with AISI S240. ~~In the absence of specific bracing requirements, trusses shall be braced in accordance with accepted industry practices, such as the SBCA *Cold-Formed Steel Building Component Safety Information (CFSBCSI) Guide to Good Practice for Handling, Installing & Bracing of Cold-Formed Steel Trusses*, S230 Section F6.~~ Trusses shall be connected to the top track of the load-bearing wall in accordance with Table R804.3, either with ~~two~~ the required number of No. 10 screws applied through the flange of the truss or by using a 54-mil (1.37 mm) clip angle with ~~two~~ the required number of No. 10 screws in each leg.

Reason: This proposal is the continuation of efforts by the American Iron and Steel Institute (AISI) over the past few ICC code cycles to streamline and consolidate cold-formed steel framing provisions within the International Residential Code (IRC). The intent of this proposal is to direct the user to AISI S230 – *Standard for Cold-Formed Steel Framing - Prescriptive Method for One- and Two-Family Dwellings (AISI S230-18)* and AISI S240 - *North American Standard for Cold-Formed Steel Structural Framing (AISI S240-15)* for cold-formed steel framing provisions related to specific material and member requirements.

The provisions in this proposal identified to be replaced with reference to AISI standards are repeated verbatim in all cold-formed steel framing sections in the IRC (Sections 505, 603, and 804). In addition, all of the provisions proposed to be replaced are identical to those being referenced in AISI standards. Therefore, there are no technical changes being proposed through this code change proposal. To aid the committee, an AISI-IRC cross reference document has been attached to this proposal. The cross reference document displays all sections from AISI standards being referenced to the corresponding IRC sections (in the order as they appear in the code change proposal).

There is a concurrent proposal updating the reference in Chapter 44 to AISI S230-18.

AISI standards are free of charge and available for download at www.aisistandards.org.

Bibliography: AISI (2018), *Standard for Cold-Formed Steel Framing - Prescriptive Method for One- and Two-Family Dwellings*, ANSI/AISI S230-18, American Iron and Steel Institute, Washington D.C.
AISI (2015), *North American Standard for Cold-Formed Steel Structural Framing*, ANSI/AISI S240-15, American Iron and Steel Institute, Washington D.C.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This code change does not propose any technical changes to the material requirements or framing practices for cold-formed steel framing. The intention is simply to direct the user to the appropriate AISI standard for the necessary information. All AISI standards are available free of charge at www.aisistandards.org.

Proposal # 3968

RB181-19

RB182-19

IRC: R506.1, CHAPTER 44 PTI (New)

Proponent: Amy Dowell, representing Post-Tensioning Institute (amy.dowell@post-tensioning.org); Stephen Szoke, representing American Concrete Institute (steve.szoke@concrete.org)

2018 International Residential Code

Revise as follows:

R506.1 General. Concrete slab-on-ground floors, other than post-tensioned slab-on-ground floors, shall be designed and constructed in accordance with the provisions of this section or ACI 332. ~~Floors~~ Such floors shall be a minimum 3¹/₂ inches (89 mm) thick (for expansive soils, see Section R403.1.8). Post-tensioned concrete slabs-on-ground floors placed on expansive or stable soils shall be designed and constructed in accordance with PTI DC—10.5. The specified compressive strength of concrete shall be as set forth in Section R402.2.

Add new text as follows:

PTI

Post-Tensioning Institute
38800 Country Club Drive
Farmington Hills MI 48331
US

Add new standard(s) as follows:

PTI

Post-Tensioning Institute
38800 Country Club Drive
Farmington Hills MI 48331
US

DC—10.5-12: Standard Requirements for Design and Analysis of Shallow Concrete Foundations on Expansive and Stable Soils

Reason: There are currently no provisions for designing post-tensioned slabs on expansive or stable soils in IRC. This proposal includes a new reference to PTI standard PTI DC10.5-19, Standard Requirements for Design and Analysis of Shallow Concrete Foundations on Expansive and Stable Soils. Post-tensioned slabs are commonly used on stable soils for crack control as well as reduced slab thickness and nonprestressed steel use. This reduction in material use typically offsets the cost of the post-tensioning materials and labor.

Additional documentation can be viewed at http://ww2.post-tensioning.org/PDF_FILES/190102-DC10.5-Expansive and Stable Soils-Public Review.pdf.

Bibliography: .

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Post-tensioned slabs are commonly used on expansive and stable soils for crack control as well as reduced slab thickness and nonprestressed steel use. This reduction in material use typically offsets the cost of the post-tensioning materials and labor.

Staff Analysis: The referenced standard, PTI-DC-10.5-12, is currently referenced in other 2018 I-codes.

RB183-19

IRC®: R506.2.3, ASTM Chapter 44 (New)

Proponent: Terry Kozlowski, representing Southern Nevada Chapter; Valarie Evans, representing Southern Nevada Chapter; Amanda Moss, representing SN-ICC Member; Cassidy Wilson, representing SN-ICC Member; Nenad Mirkovic, representing City of Las Vegas

2018 International Residential Code

Revise as follows:

R506.2.3 Vapor retarder. A ~~6-mil-10-mil (0.006-0.010 inch; 152- μ m 0.254 mm)~~ polyethylene or *approved* vapor retarder conforming to ASTM E 1745 Class A requirements with joints lapped not less than 6 inches (152 mm) shall be placed between the concrete floor slab and the base course or the prepared subgrade where a base course does not exist.

Exception: The vapor retarder is not required for the following:

1. Garages, utility buildings and other unheated *accessory structures*.
2. For unheated storage rooms having an area of less than 70 square feet (6.5 m²) and carports.
3. Driveways, walks, patios and other flatwork not likely to be enclosed and heated at a later date.
4. Where *approved* by the *building official*, based on local site conditions.

Add new text as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428

E1745-17: Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs

Reason: By coordinating the requirements for the vapor retarder with the American Concrete Institute (ACI) recommendations, this proposal will promote consistency across codes and standards for various moisture conditions.

Bibliography: ACI 302.2R Section 9.3:

“...ACI 302.1R recommends a minimum 10 mil (0.25 mm) vapor retarder thickness when the retarder is protected with a granular fill. When the vapor retarder is not protected by a fill, some specifiers require a 15 mil (0.38 mm) thickness or greater...”

Cost Impact: The code change proposal will increase the cost of construction. This proposal will increase the cost of construction for an average 2,200 square foot single-family dwelling by an estimated \$28.60, based on cost analysis in current market conditions.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM E1745-17, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

RB184-19

IRC: R507.1, TABLE R507.3.1, R507.4, TABLE R507.4, R507.5, TABLE R507.5, TABLE R507.5(2) (New), TABLE R507.5(3) (New), TABLE R507.5(4) (New), R507.6, TABLE R507.6, TABLE R507.9.1.3(1)

Proponent: Deck Code Coalition, Charles Bajnai (chair), North American Deck and Railing Assoc (NADRA), Retired from Chesterfield County, VA, representing Deck Code Coalition (csbajnai@gmail.com)

2018 International Residential Code

Revise as follows:

R507.1 Decks. Wood-framed decks shall be in accordance with this section. Decks shall be designed for the live load required in Section R301.5 or the ground snow load indicated in Table R301.2(1), whichever is greater. For decks using materials and conditions not prescribed in this section, refer to Section R301.

TABLE R507.3.1
MINIMUM FOOTING SIZE FOR DECKS

LIVE OR GROUND SNOW LOAD ^b (psf)	TRIBUTARY AREA ^e (sq. ft.)	SOIL BEARING CAPACITY ^{a, c, d}											
		1500 psf			2000 psf			2600 ^e			≥ 3000 psf		
		Side of a square footing (inches)	Diameter of a round footing (inches)	Thickness ^f (inches)	Side of a square footing (inches)	Diameter of a round footing (inches)	Thickness ^f (inches)	Side of a square footing (inches)	Diameter of a round footing (inches)	Thickness ^f (inches)	Side of a square footing (inches)	Diameter of a round footing (inches)	Thickness ^f (inches)
40	20	42 10	44 10	6	42 9	44 9	6	42	44	6	42 7	44 8	6
	40	14	46 14	6 7	12	44 13	6	42	44	6	42 10	44 10	6
	60	17	49 18	6 9	15	47 16	6 8	43	46	6	42	44 13	6
	80	20	22	7	17	19	6	45	47	6	14	16	6
	100	22	25	8	19	21	6	47	49	6	15	17	6
	120	24	27	9	21	23	7	49	51	6	17	19	6
	140	26	29	10	22	25	8	50	52	7	18	21	6
160	28	31	11	24	27	9	51	53	8	20	22	7	
50	20	42 11	44 12	6	42 10	44 10	6	42	44	6	42 8	44 8	6
	40	46 15	47 15	6	49 8	46 14	6	42	44	6	42 11	44 12	6
	60	19	21	6	16	18	6	44	46	6	13	15	6
	80	21	24	8	19	21	6	47	49	6	15	17	6
	100	24	27	9	21	23	7	49	51	6	17	19	6
	120	26	30	10	23	25	8	50	52	7	19	21	6
	140	28	32	11	25	28	9	52	54	8	20	23	7
160	30	34	12	26	30	10	54	56	9	21	24	8	
60	20	12	44 13	6	42 11	44 11	6	42	44	6	42 9	44 9	6
	40	46 17	49 18	6	44 15	46 15	6 8	43	44	6	42	44 13	6
	60	20	25	7	17	20	6	46	48	6	14	16	6
	80	23	26	9	20	23	7	48	50	6	16	19	6
	100	26	29	10	22	25	8	50	53	7	18	21	6
	120	28	32	11	25	28	9	52	55	8	20	23	7
	140	31	35	12	27	30	10	54	57	9	22	24	8
160	33	37	13	28	32	11	56	59	10	23	26	9	

**TABLE R507.4
DECK POST HEIGHT**

LOADS ^b (psf)	POST SPECIES ^c	POST SIZE ^d	TRIBUTARY AREA ^{g,h} (sqft)								
			20	40	60	80	100	120	140	160	
			MAXIMUM DECK POST HEIGHT ^a (feet-inches)								
40 Live Load	Southern Pine	4 x 4	14-0	13-8	11-0	9-5	8-4	7-5	6-9	6-2	
		4 x 6	14-0	14-0	13-11	12-0	10-8	9-8	8-10	8-2	
		6 x 6	14-0	14-0	11-0	14-0	14-0	14-0	14-0	14-0	
		8 x 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0	
	Douglas Fir ^e ₁	4 x 4	14-0	13-6	10-10	9-3	8-0	7-0	6-2	5-3	
		4 x 6	14-0	14-0	13-10	11-10	10-6	9-5	8-7	7-10	
	Hem-fir ^e ₁	6 x 6	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0	
		8 x 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0	
	SPF ^e	Redwood ^f ₁	4 x 4	14-0	12-1	9-8	8-22	7-1	6-2	5-3	4-2
			4 x 6	14-0	14-0	12-4	10-7	9-4	8-4	7-7	6-11
	Western Cedars ^f ₁	6 x 6	14-0	14-0	14-0	14-0	14-0	14-0	14-0	12-10	
		Ponderosa Pine ^f ₁									
	Red Pine ^f	8 x 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0	
	50 Ground Snow Load	Southern Pine	4 x 4	14-0	12-2	9-10	8-5	7-5	9-7	5-11	5-4
			4 x 6	14-0	14-0	12-6	10-9	9-6	8-7	7-10	7-3
			6 x 6	14-0	14-0	14-0	14-0	14-0	14-0	14-0	13-4
8 x 8			14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0	
Douglas Fir ^e ₁		4 x 4	14-0	12-1	9-8	8-2	7-1	6-2	5-3	4-2	
		4 x 6	14-0	14-0	12-4	10-7	9-4	8-4	7-7	6-11	
		6 x 6	14-0	14-0	14-0	14-0	14-0	14-0	14-0	12-10	
Hem-fir ^e ₁		8 x 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0	
SPF ^e											

	Redwood <u>f</u> ₁	4 x 4	14-0	11-8	9-0	6-10	3-7	NP	NP	NP	
		4 x 6	14-0	14-0	12-0	10-0	8-6	7-0	5-3	NP	
	Western Cedars <u>f</u> ₁	6 x 6	14-0	14-0	14-0	14-0	14-0	14-0	10-8	2-4	
	Ponderosa Pine <u>f</u> ₁										
	Red Pine <u>f</u>	8 x 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0	
60	Southern Pine	4 x 4	14-0	11-1	8-11	7-7	6-7	5-10	5-2	4-6	
		4 x 6	14-0	14-0	11-4	9-9	8-7	7-9	7-1	6-6	
		6 x 6	14-0	14-0	14-0	14-0	14-0	14-0	12-9	11-2	
		8 x 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0	
	Douglas Fir <u>e</u> ₁	4 x 4	14-0	10-11	8-8	7-3	6-2	5-0	3-7	NP	
		4 x 6	14-0	13-11	11-2	9-7	8-4	7-5	6-8	5-11	
	Hem-fir <u>e</u> ₁	6 x 6	14-0	14-0	14-0	14-0	14-0	14-0	12-2	10-2	
	Ground	SPF <u>e</u>									
	Snow		8 x 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0
	Load	Redwood <u>f</u> ₁	4 x 4	14-0	10-6	7-9	4-7	NP	NP	NP	NP
			4 x 6	14-0	13-7	10-9	8-9	7-0	4-9	NP	NP
		Western Cedars <u>f</u> ₁	6 x 6	14-0	14-0	14-0	14-0	14-0	9-9	NP	NP
		Ponderosa Pine <u>f</u> ₁									
Red Pine <u>f</u>		8 x 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0	
70	Southern Pine	4 x 4	14-0	10-2	8-2	6-11	5-11	5-2	4-4	3-4	
		4 x 6	14-0	12-11	10-5	8-11	7-10	7-1	6-5	5-10	
		6 x 6	14-0	14-0	14-0	14-0	14-0	12-9	10-11	8-7	
		8 x 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0	
	Douglas Fir <u>e</u> ₁	4 x 4	14-0	10-1	7-11	6-6	5-3	3-7	NP	NP	
		4 x 6	14-0	12-10	10-3	8-9	7-7	6-8	5-10	4-11	
		6 x 6	14-0	14-0	14-0	14-0	14-0	12-2	9-9	5-9	
	Hem-fir <u>e</u> ₁										
		8 x 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0	
	Ground	SPF <u>e</u>									
	Snow										
	Load										

Redwood ^f ₁	4 x 4	14-0	9-5	6-5	NP	NP	NP	NP	NP
	4 x 6	14-0	12-6	9-8	7-7	5-3	NP	NP	NP
Western Cedars ^f ₁	6 x 6	14-0	14-0	14-0	14-0	10-8	NP	NP	NP
Ponderosa Pine ^f ₁									
Red Pine ^f	8 x 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa., NP = Not Permitted

- a. Measured from the underside of the beam to top of footing or pier.
- b. 10 psf dead load. Snow load not assumed to be concurrent with live load.
- c. No. 2 grade, wet service factor included.
- d. Notched deck posts shall be sized to accommodate beam size per in accordance with Section R507.5.2
- e. Includes incising factor.
- f. Incising factor not included.
- g. Area, in square feet, of deck surface supported by post and footings.
- h. Interpolation permitted. Extrapolation not permitted.

Revise as follows:

R507.5 Deck Beams. Maximum allowable spans for wood deck beams, as shown in Figure R507.5, shall be in accordance with ~~Table R507.5~~ Tables R507.5(1) through R507(4). Beam plies shall be fastened with two rows of 10d (3-inch x 0.128-inch) nails minimum at 16 inches (406 mm) on center along each edge. Beams shall be permitted to cantilever at each end up to one-fourth of the allowable beam span. Deck beams of other materials shall be permitted where designed in accordance with accepted engineering practices.

TABLE R507.5(1)
MAXIMUM DECK BEAM SPAN LENGTHS^{a, b, g} (feet - inches) - 40 PSF LIVE LOAD^c

BEAM SPECIES^{e, d}	BEAM SIZE^{d, e}	DECK JOIST SPAN^{a, i}						
		LESS THAN OR EQUAL TO:						
		(feet)						
		6	8	10	12	14	16	18
		<u>MAXIMUM BEAM SPAN^{a, b, f}</u>						
		(feet - inches)						

Southern p_Pine	1 - 2 x 6	4-11 <u>4-7</u>	4-0	3-7	3-3	3-0	2-10	2-8 <u>2-7</u>
	1 - 2 x 8	5-11 <u>5-10</u>	5-1	4-7 <u>4-6</u>	4-2 4-1	2-10 3-10	3-7	3-5 <u>3-4</u>
	1 - 2 x 10	7-0 <u>6-11</u>	6-0	5-5 <u>5-4</u>	4-11	4-7 <u>4-6</u>	4-3	4-0
	1 - 2 x 12	8-3 <u>8-2</u>	7-1	6-4	5-10 <u>5-9</u>	5-5 <u>5-4</u>	5-0	4-9 <u>4-8</u>
	2 - 2 x 6	6-11 <u>6-10</u>	5-11	5-4 <u>5-3</u>	4-10	4-6	4-3 <u>4-2</u>	4-0 <u>3-11</u>
	2 - 2 x 8	8-9 <u>8-8</u>	7-7 <u>7-6</u>	6-9	6-2	5-9 <u>5-8</u>	5-4	5-0
	2 - 2 x 10	10-4	9-0 <u>8-11</u>	8-0	7-4 <u>7-3</u>	6-9	6-4	6-0 <u>5-11</u>
	2 - 2 x 12	12-2	10-7 <u>10-6</u>	9-5	8-7	8-0 <u>7-11</u>	7-6 <u>7-5</u>	7-0
	3 - 2 x 6	8-2 <u>8-6</u>	7-5	6-8	6-1	5-8 <u>5-7</u>	5-3	5-0 <u>4-11</u>
	3 - 2 x 8	10-10 <u>10-11</u>	9-6 <u>9-5</u>	8-6 <u>8-5</u>	7-9 <u>7-8</u>	7-2 <u>7-1</u>	6-8	6-4 <u>6-3</u>
	3 - 2 x 10	13-0 <u>12-11</u>	11-3 <u>11-2</u>	10-0	9-2 <u>9-1</u>	8-6 <u>8-5</u>	7-11	7-6 <u>7-5</u>
	3 - 2 x 12	15-3	13-3 <u>13-2</u>	11-10 <u>11-9</u>	10-9	10-0 <u>9-11</u>	9-4	8-10 <u>8-9</u>

Douglas fir-larch ^e _g , Hem-fir ^e _g , Spruce-pine-fir ^e _g , redwood, western cedars, ponderosa pine ^f , red pine ^f	3 x 6 or 2	5-5	4-8	4-2	3-10	3-6	3-1	2-9
	1-2 x 6	4-1	3-6	3-0	2-6	2-1	1-10	1-7
	3 x 8 or 2	6-10	5-11	5-4	4-10	4-6	4-1	3-8
	1-2 x 8	5-6	4-9	4-0	3-3	2-9	2-5	2-1
	3 x 10 or 2	8-4	7-3	6-6	5-11	5-6	5-1	4-8
	1-2 x 10	6-8	5-10	5-1	4-2	3-6	3-1	2-8
	3 x 12 or 2	9-8	8-5	7-6	6-10	6-4	5-11	5-7
	1-2 x 12	7-9	6-9	6-0	5-1	4-4	3-9	3-3
	4 x 6	6-5	5-6	4-11	4-6	4-2	3-11	3-8
	2-2 x 6	6-1	5-3	4-9	4-4	4-0	3-8	3-3
	4 x 8	8-5	7-3	6-6	5-11	5-6	5-2	4-10
	2-2 x 8	8-2	7-1	6-4	5-9	5-4	4-10	4-3
	4 x 10	9-11	8-7	7-8	7-0	6-6	6-1	5-8
	2-2 x 10	10-0		7-9				5-5
	4 x 12	11-5	9-11	8-10	8-1	7-6	7-0	6-7
	2-2 x 12	11-7	10-0	8-11	8-2	7-7	7-1	
	3 - 2 x 6	7-4	6-8	6-0	5-6	5-1	4-9	4-6
		7-8	6-7	5-11	5-5	5-0	4-8	4-5
	3 - 2 x 8	9-8	8-6	7-7	6-11	6-5	6-0	5-8
		10-3	8-10	7-11	7-3	6-8	6-3	5-11
3 - 2 x 10	12-0	10-5	9-4	8-6	7-10	7-4	6-11	
	12-6	10-10	9-8	8-10	8-2	7-8	7-2	
3 - 2 x 12	13-11	12-1	10-9	9-10	9-1	8-6	8-1	
	14-6	12-7	11-3	10-3	9-6	8-11	8-5	
Redwood ^h ₁	1 - 2 x 6	4-2	3-7	3-1	2-7	2-2	1-10	1-8
	1 - 2 x 8	5-4	4-7	4-1	3-4	2-10	2-6	2-2
Western Cedars ^h ₁	1 - 2 x 10	6-6	5-7	5-0	4-3	3-8	3-2	2-9
	1 - 2 x 12	7-6	6-6	5-10	5-3	4-5	3-10	3-5
Ponderosa Pine ^h ₁	2 - 2 x 6	6-2	5-4	4-10	4-5	4-1	3-9	3-4
	2 - 2 x 8	7-10	6-10	6-1	5-7	5-2	4-10	4-4
Red Pine ^h	2 - 2 x 10	9-7	8-4	7-5	6-9	6-3	5-10	5-6
	2 - 2 x 12	11-1	9-8	8-7	7-10	7-3	6-10	6-5

	<u>3 - 2 x 6</u>	<u>7-8</u>	<u>6-9</u>	<u>6-0</u>	<u>5-6</u>	<u>5-1</u>	<u>4-9</u>	<u>4-6</u>
	<u>3 - 2 x 8</u>	<u>9-10</u>	<u>8-6</u>	<u>7-7</u>	<u>6-11</u>	<u>6-5</u>	<u>6-0</u>	<u>5-8</u>
	<u>3 - 2 x 10</u>	<u>12-0</u>	<u>10-5</u>	<u>9-4</u>	<u>8-6</u>	<u>7-10</u>	<u>7-4</u>	<u>6-11</u>
	<u>3 - 2 x 12</u>	<u>13-11</u>	<u>12-1</u>	<u>10-9</u>	<u>9-10</u>	<u>9-1</u>	<u>8-6</u>	<u>8-1</u>

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound = 0.454 kg.

a. Interpolation permitted. Extrapolation not permitted.

b. Beams supporting a single span of joists with or without cantilever.

c. ~~a. Ground snow load, live load = 40 psf, dead~~ Dead load = 10 psf, L/Δ = 360 at main span, L/Δ = 180 at cantilever with a 220-pound point load applied at the end. Snow load not assumed to be concurrent with live load.

~~b. Beams supporting deck joists from one side only.~~

d. ~~e.~~ No. 2 grade, wet service factor included.

~~e. d.~~ Beam depth shall be equal to or greater than or equal to depth of joists with the depth intersecting joist for a flush beam condition connection.

~~f. g.~~ Beam cantilevers are limited to the adjacent beam's span divided by 4.

~~g. e.~~ Includes incising factor.

~~h. f.~~ Northern species: Incising factor not included.

~~i.~~ Deck joist span as shown in Figure R507.5

Add new text as follows:

TABLE R507.5(2)
MAXIMUM DECK BEAM SPAN - 50 PSF GROUND SNOW LOAD ^e

BEAM	BEAM	DECK JOIST SPAN (feet) ^{a,i}						
		<u>6</u>	<u>8</u>	<u>10</u>	<u>12</u>	<u>14</u>	<u>16</u>	<u>18</u>
SPECIES ^d	SIZE ^e	MAXIMUM BEAM SPAN						
		(feet-inches) ^{a,b,f}						
Southern Pine	<u>1-2x6</u>	<u>4-2</u>	<u>3-8</u>	<u>3-3</u>	<u>2-11</u>	<u>2-9</u>	<u>2-5</u>	<u>2-2</u>
	<u>1-2x8</u>	<u>5-4</u>	<u>4-7</u>	<u>4-1</u>	<u>3-9</u>	<u>3-6</u>	<u>3-3</u>	<u>2-10</u>
	<u>1-2x10</u>	<u>6-4</u>	<u>5-6</u>	<u>4-11</u>	<u>4-6</u>	<u>4-2</u>	<u>3-10</u>	<u>3-8</u>
	<u>1-2x12</u>	<u>7-6</u>	<u>6-5</u>	<u>5-9</u>	<u>5-3</u>	<u>4-10</u>	<u>4-7</u>	<u>4-3</u>
	<u>2-2x6</u>	<u>6-3</u>	<u>5-5</u>	<u>4-10</u>	<u>4-5</u>	<u>4-1</u>	<u>3-10</u>	<u>3-7</u>
	<u>2-2x8</u>	<u>7-11</u>	<u>6-10</u>	<u>6-2</u>	<u>5-7</u>	<u>5-2</u>	<u>4-10</u>	<u>4-7</u>

	2-2x10	9-5	8-2	7-3	6-8	6-2	5-9	5-5
	2-2x12	11-1	9-7	8-7	7-10	7-3	6-9	6-5
	3-2x6	7-10	6-9	6-1	5-6	5-1	4-9	4-6
	3-2x8	9-11	8-7	7-8	7-0	6-6	6-16	5-9
	3-2x10	11-9	10-2	9-1	8-4	7-8	7-2	6-9
	3-2x12	13-11	12-0	10-9	9-10	9-1	8-6	8-0
Douglas fir-larch g_1	1-2x6	3-9	3-3	2-6	2-1	1-9	1-6	1-4
	1-2x8	5-0	4-3	3-4	2-9	2-3	2-0	1-9
	1-2x10	6-1	5-4	4-3	3-6	2-11	2-6	2-3
	1-2x12	7-1	6-2	5-2	4-3	3-7	3-1	2-9
Hem-fir g_1	2-2x6	5-7	4-10	4-4	3-11	3-6	3-0	2-8
	2-2x8	7-5	6-5	5-9	5-3	4-7	4-0	3-6
Spruce-pine-fir g	2-2x10	9-1	7-10	7-0	6-5	5-11	5-1	4-6
	2-2x12	10-7	9-2	8-2	7-5	6-11	6-3	5-6
	3-2x6	7-0	6-0	5-5	4-11	4-7	4-3	4-0
	3-2x8	9-4	8-1	7-3	6-7	6-1	5-8	5-4
	3-2x10	11-5	9-10	8-10	8-1	7-5	7-0	6-7
	3-2x12	13-3	11-6	10-3	9-5	8-8	8-1	7-8
Redwood h_1	1-2x6	3-10	3-4	2-7	2-2	1-10	1-7	1-5
	1-2x8	4-10	4-2	3-5	2-10	2-4	2-1	1-10
	1-2x10	5-11	5-1	4-4	3-7	3-0	2-8	2-4
	1-2x12	6-10	5-11	5-4	4-4	3-8	3-2	2-10
Western Cedars h_1	2-2x6	5-8	4-11	4-5	4-0	3-7	3-1	2-9
	2-2x8	7-2	6-3	5-7	5-1	4-8	4-1	3-8
Ponderosa Pine h_1	2-2x10	8-9	7-7	6-9	6-2	5-9	5-3	4-8
	2-2x12	10-2	8-10	7-10	7-2	6-8	6-3	5-8
Red Pine h	3-2x6	7-1	6-2	5-6	5-0	4-8	4-4	4-1
	3-2x8	9-0	7-9	6-11	6-4	5-11	5-6	5-2
	3-2x10	11-0	9-6	8-6	7-9	7-2	6-9	6-4
	3-2x12	12-9	11-0	9-10	9-0	8-4	7-9	7-4

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound = 0.454 kg.

a. Interpolation allowed. Extrapolation is not allowed.

b. Beams supporting a single span of joists with or without cantilever.

c. Dead load = 10 psf, $L/\Delta = 360$ at main span, $L/\Delta = 180$ at cantilever. Snow load not assumed to be concurrent with live load.

d. No. 2 grade, wet service factor included.

e. Beam depth shall be equal to or greater than the depth of intersecting joist for a flush beam connection.

f. Beam cantilevers are limited to the adjacent beam's span divided by 4.

g. Includes incising factor

h. Incising factor not included.

i. Deck joist span as shown in Figure R507.5

TABLE R507.5(3)
MAXIMUM DECK BEAM SPAN - 60 PSF GROUND SNOW LOAD ^c

BEAM SPECIES ^d	BEAM SIZE ^e	DECK JOIST SPAN ^{a, h} (feet)						
		6	8	10	12	14	16	18
		MAXIMUM BEAM SPAN ^{a, b, f}						
Southern pine	1-2x6	3-11	3-4	3-0	2-9	2-5	2-1	1-10
	1-2x8	4-11	4-3	3-10	3-6	3-2	2-9	2-5
	1-2x10	5-10	5-1	4-6	4-2	3-10	3-6	3-1
	1-2x10	6-11	6-0	5-4	4-10	4-6	4-3	3-10
	2-2x6	5-9	5-0	4-6	4-1	3-9	3-6	3-4
	2-2x8	7-4	6-4	5-8	5-2	4-9	4-6	4-3
	2-2x10	8-8	7-6	6-9	6-2	5-8	5-4	5-0
	2-2x12	10-3	8-11	7-11	7-3	6-8	6-3	5-11
	3-2x6	7-3	6-3	5-7	5-1	4-9	4-5	4-2
	3-2x8	9-2	7-11	7-1	6-6	6-0	5-7	5-3
	3-2x10	10-11	9-5	8-5	7-8	7-2	6-8	6-3
	3-2x12	12-10	11-2	9-11	9-1	8-5	7-10	7-5
Douglas fir-larch ^{g, i}	1-2x6	3-5	2-9	2-2	1-9	1-6	1-3	1-1
	1-2x8	4-8	3-8	2-10	2-4	1-11	1-8	1-6
	1-2x10	5-8	4-8	3-8	3-0	2-6	2-2	1-11
	1-2x12	6-7	5-8	4-5	3-7	3-1	2-7	2-3
	2-2x6	5-2	4-5	4-0	3-6	3-0	1-11	1-8
	2-2x8	6-11	5-11	5-4	4-8	3-11	3-5	3-0
Hem-fir ^{g, i}	2-2x10	8-5	7-3	6-6	5-11	5-1	4-5	3-10
	2-2x12	9-9	8-5	7-7	6-11	6-2	5-4	4-8
Spruce-pine-fir ^{g, i}	3-2x6	6-5	5-7	5-0	4-7	4-3	3-11	3-5
	3-2x8	8-8	7-6	6-8	6-1	5-8	5-2	4-7
	3-2x10	10-7	9-2	8-2	7-5	6-11	6-5	5-10
	3-2x12	12-3	10-8	9-6	8-8	8-0	7-6	7-1

Redwood ^h ₁	1-2x6	3-6	2-10	2-3	1-10	1-7	1-4	1-2
	1-2x8	4-6	3-9	2-11	2-5	2-0	1-9	1-7
	1-2x10	5-6	4-9	3-9	3-1	2-7	2-3	2-0
	1-2x12	6-4	5-6	4-7	3-9	3-2	2-9	2-5
Western Cedars ^h ₁	2-2x6	5-3	4-6	4-1	3-8	3-1	2-8	2-4
	2-2x8	6-8	5-9	5-2	4-8	4-1	3-6	3-1
Ponderosa Pine ^h ₁	2-2x10	8-1	7-0	6-3	5-9	5-2	4-6	4-0
	2-2x12	9-5	8-2	7-3	6-8	6-2	5-6	4-10
Red Pine ^h	3-2x6	6-7	5-8	5-1	4-8	4-4	4-0	3-7
	3-2x8	8-4	7-2	6-5	5-11	5-5	5-1	4-8
	3-2x10	10-2	8-10	7-10	7-2	6-8	6-3	5-10
	3-2x12	11-9	10-2	9-1	8-4	7-8	7-3	6-10

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound = 0.454 kg.

a. Interpolation allowed. Extrapolation is not allowed.

b. Beams supporting a single span of joists with or without cantilever.

c. Dead load = 10 psf, $L/\Delta = 360$ at main span, $L/\Delta = 180$ at cantilever. Snow load not assumed to be concurrent with live load.

d. No. 2 grade, wet service factor included.

e. Beam depth shall be equal to or greater than the depth of intersecting joist for a flush beam connection.

f. Beam cantilevers are limited to the adjacent beam's span divided by 4.

g. Includes incising factor

h. Incising factor not included.

i. Deck joist span as shown in Figure R507.5

TABLE R507.5(4)
MAXIMUM DECK BEAM SPAN - 70 PSF GROUND SNOW LOAD ^c

BEAM	BEAM	DECK JOIST SPAN (feet) ^{a,i}						
		6	8	10	12	14	16	18
SPECIES ^d	SIZE ^e	MAXIMUM BEAM SPAN ^{a,b,f}						
		(feet-inches)						
	1-2x6	3-8	3-2	2-10	2-1	1-10	1-4	1-7
	1-2x8	4-7	4-0	3-7	3-3	2-9	2-5	2-2
	1-2x10	5-6	4-9	4-3	3-10	3-7	3-1	2-9

Southern Pine	1-2x12	6-5	5-7	5-0	4-7	4-3	3-9	3-4
	2-2x6	5-5	4-8	4-2	3-10	3-6	3-3	3-1
	2-2x8	6-10	5-11	5-4	4-10	4-6	4-2	3-11
	2-2x10	8-2	7-1	6-4	5-9	5-4	5-0	4-8
	2-2x12	9-7	8-4	7-5	6-9	6-3	5-10	5-6
	3-2x6	6-9	5-10	5-3	4-9	4-5	4-2	3-11
	3-2x8	8-7	7-5	6-8	6-1	5-7	5-3	4-11
	3-2x10	10-2	8-10	7-11	7-2	6-8	6-3	5-10
	3-2x12	12-0	10-5	9-4	8-6	7-10	7-4	6-11
Douglas fir-larch ^g	1-2x6	3-3	2-5	1-10	1-6	1-3	1-1	1-0
	1-2x8	4-4	3-2	2-6	2-0	1-8	1-6	1-4
	1-2x10	5-4	4-1	3-2	2-7	2-2	1-11	1-8
	1-2x12	6-2	5-0	3-10	3-2	2-8	2-4	2-0
Hem-fir ^g	2-2x6	4-10	4-2	3-9	3-1	2-7	2-3	2-0
	2-2x8	6-5	5-7	5-0	4-1	3-5	3-0	2-8
Spruce -pine-fir ^g	2-2x10	7-10	6-10	6-1	5-39	4-5	3-10	3-5
	2-2x12	9-2	7-11	7-1	6-4	5-5	4-8	4-1
	3-2x6	6-0	5-31	4-8	4-3	3-11	3-5	3-0
	3-2x8	8-1	7-0	6-3	5-8	5-2	4-6	4-0
	3-2x10	9-10	8-6	7-8	7-0	6-5	5-9	5-1
	3-2x12	11-6	9-11	8-11	8-1	7-6	7-0	6-3
Redwood ^h	1-2x6	3-4	2-6	1-11	1-7	1-4	1-2	1-0
	1-2x8	4-2	3-3	2-7	2-1	1-9	1-7	1-4
	1-2x10	5-1	4-2	3-3	2-8	2-3	2-0	1-9
Western Cedars ^h	1-2x12	5-11	5-1	4-0	3-3	2-9	2-5	2-1
	2-2x6	4-11	4-3	3-10	3-2	2-8	2-4	2-1
Poderosa Pine ^h	2-2x8	6-3	5-5	4-10	4-2	3-7	3-1	2-9
	2-2x10	7-7	6-7	5-10	5-4	4-7	3-11	3-6
Red Pine ^h	2-2x12	8-10	7-7	6-10	6-3	5-6	4-10	4-3
	3-2x6	6-2	5-4	4-9	4-4	4-0	3-6	3-1
	3-2x8	7-9	6-9	6-0	5-6	5-1	4-8	4-1
	3-2x10	9-6	8-3	7-4	6-9	6-3	5-10	5-3
	3-2x12	11-0	9-6	8-6	7-9	7-3	6-9	6-4

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound = 0.454 kg.

a. Interpolation allowed. Extrapolation is not allowed.

b. Beams supporting a single span of joists with or without cantilever.

c. Dead load = 10 psf, $L/\Delta = 360$ at main span, $L/\Delta = 180$ at cantilever. Snow load not assumed to be concurrent with live load.

d. No. 2 grade, wet service factor included.

e. Beam depth shall be equal to or greater than the depth of intersecting joist for a flush beam connection.

f. Beam cantilevers are limited to the adjacent beam's span divided by 4.

g. Includes incising factor

h. Incising factor not included.

i. Deck joist span as shown in Figure R507.5

Revise as follows:

R507.6 Deck joists. Maximum allowable spans for wood deck joists, as shown in Figure R507.6, shall be in accordance with Table R507.6. The maximum joist spacing shall be limited by the decking materials in accordance with Table R507.7. ~~The maximum joist cantilever shall be limited to one-fourth of the joist span or the maximum cantilever length specified in Table R507.6, whichever is less.~~

Delete and substitute as follows:

**TABLE R507.6
DECK JOIST SPANS FOR COMMON LUMBER SPECIES (ft. - in.)**

SPECIES ^a	SIZE	ALLOWABLE JOIST SPAN ^b			MAXIMUM CANTILEVER ^{c, f}		
		SPACING OF DECK JOISTS (inches)			SPACING OF DECK JOISTS WITH CANTILEVERS ^c (inches)		
		12	16	24	12	16	24
Southern pine	2 x 6	9-11	9-0	7-7	1-3	1-4	1-6
	2 x 8	13-1	11-10	9-8	2-1	2-3	2-5
	2 x 10	16-2	14-0	11-5	3-4	3-6	2-10
	2 x 12	18-0	16-6	13-6	4-6	4-2	3-4
Douglas fir-larch ^d , hem-fir ^d , spruce-pine-fir ^d	2 x 6	9-6	8-8	7-2	1-2	1-3	1-5
	2 x 8	12-6	11-1	9-1	1-11	2-1	2-3
	2 x 10	15-8	13-7	11-1	3-1	3-5	2-9
	2 x 12	18-0	15-9	12-10	4-6	3-11	3-3
	2 x 6	8-10	8-0	7-0	1-0	1-1	1-2

Redwood, western cedars, ponderosa pine ^e , red pine ^e	2x8	11-8	10-7	8-8	1-8	1-10	2-0
	2x10	14-11	13-0	10-7	2-8	2-10	2-8
	2x12	17-5	15-1	12-4	3-10	3-9	3-1

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound = 0.454 kg.

- a. No. 2 grade with wet service factor.
- b. Ground snow load, live load = 40 psf, dead load = 10 psf, L/Δ = 360.
- c. Ground snow load, live load = 40 psf, dead load = 10 psf, L/Δ = 360 at main span, L/Δ = 180 at cantilever with a 220-pound point load applied to end.
- d. Includes incising factor.
- e. Northern species with no incising factor.
- f. Cantilevered spans not exceeding the nominal depth of the joist are permitted.

TABLE R507.6
MAXIMUM DECK JOIST SPANS

LOAD ^a (psf)	JOIST SPECIES ^b	JOIST SIZE	JOIST SPACING (inches)			ADJACENT JOIST SPAN ^d (feet)									
			12	16	24	4	6	8	10	12	14	16	18		
			MAXIMUM JOIST SPAN ^c					MAXIMUM CANTILEVER ^d							
			(feet-inches)					(feet-inches)							
40 Live Load	Southern Pine	2x6	9-11	9-0	7-7	1-0	1-6	1-5	NP	NP	NP	NP	NP		
		2x8	13-1	11-10	9-8	1-0	1-6	2-0	2-6	2-3	NP	NP	NP		
		2x10	16-2	14-0	11-5	1-0	1-6	2-0	2-6	3-0	3-4	3-4	NP		
		2x12	18-0	16-6	13-6	1-0	1-6	2-0	2-6	3-0	3-6	4-0	4-1		
	Douglas fir-larch ^e	2x6	9-6	8-4	6-10	1-0	1-6	1-4	NP	NP	NP	NP	NP		
		2x8	12-6	11-1	9-1	1-0	1-6	2-0	2-3	2-0	NP	NP	NP		
	Hem-fir ^e	2x10	15-8	13-7	11-1	1-0	1-6	2-0	2-6	3-0	3-3	NP	NP		
		2x12	18-0	15-9	12-10	1-0	1-6	2-0	2-6	3-0	3-6	3-11	3-11		
	Spruce-pine-fir ^e	2x6	8-10	8-0	6-10	1-0	1-4	1-1	NP	NP	NP	NP	NP		
		2x8	11-8	10-7	8-8	1-0	1-6	2-0	1-11	NP	NP	NP	NP		
		2x10	14-11	13-0	10-7	1-0	1-6	2-0	2-6	3-0	2-9	NP	NP		
	Western Cedars ^f	2x12	17-5	15-1	12-4	1-0	1-6	2-0	2-6	3-0	3-6	3-8	NP		
			15-1	12-4	1-0	1-6	2-0	2-6	3-0	3-6	3-8	NP			
	Ponderosa Pine ^f														
	Red Pine ^f														

50	Ground	Southern Pine	2x6	9-2	8-4	7-4	1-0	1-6	1-5	NP	NP	NP	NP	NP	
			2x8	12-1	11-0	9-7	1-0	1-6	2-0	2-5	2-3	NP	NP	NP	
			2x10	15-5	14-1	12-3	1-0	1-6	2-0	2-6	3-0	3-1	NP	NP	
			2x12	18-0	17-1	14-6	1-0	1-6	2-0	2-6	3-0	3-6	3-10	3-10	
	Snow	Douglas fir-larch ^e ₁	2x6	8-10	8-0	7-0	1-0	1-6	1-4	NP	NP	NP	NP	NP	
			2x8	11-7	10-7	9-3	1-0	1-6	2-0	2-3	NP	NP	NP	NP	
	Load	Hem-fir ^e ₁	2x10	14-10	13-6	11-9	1-0	1-6	2-0	2-6	3-0	3-0	NP	NP	
			2x12	18-0	16-5	13-9	1-0	1-6	2-0	2-6	3-0	3-6	3-8	NP	
	Load	Redwood f ₁	2x6	8-3	7-6	6-8	1-0	1-4	1-1	NP	NP	NP	NP	NP	
			2x8	10-10	9-10	8-7	1-0	1-6	2-0	1-11	NP	NP	NP	NP	
		Western Cedars ^f ₁	2x10	13-10	12-7	11-0	1-0	1-6	2-0	2-6	2-9	NP	NP	NP	
			2x12	16-10	15-3	13-2	1-0	1-6	2-0	2-6	3-0	3-5	3-5	NP	
		Red Pine ^f ₁													
	60	Ground	Southern Pine	2x6	8-8	7-10	6-10	1-0	1-6	1-5	NP	NP	NP	NP	NP
				2x8	11-5	10-4	9-1	1-0	1-6	2-0	2-4	NP	NP	NP	NP
				2x10	14-7	13-3	11-7	1-0	1-6	2-0	2-6	2-11	2-11	NP	NP
2x12				17-8	16-1	14-0	1-0	1-6	2-0	2-6	3-0	3-6	3-7	NP	
Snow		Douglas fir-larch ^e ₁	2x6	8-4	7-6	6-7	1-0	1-6	1-4	NP	NP	NP	NP	NP	
			2x8	10-11	9-11	8-8	1-0	1-6	2-0	2-2	NP	NP	NP	NP	
Load		Hem-fir ^e ₁	2x10	13-11	12-8	11-1	1-0	1-6	2-0	2-6	2-10	NP	NP	NP	
			2x12	17-0	15-5	13-6	1-0	1-6	2-0	2-6	3-0	3-5	3-5	NP	
Load		Redwood f ₁	2x6	7-9	7-0	6-2	1-0	1-4	NP	NP	NP	NP	NP	NP	
			2x8	10-2	9-3	8-1	1-0	1-6	2-0	1-11	NP	NP	NP	NP	
		Western Cedars ^f ₁	2x10	13-0	11-10	10-4	1-0	1-6	2-0	2-6	2-7	NP	NP	NP	
			2x12	15-10	14-4	12-7	1-0	1-6	2-0	2-6	3-0	3-2	NP	NP	
		Red Pine ^f ₁													
70		Ground	Southern Pine	2x6	8-3	7-6	6-6	1-0	1-6	1-5	NP	NP	NP	NP	NP
				2x8	10-10	9-10	8-7	1-0	1-6	2-0	2-2	NP	NP	NP	NP
				2x10	13-10	12-7	11-0	1-0	1-6	2-0	2-6	2-9	NP	NP	NP
	2x12			16-10	15-3	13-4	1-0	1-6	2-0	2-6	3-0	3-5	3-5	NP	
	Snow	Douglas fir-larch ^e ₁	2x6	7-11	7-2	6-3	1-0	1-6	NP	NP	NP	NP	NP	NP	
			2x8	10-5	9-5	8-3	1-0	1-6	2-0	2-1	NP	NP	NP	NP	
	Load	Hem-fir ^e ₁	2x10	13-3	12-0	10-6	1-0	1-6	2-0	2-6	2-8	NP	NP	NP	
			2x12	16-1	14-8	12-10	1-0	1-6	2-0	2-6	3-0	3-3	3-3	NP	
	Snow	Spruce-pine-fir ^e													

Redwood f.	2x6	7-4	6-8	5-10	1-0	1-4	NP	NP	NP	NP	NP	NP
Western Cedars f.	2x8	9-8	8-10	7-8	1-0	1-6	1-11	NP	NP	NP	NP	NP
	2x10	12-4	11-3	9-10	1-0	1-6	2-0	2-6	2-6	NP	NP	NP
Ponderosa Pine f.	2x12	15-0	13-8	11-11	1-0	1-6	2-0	2-6	2-0	3-0	NP	NP
Red Pine f.												

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound = 0.454 kg. NP = Not Permitted

a. Dead load = 10 psf. Snow load not assumed to be concurrent with live load.

b. No. 2 grade, wet service factor included.

c. L/Δ = 360 at main span.

d. L/Δ = 180 at cantilever with 220-pound point load applied to end.

e. Includes incising factor.

f. Incising factor not included.

g. Interpolation permitted. Extrapolation is not permitted.

TABLE R507.9.1.3(1)

DECK LEDGER CONNECTION TO BAND JOIST^{a, b} (Deck live load = 40 psf, deck dead load = 10 psf, snow load ≤ 40 psf)

CONNECTION DETAILS	JOIST SPAN						
	6' and less	6'1" to 8'	8'1" to 10'	10'1" to 12'	12'1" to 14'	14'1" to 16'	16'1" to 18'
	On-center spacing of fasteners						
¹ / ₂ -inch diameter lag screw with ¹ / ₂ -inch maximum sheathing ^{e, d}	30	23	18	15	13	11	10
¹ / ₂ -inch diameter bolt with ¹ / ₂ -inch maximum sheathing ^d	36	36	34	29	24	21	19
¹ / ₂ -inch diameter bolt with 1-inch maximum sheathing ^e	36	36	29	24	21	18	16

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

- a. Ledgers shall be flashed in accordance with Section R703.4 to prevent water from contacting the house band joist.
- b. Snow load shall not be assumed to act concurrently with live load.
- c. The tip of the lag screw shall fully extend beyond the inside face of the band joist.
- d. Sheathing shall be wood structural panel or solid sawn lumber.
- e. Sheathing shall be permitted to be wood structural panel, gypsum board, fiberboard, lumber or

foam sheathing. Up to $\frac{1}{2}$ -inch thickness of stacked washers shall be permitted to substitute for up to $\frac{1}{2}$ -inch of allowable sheathing thickness where combined with wood structural panel or lumber sheathing.

TABLE R507.9.1.3(1)
DECK LEDGER CONNECTION TO BAND JOIST

LOAD ^c	JOIST SPAN ^a	<u>$\frac{1}{2}$-inch diameter</u>	<u>$\frac{1}{2}$-inch diameter</u>	<u>$\frac{1}{2}$-inch diameter</u>
		<u>lag screw</u> <u>with</u>	<u>bolt</u> <u>with</u>	<u>bolt</u> <u>with</u>
(psf)	(feet)	<u>$\frac{1}{2}$-inch maximum</u>	<u>$\frac{1}{2}$-inch maximum</u>	<u>1-inch maximum</u>
		<u>sheathing ^{d, e}</u>	<u>sheathing ^e</u>	<u>sheathing ^f</u>
On-CENTER SPACING OF FASTENERS ^b				
(inches)				
40 Live Load	6	30	36	36
	8	23	36	36
	10	18	34	29
	12	15	29	24
	14	13	24	21
	16	11	21	18
	18	10	19	16
50 Ground Snow Load	6	29	36	36
	8	22	36	35
	10	17	33	28
	12	14	27	23
	14	12	23	20
	16	11	20	17
	18	9	18	15
60 Ground Snow Load	6	25	36	36
	8	18	35	30
	10	17	33	28
	12	14	27	23
	14	12	23	20
	16	11	20	17
	18	9	18	15

70	<u>6</u>	<u>22</u>	<u>36</u>	<u>35</u>
	<u>8</u>	<u>16</u>	<u>31</u>	<u>26</u>
Ground	<u>10</u>	<u>13</u>	<u>25</u>	<u>21</u>
	<u>12</u>	<u>11</u>	<u>20</u>	<u>17</u>
Snow	<u>14</u>	<u>9</u>	<u>17</u>	<u>15</u>
	<u>16</u>	<u>8</u>	<u>15</u>	<u>13</u>
Load	<u>18</u>	<u>7</u>	<u>13</u>	<u>11</u>

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

a. Interpolation permitted. Extrapolation is not permitted.

b. Ledgers shall be flashed in accordance with Section R703.4 to prevent water from contacting the house band joist.

c. Dead Load = 10 psf. Snow load shall not be assumed to act concurrently with live load.

d. The tip of the lag screw shall fully extend beyond the inside face of the band joist.

e. Sheathing shall be wood structural panel or solid sawn lumber.

f. Sheathing shall be permitted to be wood structural panel, gypsum board, fiberboard, lumber or foam sheathing. Up to $\frac{1}{2}$ -inch thickness of stacked washers shall be permitted to substitute for up to $\frac{1}{2}$ inch of allowable sheathing thickness where combined with wood structural panel or lumber sheathing.

Reason: From roughly scanning Figure R301.2(6) Ground Snow Loads, it appears that as much as ten percent of the country lives in areas where the ground snow load exceeds the live load in Table R301.5. The Deck Code Coalition proposes to prescriptively offer the people in these areas with revised tables.

The IRC's prescriptive deck provisions currently only include a 40 psf live load and 10 psf dead load. This proposal is to widen the deck provisions to include up to 70 psf ground snow load to more closely match the scope of the IRC.

For snow loading, an increase in wood strength is accounted for the load duration per the NDS®. While the geometry of the deck and nearby structures can affect the snow loading by causing drifts or snow falling from a nearby roof, these effects are neglected just as in other IRC tables, such as roof rafters. Similarly, elevated decks would have a snow load less than the ground snow load, but this reduction is neglected for simpler tables that are easy to use.

· Table R507.3.1 Minimum Footing Size for Decks - currently the table includes footings from 40 to 70 psf, but limits the minimum size of footing to 12" x 12", which is significantly oversized for small areas such as a stair landing. New rows have been added for a smaller 7"x7" footing which is more appropriate and allows for some precast concrete solutions.

· Table R507.4 Maximum Deck Post Height –the table is based now on tributary area 40,50,60, and 70 psf loading.

· Table R507.5(1) Maximum Deck Beam Span was replaced with four new tables R507.5(1) – (4) to account for the 40, 50, 60, and 70 psf loading. Section R507.5.2 now includes information that was previously in a footnote.

The load from tributary areas are altered to reflect joists and beams with cantilevers.

· Table R507.6 Maximum Deck Joist Spans was amended to account for the 40, 50, 60, and 70 psf loading. The formatting of the table is significantly altered to clarify common confusion on allowable cantilevers. Previously, the table gave the allowable cantilever in terms of joist spacing. Since the assumed main span was the allowable span for that spacing, the maximum cantilevers sometimes became smaller as joist spacing became tighter. The new format has the cantilevers be more accurately based upon the main span. The previous table included a cantilever limit of $\frac{1}{4}$ the main span, and this limit is preserved. Where cantilevers are not permitted, the size of lumber is too small to support that main span.

· Table R507.9.1.3(1) Deck Ledger Connection to Band Joist - the table is based now on tributary area 40,50,60, and 70 psf loading, but uses the same empirical capacities from the original table.

Cost Impact: The code change proposal will increase the cost of construction

In those parts of the country where the ground snow load exceeds 40 psf, it could be assumed that there would be an increased cost of construction if the local jurisdictions allowed decks to be built with a lesser live load than the ground snow load might warrant for their areas. However, by adding 50,60, and 70 psf to the prescriptive tables, some builders may save money by eliminating the cost of engineering that might otherwise be required.

For the other ninety percent of the country, there would not be an anticipated increased cost of construction, in fact there could be a reduced cost for some situations where a smaller footing requirement may be applicable.

Proposal # 4302

RB184-19

RB185-19

IRC: R312.1.4, 507.10 through 507.10.4(New)

Proponent: Deck Code Coalition, Charles Bajnai (chair), North American Deck and Railing Assoc (NADRA), Retired from Chesterfield County, VA, representing Deck Code Coalition (csbajnai@gmail.com)

2018 International Residential Code

Revise as follows:

R312.1.4 Exterior ~~plastic composite~~ guards. ~~Plastic composite exterior~~ Exterior guards shall comply with the requirements of Section ~~R317.4~~ R507.10.

Add new text as follows:

R507.10 Exterior guards. Guards shall be constructed to meet the requirements of Section R301.5, R312 and this section.

R507.10.1 Support of guards. Where guards are supported on deck framing, guard loads shall be transferred to the deck framing with a continuous load path to the deck joists.

R507.10.1.1 Guards supported by side of deck framing. Where guards are connected to the interior or exterior side of a deck joist or beam, the joist or beam shall be connected to the adjacent joists to prevent rotation of the joist or beam. Connections relying only on fasteners in end grain withdrawal are not permitted.

R507.10.1.2 Guards supported on top of deck framing. Where guards are mounted on top of the decking, the guards shall be connected to the deck framing or blocking and installed in accordance with approved manufacturer's instructions to transfer the guard loads to the adjacent joists.

R507.10.2 Wood guards. Wood posts supporting guard loads shall be a minimum 4x4. Such 4x4 wood posts supporting guard loads shall not be notched at the connection to the supporting structure.

R507.10.3 Plastic composite guards. Plastic composite guards shall comply with the provisions of Section R507.2.2.

R507.10.4 Other guards. Other approved guards shall be in accordance with manufacturer's instructions or in accordance with accepted engineering principles.

Reason: The Deck Code Coalition submits this code change to include direction for constructing exterior guards on decks where the code is currently silent. Guards provide the first line of defense against significant falls, which can result in serious and sometimes fatal injuries. Exterior guards on decks, particularly the connection of the guard system to the deck framing, are rarely engineered and even more rarely tested in a manner that proves that they are adequate to meet the requirements of Table R301.5. Exterior guards and the framing supporting them are susceptible to deterioration, and therefore require a level of care that we think should be addressed in the code.

While the language of the proposal does not define a prescriptive detail for either guard construction or a guard connection to deck framing, the intent of the language is to guide both the builder and the building officials toward an understanding of the behavior of the guard and the structure supporting the guard. The language provides guidance for developing details that will resist the action of a guard on the deck framing when the guard is protecting an occupant from falling to a lower level. This proposal should save lives.

Cost Impact: The code change proposal will increase the cost of construction. Current building practices may not meet the requirements of Table R301.5 when typical code-required safety

factors are applied, it is reasonable to assume that there will be an increase in cost as the construction techniques and details of these elements are modified to meet the proposed language. A direct result will likely be an increase in the number of fasteners, blocking labor associated with the construction of exterior guards. For those currently construction code-compliant guards, there will be little, if any, additional costs.

For those that need to update their construction techniques and wish to do so using proprietary fasteners, the material cost increase may be approximately \$20 per post, or approximately \$140 for a 12 foot by 12 foot attached deck. The extra cost has to be weighed against the increased safety and potential life savings that will occur across the country over many years.

Proposal # 4305

RB185-19

RB186-19

IRC@: TABLE R507.2.3 (New)

Proponent: Rick Allen, International Staple, Nail and Tool Association, representing International Staple, Nail and Tool Association (rallen@isanta.org)

2018 International Residential Code

Revise as follows:

TABLE R507.2.3
FASTENER AND CONNECTOR SPECIFICATIONS FOR DECKS^{a, b}

ITEM	MATERIAL	MINIMUM FINISH/COATING	ALTERNATE FINISH/COATING ^e
Nails and timber rivets	In accordance with ASTM F1667	Hot-dipped galvanized per ASTM A153, <u>Class D for $\frac{3}{8}$-inch diameter and less</u>	Stainless steel, silicon bronze or copper
Bolts ^c Lag screws ^d (including nuts and washers)	In accordance with ASTM A307 (bolts), ASTM A563 (nuts), ASTM F844 (washers)	Hot-dipped galvanized per ASTM A153, Class C (Class D for $\frac{3}{8}$ -inch diameter and less) or mechanically galvanized per ASTM B695, Class 55 or 410 stainless steel	Stainless steel, silicon bronze or copper
Metal connectors	Per manufacturer's specification	ASTM A653 type G185 zinc coated galvanized steel or post hot-dipped galvanized per ASTM A123 providing a minimum average coating weight of 2.0 oz./ft ² (total both sides)	Stainless steel

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

- Equivalent materials, coatings and finishes shall be permitted.
- Fasteners and connectors exposed to salt water or located within 300 feet of a salt water shoreline shall be stainless steel.
- Holes for bolts shall be drilled a minimum $\frac{1}{32}$ inch and a maximum $\frac{1}{16}$ inch larger than the bolt.
- Lag screws $\frac{1}{2}$ inch and larger shall be predrilled to avoid wood splitting per the National Design Specification (NDS) for Wood Construction.
- Stainless-steel-driven fasteners shall be in accordance with ASTM F1667.

Reason: Timber Rivets are not addressed in ASTM F1667

Nails are $\frac{3}{8}$ " in diameter or less. ASTM A153 calls for Class D coating (minimum 1 oz. / ft²) for this size fastener.

These changes align with the requirements of these ASTM standards.

Cost Impact: The code change proposal will not increase or decrease the cost of construction There will be no change is cost of construction. The proposal just clarifies the standards.

Proposal # 3866

RB186-19

RB187-19

RC: R403.1.4, R403.1.4.1, R507.3, R507.3.2, R507.3.3(New)

Proponent: Deck Code Coalition, Charles Bajnai (chair), North American Deck and Railing Assoc (NADRA), Retired from Chesterfield County, VA, representing Deck Code Coalition (csbajnai@gmail.com)

2018 International Residential Code

Revise as follows:

R507.3 Footings. Decks shall be supported on concrete footings or other approved structural systems designed to accommodate all loads in accordance with Section R301. Deck footings shall be sized to carry the imposed loads from the deck structure to the ground as shown in Figure R507.3. ~~The footing depth shall be in accordance with Section R403.1.4.~~

~~Exception~~ Exceptions:

1. Footings shall not be required for free ~~Free~~-decks consisting of joists directly supported on grade over their entire length.
2. Footings shall not be required for freestanding decks that meet all of the following criteria:
 - 2.1. The joists bear directly on precast concrete pier blocks at grade without support by beams or posts.
 - 2.2. The area of the deck does not exceed 200 square feet.
 - 2.3. The walking surface is not more than 20 inches above grade at any point within 36 inches measured horizontally from the edge.

R507.3.2 Minimum depth. ~~Deck footings shall extend below the frost line specified in Table R301.2(1) in accordance with Section R403.1.4.1.~~ Deck footings shall be placed not less than 12 inches below the undisturbed ground surface.

~~Exceptions:~~

1. ~~Free-standing decks that meet all of the following criteria:~~
 - 1.1. ~~The joists bear directly on precast concrete pier blocks at grade without support by beams or posts.~~
 - 1.2. ~~The area of the deck does not exceed 200 square feet (18.9 m²).~~
 - 1.3. ~~The walking surface is not more than 20 inches (616 mm) above grade at any point within 36 inches (914 mm) measured horizontally from the edge.~~
2. ~~Free-standing decks need not be provided with footings that extend below the frost line.~~

Add new text as follows:

R507.3.3 Frost protection. Where decks are attached to a frost protected structure, deck footings shall be protected from frost by one or more of the following methods:

1. By extending below the frost line specified in Table R301.2(1).
2. By erecting on solid rock.
3. Other approved methods of frost protection.

Revise as follows:

R403.1.4 Minimum depth. Exterior footings shall be placed not less than 12 inches (305 mm) below the undisturbed ground surface. Where applicable, the depth of footings shall also conform to Sections R403.1.4.1 through R403.1.4.2. Deck footings shall be in accordance with Section R507.3.

R403.1.4.1 Frost protection. Except where otherwise protected from frost, foundation walls, piers and other permanent supports of buildings and structures shall be protected from frost by one or more of the following methods:

1. Extended below the frost line specified in Table R301.2.(1).
2. Constructed in accordance with Section R403.3.
3. Constructed in accordance with ASCE 32.
4. Erected on solid rock.

Footings shall not bear on frozen soil unless the frozen condition is permanent.

Exceptions:

1. Protection of free-standing *accessory structures* with an area of 600 square feet (56 m²) or less, of light-frame construction, with an eave height of 10 feet (3048 mm) or less shall not be required.
2. Protection of free-standing *accessory structures* with an area of 400 square feet (37 m²) or less, of other than light-frame construction, with an eave height of 10 feet (3048 mm) or less shall not be required.
3. ~~Decks not supported by a dwelling need not be provided with footings that extend below the frost line.~~

Reason: The Deck Code Coalition (DCC) is intending to clean up Chapter 4 by pointing out that deck footing details are in Section R507.

Section R507 is further cleaned up by relocating exceptions of R507.3.2 into R507.3 because the exceptions are not related to footing depth but rather about when footings not required.

The DCC added a new section dealing with footings in frost prone areas by borrowing from R403.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The Deck Code Coalition does not anticipate any cost impact.

The text exceptions were not modified, only relocated to a more appropriate section.

The new section on frost protection was moved from Chapter 4 to Chapter 5.

Proposal # 4303

RB187-19

RB188-19

IRC@: R507.5

Proponent: Deck Code Coalition, Charles Bajnai (chair), North American Deck and Railing Assoc (NADRA), Retired from Chesterfield County, VA, representing Deck Code Coalition (csbajnai@gmail.com)

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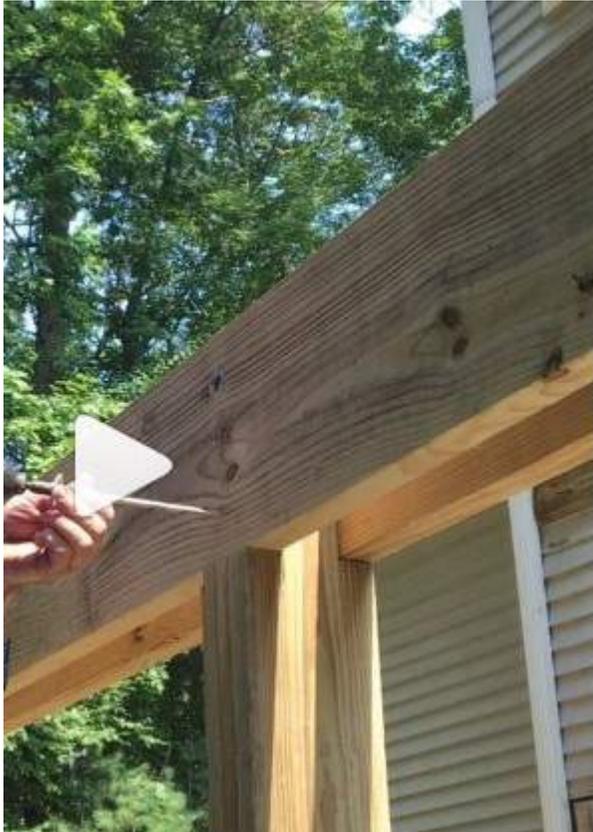
Revise as follows:

R507.5 Deck Beams. Maximum allowable spans for wood deck beams, as shown in Figure R507.5, shall be in accordance with Table R507.5. Beam plies shall be fastened together with two rows of 10d (3-inch x 0.128-inch) nails minimum at 16 inches (406 mm) on center along each edge. Beams shall be permitted to cantilever at each end up to one-fourth of the allowable beam span. Deck beams of other materials shall be permitted where designed in accordance with accepted engineering practices.

Reason: As the original authors of Section R507 in the 2015 IRC, the DCC wanted to clarify that Section R507.5 intended to mean that multi-ply beams are required to be fastened *together* in order to perform as intended. When multi-ply beams are connected together with 10d nails at 16" o.c., their depth to width ratio resists top chord bending.

It appears that some folks are still building deck beams and separating plies .

Figures R507.5.1(1) and (2) tried to cover this, but it appears that some folks do not understand the intent. Hopefully the new word will strengthen the understanding and eliminate the poor construction practice.



Cost Impact: The code change proposal will not increase or decrease the cost of construction. There should be no increased cost related to this proposal. There is no change in the intent of the code from the 2018 version.

RB189-19

IRC®: R507.5

Proponent: Deck Code Coalition, Charles Bajnai (chair), North American Deck and Railing Assoc (NADRA), retired, representing Deck Code Coalition (csbajnai@gmail.com)

2018 International Residential Code

Revise as follows:

R507.5 Deck Beams. Maximum allowable spans for wood deck beams, as shown in Figure R507.5, shall be in accordance with Table R507.5. Beam plies shall be fastened with two rows of 10d (3-inch × 0.128-inch) nails minimum at 16 inches (406 mm) on center along each edge. Beams shall be permitted to cantilever at each end up to one-fourth of the ~~allowable-actual~~ beam span. Deck beams of other materials shall be permitted where designed in accordance with accepted engineering practices.

Reason: The Deck Code Coalition (DCC) submits this code change because the cantilever length should be governed by the actual beam span, not the allowable beam span.

Example:

- A 2x12 beam may be *allowed* to span 16 feet based on the imposed load, but may be *actually* only spanning 4 feet.
- The maximum cantilever should be 1 foot, not 4 feet.
- In this example, the old text would have *allowed* a 4 foot cantilever with a 4' back span.
- Back span must be at least 4x the cantilever length.

Cost Impact: The code change proposal will increase the cost of construction

This proposal might increase the cost of construction because the contractor would not be able to extend cantilevers out as far without increasing beam size.

Proposal # 4300

RB189-19

RB190-19

IRC@: TABLE R507.5

Proponent: Deck Code Coalition, Charles Bajnai (chair), North American Deck and Railing Assoc (NADRA), representing Deck Code Coalition (csbajnai@gmail.com)

2018 International Residential Code

Revise as follows:

**TABLE R507.5
DECK BEAM SPAN LENGTHS^{a, b, g} (feet – inches)**

SPECIES ^c	SIZE ^d	EFFECTIVE DECK JOIST SPAN LENGTH ^h						
		LESS THAN OR EQUAL TO:(feet)						
		6	8	10	12	14	16	18
		DECK BEAM SPAN LENGTH ^{a, b, g} (feet-inches)						
Southern pine	1 – 2 × 6	4-11	4-0	3-7	3-3	3-0	2-10	2-8
	1 – 2 × 8	5-11	5-1	4-7	4-2	2-10	3-7	3-5
	1 – 2 × 10	7-0	6-0	5-5	4-11	4-7	4-3	4-0
	1 – 2 × 12	8-3	7-1	6-4	5-10	5-5	5-0	4-9
	2 – 2 × 6	6-11	5-11	5-4	4-10	4-6	4-3	4-0
	2 – 2 × 8	8-9	7-7	6-9	6-2	5-9	5-4	5-0
	2 – 2 × 10	10-4	9-0	8-0	7-4	6-9	6-4	6-0
	2 – 2 × 12	12-2	10-7	9-5	8-7	8-0	7-6	7-0
	3 – 2 × 6	8-2	7-5	6-8	6-1	5-8	5-3	5-0
	3 – 2 × 8	10-10	9-6	8-6	7-9	7-2	6-8	6-4
	3 – 2 × 10	13-0	11-3	10-0	9-2	8-6	7-11	7-6
3 – 2 × 12	15-3	13-3	11-10	10-9	10-0	9-4	8-10	
	3 × 6 or 2 – 2 × 6	5-5	4-8	4-2	3-10	3-6	3-1	2-9
	3 × 8 or 2 – 2 × 8	6-10	5-11	5-4	4-10	4-6	4-1	3-8

Douglas fir-larch^e, hem-fir^e, spruce-pine-fir^e, redwood, western cedars, ponderosa pine^f, red pine^f

3 × 10 or 2 – 2 × 10	8-4	7-3	6-6	5- 11	5-6	5-1	4-8
3 × 12 or 2 – 2 × 12	9-8	8-5	7-6	6- 10	6-4	5- 11	5-7
4 × 6	6-5	5-6	4-11	4-6	4-2	3- 11	3-8
4 × 8	8-5	7-3	6-6	5- 11	5-6	5-2	4- 10
4 × 10	9-11	8-7	7-8	7-0	6-6	6-1	5-8
4 × 12	11-5	9- 11	8-10	8-1	7-6	7-0	6-7
3 – 2 × 6	7-4	6-8	6-0	5-6	5-1	4-9	4-6
3 – 2 × 8	9-8	8-6	7-7	6- 11	6-5	6-0	5-8
3 – 2 × 10	12-0	10- 5	9-4	8-6	7- 10	7-4	6- 11
3 – 2 × 12	13- 11	12- 1	10-9	9- 10	9-1	8-6	8-1

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound = 0.454 kg.

- Ground snow load, live load = 40 psf, dead load = 10 psf, $L/\Delta = 360$ at main span, $L/\Delta = 180$ at cantilever with a 220-pound point load applied at the end.
- Beams supporting deck joists from one side only.
- No. 2 grade, wet service factor.
- Beam depth shall be greater than or equal to depth of joists with a flush beam condition.
- Includes incising factor.
- Northern species. Incising factor not included.
- Beam cantilevers are limited to the adjacent beam's span divided by 4.
- For calculation of effective deck joist span, the actual joist span length shall be multiplied by the joist span factor from the following table.

<u>C/J</u>	<u>Joist span factor</u>
0 (no cantilever)	0.66
1/12 (0.87)	0.72
1/10 (0.10)	0.80
1/8 (0.125)	0.84
1/6 (0.167)	0.90
1/4 (0.250)	1.00

J = actual joist span length (feet)

C = actual joist cantilever length (feet)

Reason: The current beam span table incorporates a conservative assumption that all deck joists cantilever the

allowable ¼ of the main span past the beam. This assumption is included in the calculated tributary area of the beam design within the headings of deck joist span. The proposed footnote adds a factor that allows this assumption to be counteracted so that designers that do not use a full cantilever do not have to overdesign the beam.

Example:

A deck is designed using Southern Pine, (2) 2x10

Joist span is 12' and no cantilever.

SIZE ^d	<u>Effective Deck Joist Span Length</u>						
	(feet) ^h						
	6	8	10	12	14	16	18
	<u>DECK BEAM SPAN LENGTH ^{a,b,g} (feet – inches)</u>						
1 – 2 x 6	4-11	4-0	3-7	3-3	3-0	2-10	2-8
1 – 2 x 8	5-11	5-1	4-7	4-2	2-10	3-7	3-5
1 – 2 x 10	7-0	6-0	5-5	4-11	4-7	4-3	4-0
1 – 2 x 12	8-3	7-1	6-4	5-10	5-5	5-0	4-9
2 – 2 x 6	6-11	5-11	5-4	4-10	4-6	4-3	4-0
2 – 2 x 8	8-9	7-7	6-9	6-2	5-9	5-4	5-0
2 – 2 x 10	10-4	9-0	8-0	7-4	6-9	6-4	6-0
2 – 2 x 12	12-2	10-7	9-5	8-7	8-0	7-6	7-0
3 – 2 x 6	8-2	7-5	6-8	6-1	5-8	5-3	5-0
3 – 2 x 8	10-10	9-6	8-6	7-9	7-2	6-8	6-4
3 – 2 x 10	13-0	11-3	10-0	9-2	8-6	7-11	7-6
3 – 2 x 12	15-3	13-3	11-10	10-9	10-0	9-4	8-10

- C = 0 feet
- J = 12 feet
- The existing table would say the maximum beam span length would be 7'-4"

Applying the adjustment factor

- C /J= 0 and the joist span factor calculates out to .66
- The effective joist span can be adjusted as .66 x 12 = 8 feet
- The maximum beam span length is 9'-0" since there is no cantilever.

Note: The beam length is not reduced by .66, but rather the effective joist span length is reduced by .66.

Also there were a few minor adjustments to the titles in the table. They were done to help add clarity to the table.

Cost Impact: The code change proposal will decrease the cost of construction

If the deck is constructed with a cantilevered beam, the beam may be able to be downsized if it is constructed

with a cantilever that is not at its maximum length. For some decks this could save a few dollars with smaller beam material.

Proposal # 4830

RB190-19

RB191-19

IRC®: R507.7, TABLE R507.7

Proponent: Deck Code Coalition, Charles Bajnai (chair), North American Deck and Railing Assoc (NADRA), representing Deck Code Coalition (csbajnai@gmail.com)

2018 International Residential Code

Revise as follows:

R507.7 Decking. Maximum allowable spacing for joists supporting wood decking, excluding stairways, shall be in accordance with Table R507.7. Wood decking shall be attached to each supporting member with not less than two 8d threaded nails or two No. 8 wood screws. Maximum allowable spacing for joists supporting plastic composite decking shall be in accordance with Section R507.2. Other approved decking or fastener systems shall be installed in accordance with the manufacturer's installation requirements.

TABLE R507.7
MAXIMUM JOIST SPACING FOR WOOD DECKING

DECKING MATERIAL TYPE AND NOMINAL SIZE	MAXIMUM ON-CENTER JOIST SPACING ^e			
	Decking perpendicular to joist		Decking diagonal to joist ^a	
	Single Span ^c	Multi-Span ^c	Single Span ^c	Multi-Span ^c
	MAXIMUM ON-CENTER JOIST SPACING			
1 1/4 5/4 inch-thick wood deck boards ^b	12 inches	16 inches	8 inches	12 inches
2-inch-thick wood	24 inches	24 inches	18 inches	16 24 inches
Plastic composite	In accordance with Section R507.2		In accordance with Section R507.2	

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 degree = 0.01745 rad.

a. Maximum angle of 45 degrees from perpendicular for wood deck boards.

b. Or other maximum span provided by an accredited lumber grading or inspection agency.

c. Individual wood deck boards supported by two joists shall be considered *single span* and three or more joists shall be considered *multi-span*.

Reason: The Deck Code Coalition proposes to replace the existing decking span table to correct:

1. the allowable span for 2x wood,
2. allow lumber grading or inspection agencies to rate 5/4" decking for longer spans, and
3. provide values for single span conditions.

Currently, the table is overly conservative for 2x material. When evaluated per the American Lumber Standards Committee's (ALSC) decking policy, 2x nominal material can span 24 inches instead of the 16 inches currently allowed.

Similarly, 5/4 inch decking is rated per ALSC's decking policy. While the minimum rated span is 16 inches, for stronger species or grades, the allowable rated span can be larger. The proposed table keeps the conservative baseline while increasing flexibility to manufacturers and designers.

Lastly, the ALSC policy is for evaluation of decking with two-span conditions, which is an unstated assumption in the current table. The proposed table not only exposes that assumption but also gives values for single-span conditions that may be impossible to avoid for some decking layouts.

For information for the ALSC decking policy refer to

http://www.alsc.org/greenbook%20collection/UntreatedProgram_EvaluationofRecommendedSpans.PDF

Cost Impact: The code change proposal will decrease the cost of construction

The code change proposal will decrease the cost of construction. There might be a reduced cost if a builder is laying decking on the diagonal. The other items in the table remain the same.

Proposal # 4301

RB191-19

RB192-19

IRC@: R507.9.1.2

Proponent: Borjen Yeh, APA - The Engineered Wood Association, representing APA - The Engineered Wood Association (borjen.yeh@apawood.org); Ralph Leyva, representing APA- The Engineered Wood Assoc (ralph.leyva@apawood.org)

2018 International Residential Code

Revise as follows:

R507.9.1.2 Band joist details. Band joists supporting a ledger shall be a minimum 2-inch-nominal (51 mm), solid-sawn, spruce-pine-fir or better lumber or a minimum 1-inch by ~~9-1/2-inch (25 mm x 241 mm) dimensional, Douglas fir or better, laminated veneer lumber.~~ nominal engineered wood rim boards in accordance with Section R502.1.7. Band joists shall bear fully on the primary structure capable of supporting all required loads.

Reason: This proposal requires the band joists used to attach the deck ledger to be in compliance with sawn lumber or the engineered wood rim board, which is recognized in R502.1.7. The current language restricts the band joists to be a minimum of 1-inch by 9-1/2-inch dimensional, Douglas fir or better, laminated veneer lumber. This proposal retains the minimum rim joist thickness of 1 inch but removes the minimum depth of 9-1/2-inch because the framing members might be less than 9-1/2 inches, such as 10x dimension lumber with a net depth of 9-1/4 inches or 8x with a net depth of 7-1/4 inches. In addition, based on Section R502.1.7, band joists qualified under ANSI/APA PRP 410 or ASTM D7672 include engineered wood products beyond "Douglas-fir laminated veneer lumber" (LVL). It should be noted that the ledger connection for the qualified band joists is required by ANSI/APA PRP 410 or ASTM D7672 to be tested at 5 times or more of the design capacity used to develop the current IRC Table R507.9.1.3(1).

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal is intended to clarify the reference of the band joists based on the code.

Proposal # 4663

RB192-19

RB193-19

IRC@: TABLE R602.3(1) (New)

Proponent: Rick Allen, International Staple, Nail and Tool Association, representing International Staple, Nail and Tool Association (rallen@isanta.org)

2018 International Residential Code

Revise as follows:

**TABLE R602.3(1)
FASTENING SCHEDULE**

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a, b, c}	SPACING AND LOCATION
Roof			
1	Blocking between ceiling joists or rafters or trusses to top plate or other framing below	4-8d box (2½" × 0.113") or 3-8d common (2½" × 0.131"); or 3-10d box (3" × 0.128"); or 3-3" × 0.131" nails; or 3- 3" 14 gage staples 7/16" crown	Toe nail
	Blocking between rafters or truss not at the wall top plate, to rafter or truss	2-8d common (2½" x 0.131"); or 2- (3" x 0.131") nails or 2- 3" 14 gage staples 7/16" crown	Each end toe nail
		2-16d common (3½" x 0.162"); or 3-(3" x 0.131") nails or 3- 3" 14 gage staples 7/16" crown	End nail
	Flat blocking to truss and web filler	16d common (3½" x 0.162"); or (3" x 0.131") nails; or 3" 14 gage staples 7/16" crown	6" o.c. Face nail
2	Ceiling joists to top plate	Stainless Steel Fasteners Are Not Applicable In This Connection 4-8d box (2½" × 0.113"); or 3-8d common (2½" × 0.131"); or 3-10d box (3" × 0.128"); or 3-3" × 0.131" nails; or 3- 3" 14 gage staples 7/16" crown	Per joist, toe nail
3	Ceiling joist not attached to parallel rafter, laps over partitions (see Section R802.5.2 and Table R802.5.2)	4-10d box (3" × 0.128"); or 3-16d common (3½" × 0.162"); or 4-3" × 0.131" nails or 4- 3" 14 gage staples 7/16" crown	Face nail
4	Ceiling joist attached to parallel rafter (heel joint) (see Section R802.5.2 and Table R802.5.2)	Table R802.5.2	Face nail
5	Collar tie to rafter, face nail or 1¼" × 20	4-10d box (3" × 0.128"); or 3-10d common (3" × 0.148"); or 4-3" × 0.131"	Face nail each rafter

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a, b, c}	SPACING AND LOCATION
	ga. ridge strap to rafter	nails or 4- 3" 14 gage staples $\frac{7}{16}$ " crown	
6	Rafter or roof truss to plate	<u>Stainless Steel Fasteners Are Not Applicable In This Connection</u> 3-16d box nails ($3\frac{1}{2}$ " \times 0.135"); or 3-10d common nails (3" \times 0.148"); or 4-10d box (3" \times 0.128"); or 4-3" \times 0.131" nails; or 4- 3" 14 gage staples $\frac{7}{16}$ " crown	2 toe nails on one side and 1 toe nail on opposite side of each rafter or truss'
7	Roof rafters to ridge, valley or hip rafters or roof rafter to minimum 2" ridge beam	4-16d ($3\frac{1}{2}$ " \times 0.135"); or 3-10d common (3" \times 0.148"); or 4-10d box (3" \times 0.128"); or 4-3" \times 0.131" nails; or 4- 3" 14 gage staples $\frac{7}{16}$ " crown	Toe nail
		3-16d box $3\frac{1}{2}$ " \times 0.135"); or 2-16d common ($3\frac{1}{2}$ " \times 0.162"); or 3-10d box (3" \times 0.128"); or 3-3" \times 0.131" nails; or 4- 3" 14 gage staples $\frac{7}{16}$ " crown	End nail
Wall			
8	Stud to stud (not at braced wall panels)	16d common ($3\frac{1}{2}$ " \times 0.162")	24" o.c. face nail
		10d box (3" \times 0.128"); or 3" \times 0.131" nails; or 4- 3" 14 gage staples $\frac{7}{16}$ " crown	16" o.c. face nail
9	Stud to stud and abutting studs at intersecting wall corners (at braced wall panels)	16d box ($3\frac{1}{2}$ " \times 0.135"); or 3" \times 0.131" nails; or 4- 3" 14 gage staples $\frac{7}{16}$ " crown	12" o.c. face nail
		16d common ($3\frac{1}{2}$ " \times 0.162")	16" o.c. face nail
10	Built-up header (2" to 2" header with $\frac{1}{2}$ " spacer)	16d common ($3\frac{1}{2}$ " \times 0.162")	16" o.c. each edge face nail
		16d box ($3\frac{1}{2}$ " \times 0.135")	12" o.c. each edge face nail
11	Continuous header to stud	5-8d box ($2\frac{1}{2}$ " \times 0.113"); or 4-8d common ($2\frac{1}{2}$ " \times	Toe nail

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a, b, c}	SPACING AND LOCATION
		0.131"); or 4-10d box (3" × 0.128")	
12	Top plate to top plate	16d common (3½" × 0.162")	16" o.c. face nail
		10d box (3" × 0.128"); or 3" × 0.131" nails; or <u>3" 14 gage staples 7/16" crown</u>	12" o.c. face nail
13	Double top plate splice	8-16d common (3½" × 0.162"); or 12-16d box (3½" × 0.135"); or 12-10d box (3" × 0.128"); or 12-3" × 0.131" nails; or <u>12- 3" 14 gage staples 7/16" crown</u>	Face nail on each side of end joint (minimum 24" lap splice length each side of end joint)
14	Bottom plate to joist, rim joist, band joist or blocking (not at braced wall panels)	16d common (3½" × 0.162")	16" o.c. face nail
		16d box (3½" × 0.135"); or 3" × 0.131" nails; or <u>3" 14 gage staples 7/16" crown</u>	12" o.c. face nail
15	Bottom plate to joist, rim joist, band joist or blocking (at braced wall panel)	3-16d box (3½" × 0.135"); or 2-16d common (3½" × 0.162"); or 4-3" × 0.131" nails; or <u>4- 3" 14 gage staples 7/16" crown</u>	<u>3 each 16" o.c. face nail</u> <u>2 each 16" o.c. face nail</u> <u>4 each 16" o.c. face nail</u> <u>16" o.c. face nail</u>
16	Top or bottom plate to stud	4-8d box (2½" × 0.113"); or 3-16d box (3½" × 0.135"); or 4-8d common (2½" × 0.131"); or 4-10d box (3" × 0.128"); or 4-3" × 0.131" nails; or <u>4- 3" 14 gage staples 7/16" crown</u>	Toe nail
		3-16d box (3½" × 0.135"); or 2-16d common (3½" × 0.162"); or 3-10d box (3" × 0.128"); or 3-3" × 0.131" nails; or <u>3- 3" 14 gage staples 7/16" crown</u>	End nail
17	Top plates, laps at corners and intersections	3-10d box (3" × 0.128"); or 2-16d common (3½" × 0.162"); or 3-3" × 0.131" nails; or <u>3- 3" 14 gage staples 7/16" crown</u>	Face nail

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a, b, c}	SPACING AND LOCATION
18	1" brace to each stud and plate	<u>Stainless Steel Fasteners Are Not Applicable In This Connection</u> 3-8d box (2½" × 0.113"); or 2-8d common (2½" × 0.131"); or 2-(3" × 0.131"); or 2-10d box (3" × 0.128"); or 2-staples 4½" 2-3" 14 gage staples 7/16" crown	Face nail
19	1" × 6" sheathing to each bearing	<u>Stainless Steel Fasteners Are Not Applicable In This Connection</u> 3-8d box (2½" × 0.113"); or 2-8d common (2½" × 0.131"); or 2-10d box (3" × 0.128"); or 2 staples, 1" crown, 16 ga., 1¾" long	Face nail
20	1" × 8" and wider sheathing to each bearing	<u>Stainless Steel Fasteners Are Not Applicable In This Connection</u> 3-8d box (2½" × 0.113"); or 3-8d common (2½" × 0.131"); or 3-10d box (3" × 0.128"); or 3 staples, 1" crown, 16 ga., 1¾" long <u>Stainless Steel Fasteners Are Not Applicable In This Connection</u> Wider than 1" × 8" 4-8d box (2½" × 0.113"); or 3-8d common (2½" × 0.131"); or 3-10d box (3" × 0.128"); or 4 staples, 1" crown, 16 ga., 1¾" long	Face nail
Floor			
21	Joist to sill, top plate or girder	4-8d box (2½" × 0.113"); or 3-8d common (2½" × 0.131"); or 3-10d box (3" × 0.128"); or 3-3" × 0.131" nails; or 3-3" 14 gage staples 7/16" crown	Toe nail

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a, b, c}	SPACING AND LOCATION
22	Rim joist, band joist or blocking to sill or top plate (roof applications also)	8d box (2½" × 0.113")	4" o.c. toe nail
		8d common (2½" × 0.131"); or 10d box (3" × 0.128"); or 3" × 0.131" nails; or 3" 14 gage staples 7/16" crown	6" o.c. toe nail
23	1" × 6" subfloor or less to each joist	<u>Stainless Steel Fasteners Are Not Applicable In This Connection</u> 3-8d box (2½" × 0.113"); or 2-8d common (2½" × 0.131"); or 3-10d box (3" × 0.128"); or 2 staples, 1" crown, 1¾" long	Face nail
Floor			
24	2" subfloor to joist or girder	3-16d box (3½" × 0.135"); or 2-16d common (3½" × 0.162")	Blind and face nail
25	2" planks (plank & beam—floor & roof)	3-16d box (3½" × 0.135"); or 2-16d common (3½" × 0.162")	At each bearing, face nail
26	Band or rim joist to joist	3-16d common (3½" × 0.162"); or 4-10 box (3" × 0.128"); or 4-3" × 0.131" nails; or 4-3" × 14 ga. staples, 7/16" crown	End nail
27	Built-up girders and beams, 2-inch lumber layers	20d common (4" × 0.192"); or	Nail each layer as follows: 32" o.c. at top and bottom and staggered.
		10d box (3" × 0.128"); or 3" × 0.131" nails; or 3" 14 gage staples 7/16" crown	24" o.c. face nail at top and bottom staggered on opposite sides
		And: 2-20d common (4" × 0.192"); or 3-10d box (3" × 0.128"); or 3-3" × 0.131" nails; or 4-3" 14 gage staples 7/16" crown	Face nail at ends and at each splice
28	Ledger strip supporting joists or rafters	4-16d box (3½" × 0.135"); or 3-16d common (3½" × 0.162"); or 4-10d box (3" × 0.128"); or 4-3" × 0.131" nails; or 3-3" 14 gage staples 7/16" crown	At each joist or rafter, face nail

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a, b, c}	SPACING AND LOCATION	
29	Bridging or blocking to joist, rafter or truss	2-10d box (3" × 0.128"), or 2-8d common (2½" × 0.131"; or 2-3" × 0.131") nails; or 2-3" 14 gage staples 7/16" crown	Each end, toe nail	
ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a, b, c}	SPACING OF FASTENERS	
			Edges (inches) ^b	Intermediate supports ^c (inches)
Wood structural panels, subfloor, roof and interior wall sheathing to framing and particleboard wall sheathing to framing [see Table R602.3(3) for wood structural panel exterior wall sheathing to wall framing]				
30	3/8" - 1/2"	6d common or deformed (2" × 0.113"); or 2 3/8" × 0.113" nail (subfloor, wall) 8d common (2½" × 0.131") nail (roof); or RSRS-01 (2 3/8" × 0.113") nail (roof)	6	12
		8d common (2½" × 0.131") nail (roof); or RSRS-01 (2 3/8" × 0.113") nail (roof)	6	12'
		2 3/8" × 0.113" (roof)	4	8
31	19/32" - 4" 3/4"	8d common nail (2½" × 0.131"); or RSRS-01; (2 3/8" × 0.113") nail (roof)	6	12'
		2 3/8" × 0.113" (roof)	4	8
		deformed 2" × 0.113" (wall or subfloor)	6	12
32	4 1/8" 7/8" - 1 1/4"	10d common (3" × 0.148") nail; or 8d (2½" × 0.131") deformed nail	6	12
Other wall sheathing^a				
33	1/2" structural cellulosic fiberboard sheathing	1½" × 0.120" galvanized roofing nail, 7/16" head diameter, or 1¼" long 16 ga. staple with 7/16" or 1" crown	3	6
34	25/32" structural cellulosic fiberboard sheathing	1¾" × 0.120" galvanized roofing nail, 7/16" head diameter, or 1½" long 16	3	6

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a, b, c}	SPACING AND LOCATION	
		ga. staple with $\frac{7}{16}$ " or 1" crown		
35	$\frac{1}{2}$ " gypsum sheathing ^d	$1\frac{1}{2}$ " x 0.120 galvanized roofing nail, $\frac{7}{16}$ " head diameter; or 16 gage staple galvanized, $1\frac{1}{2}$ " long; $\frac{7}{16}$ " or 1" crown or $1\frac{1}{4}$ " screws, Type W or S	7	7
36	$\frac{5}{8}$ " gypsum sheathing ^d	$1\frac{3}{4}$ " x 0.120" galvanized roofing nail; $\frac{7}{16}$ " head diameter; or 16 gage staple galvanized, $1\frac{5}{8}$ " long; $\frac{7}{16}$ " or 1" crown; or $1\frac{5}{8}$ " screws, Type W or S	7	7
Wood structural panels, combination subfloor underlayment to framing				
37	$\frac{3}{4}$ " and less	deformed (2" x 0.113") or 6d deformed (2" x 0.120") nail; or 8d common (2 $\frac{1}{2}$ " x 0.131") nail	6	12
38	$\frac{7}{8}$ " - 1"	8d common (2 $\frac{1}{2}$ " x 0.131") nail; or deformed (2 $\frac{1}{2}$ " x 0.131"); or 8d deformed (2 $\frac{1}{2}$ " x 0.120") nail	6	12
39	$1\frac{1}{8}$ " - $1\frac{1}{4}$ "	10d common (3" x 0.148") nail; or deformed (2 $\frac{1}{2}$ " x 0.131"); or 8d deformed (2 $\frac{1}{2}$ " x 0.120") nail	6	12

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s; 1 ksi = 6.895 MPa.

a. Nails are smooth-common, box or deformed shanks except where otherwise stated. Nails used for framing and sheathing connections shall have minimum average bending yield strengths as shown: 80 ksi for shank diameter of 0.192 inch (20d common nail), 90 ksi for shank diameters larger than 0.142 inch but not larger than 0.177 inch, and 100 ksi for shank diameters of 0.142 inch or less.

b. Staples are 16 gage wire and have a minimum $\frac{7}{16}$ -inch on diameter crown width.

c. Nails shall be spaced at not more than 6 inches on center at all supports where spans are 48 inches or greater.

d. Four-foot by 8-foot or 4-foot by 9-foot panels shall be applied vertically.

e. Spacing of fasteners not included in this table shall be based on Table R602.3(2).

- f. For wood structural panel roof sheathing attached to gable end roof framing and to intermediate supports within 48 inches of roof edges and ridges, nails shall be spaced at 6 inches on center where the ultimate design wind speed is less than 130 mph and shall be spaced 4 inches on center where the ultimate design wind speed is 130 mph or greater but less than 140 mph.
- g. Gypsum sheathing shall conform to ASTM C1396 and shall be installed in accordance with GA 253. Fiberboard sheathing shall conform to ASTM C208.
- h. Spacing of fasteners on floor sheathing panel edges applies to panel edges supported by framing members and required blocking and at floor perimeters only. Spacing of fasteners on roof sheathing panel edges applies to panel edges supported by framing members and required blocking. Blocking of roof or floor sheathing panel edges perpendicular to the framing members need not be provided except as required by other provisions of this code. Floor perimeter shall be supported by framing members or solid blocking.
- i. Where a rafter is fastened to an adjacent parallel ceiling joist in accordance with this schedule, provide two toe nails on one side of the rafter and toe nails from the ceiling joist to top plate in accordance with this schedule. The toe nail on the opposite side of the rafter shall not be required.
- j. RSRS-01 is a Roof Sheathing Ring Shank nail meeting the specifications in ASTM F1667.

Reason: IRC Table R602.3(1) and IBC Table 2304.10.1 are essentially the same table in terms of structural connections. Although the connections are closely aligned, there are variations in the prescribed fastener in the

two tables. Some fasteners are prescribed in the IRC table and not in the IBC table and others are prescribed in the IBC table and not the IRC table. This proposal is written to harmonize the fasteners between the two tables. In addition, where additional information exists in one table and not the other, this too is being harmonized.

For connection # 2,6,18,19, 20 & 23 there was a code change proposal RB272-13 entered in by the American Wood Council for the 2015 IRC. The reference nail values for the nailing schedule were based on Reference Lateral Values and Reference Withdrawal values. All other connections in the table were based on Reference Lateral Design Values. In the 2018 NDS, the reference withdrawal values for stainless steel nails were tabulated in a new NDS table (12.2D). The withdrawal values for stainless steel are lower than the values for carbon steel (bright or galvanized) nails of equivalent diameters.

As such, the lower stainless steel withdrawal values combined with the publication date of the 2018 NDS and the 2015 code proposal date would indicate that the basis of the original code proposal is relevant to only carbon steel nails and not to stainless steel nails. The added note to these connections is to exclude stainless steel from these connections based on the lower withdrawal values.

Connection 1:

Added 14 gage staple from IBC 2304.10.1

Added Blocking Between Rafters or Truss not at the wall top plate to rafter or truss from IBC 2304.10.1

Added flat blocking to truss and web filler from IBC 2304.10.1

Connection 2:

Added note regarding stainless steel fasteners

Added 14 gage staples from IBC 2304.10.1

Connection 3, 5

Added 14 gage staples from IBC 2304.10.1

Connection 6

Added note regarding stainless steel fasteners

Added 14 gage staples from IBC 2304.10.1

Connections 7, 8, 9, 12, 13, 14, 15, 16, 17

Added 14 gage staples from IBC 2304.10.1

Connection 15

Changed fastener spacing and location description to match IBC 2304.10.1

Connection 18

Added note regarding stainless steel fasteners

Added 3" x 0.131" nails from IBC 2304.10.1

Added 14 gage staples from IBC 2304.10.1 and eliminated the 16 gage staple reference

Connections 19 & 20

Added note regarding stainless steel fasteners

Connection 21 & 22

Added 14 gage staples from IBC 2304.10.1

Connection 23

Added note regarding stainless steel fasteners

Connections 27, 28 & 29

Added 14 gage staples from IBC 2304.10.1

Connection 30:

The roof fasteners have been separated from the subfloor and wall fasteners for better clarification when reading

Connection 31:

Panel thickness range is changed to match the thickness range in the IBC.

Connection 32:

Panel thickness range is changed to match the thickness range in the IBC. Additionally, the description **8d** deformed (2½" x 0.131") in an incorrect description. ASTM F1667 does not have a classification for 8d deformed. The correct description is a deformed 2½" x 0.131" nail.

Connections 33 -34

The current nail descriptions are incomplete and missing a shank diameter. These changes match SDPWS

Connection 35-36

The current nail descriptions are incomplete and missing a shank diameter.

Connection 37:

Adding the deformed 2" x 0.113" nail will harmonize with the IBC table. A **6d** deformed 2" x 0.120" nail is not addressed in ASTM F1667. The correct description is a deformed 2" x 0.120" nail and should be used to avoid

confusion

Connection 38 & 39:

An **8d** deformed 2½" x 0.120 nail is not addressed in ASTM F1667. The correct description is a deformed 2½" x 0.120 nail and should be used to avoid confusion

Footnote b. deleted because of the addition of the 14 gage staples to the table

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The proposed changes should not change cost of construction as it harmonizes the fasteners between the IBC and IRC

Proposal # 3958

RB193-19

RB194-19

IRC@: TABLE R602.3(1), R602.7.5

Proponent: Paul Coats, representing American Wood Council (pcoats@awc.org)

2018 International Residential Code

Revise as follows:

TABLE R602.3(1)
FASTENING SCHEDULE

Portions of table not shown remain unchanged.

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a, b, c}	SPACING AND LOCATION
Wall			
12	Adjacent full-height stud to end of header	4-16d box (3 1/2" x 0.135"; or 3-16d common (3 1/2" x 0.162"); or 4-10d box (3" x 0.128"); or 4 - 3" x 0.131"	End nail

R602.7.5 Supports for headers. Headers shall be supported on each end with one or more jack studs or with approved framing anchors in accordance with Table R602.7(1) or R602.7(2). The full-height stud adjacent to each end of the header shall be end nailed to each end of the header in accordance with four-16d nails (3.5 inches x 0.135 inches Table R602.3(1)). The minimum number of full-height studs at each end of a header shall be in accordance with Table R602.7.5-R602.7.5.

Reason: This proposal makes no technical changes, but simply places the required nailing of the first full-height stud adjacent to the header into the fastening schedule table with the other structural connections, so it can be found more easily and to avoid correlation problems in the future. Additional full-height studs would be fastened to each other in accordance with row 8 of Table R602.3(1), "Stud to stud (not at braced wall panels)" or row 9, "Stud to stud and abutting studs at intersection wall corners (at braced wall panels)." The only change to Table R602.3(1) is the addition of a new row 12 and the renumbering of subsequent rows.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal does not change requirements but changes location of a requirement and adds options for nailing.

Proposal # 4274

RB194-19

RB195-19

IRC®: TABLE R602.3(1), ASTM Chapter 44 (New)

Proponent: Tim Earl, representing The Gypsum Association (tearl@gbhinternational.com)

2018 International Residential Code

Revise as follows:

**TABLE R602.3(1)
FASTENING SCHEDULE**

Portions of table not shown remain unchanged.

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a, b, c}	SPACING AND LOCATION	
ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a, b, c}	SPACING OF FASTENERS	
			Edges (inches) ^h	Intermediate supports ^{c, e} (inches)
Other wall sheathing ^g				
33	1/2" structural cellulosic fiberboard sheathing	1 1/2" galvanized roofing nail, 7/16" head diameter, or 1 1/4" long 16 ga. staple with 7/16" or 1" crown	3	6
34	25/32" structural cellulosic fiberboard sheathing	1 3/4" galvanized roofing nail, 7/16" head diameter, or 1 1/2" long 16 ga. staple with 7/16" or 1" crown	3	6
35	1/2" gypsum sheathing ^d	1 1/2" galvanized roofing nail; staple galvanized, 1 1/2" long; 1 1/4" screws, Type W or S	7	7
36	5/8" gypsum sheathing ^d	1 3/4" galvanized roofing nail; staple galvanized, 1 5/8" long; 1 5/8" screws, Type W or S	7	7

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s; 1 ksi = 6.895 MPa.

g. Gypsum sheathing shall conform to ASTM C1396 and shall be installed in accordance with GA 253 or ASTM C1280. Fiberboard sheathing shall conform to ASTM C208.

Add new standard(s) as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428

C1280-18: Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing

Reason: This adds the ASTM standard as an alternative to the GA (industry) standard for those who may wish to refer preferentially to the ASTM document. In practice there is no difference between the two documents.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This simply adds another referenced standard as an option, with no impact on cost.

Staff Analysis: The referenced standard, ASTM C1280-18, is currently referenced in other 2018 I-codes.

Proposal # 4021

RB195-19

RB196-19

IRC®: TABLE R602.3(1)

Proponent: James Smith, American Wood Council, representing American Wood Council (jsmith@awc.org)

2018 International Residential Code

Revise as follows:

**TABLE R602.3(1)
FASTENING SCHEDULE**

Portions of table not shown remain unchanged.

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a, b, c}	SPACING AND LOCATION	
ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a, b, c}	SPACING OF FASTENERS	
			Edges (inches) ^h	Intermediate supports ^{c, e} (inches)
Wood structural panels, subfloor, roof and interior wall sheathing to framing and particleboard wall sheathing to framing [see Table R602.3(3) for wood structural panel exterior wall sheathing to wall framing]				
30	$3/8'' - 1/2''$	6d common ($2'' \times 0.113''$) nail (subfloor, wall) ⁱ 8d common ($2\ 1/2'' \times 0.131''$) nail (roof); or RSRS-01 ($2\ 3/8'' \times 0.113''$) nail (roof) ^j	6 ^f	4 <u>6</u> ^f
31	$19/32'' - 1''$	8d common nail ($2\ 1/2'' \times 0.131''$); or RSRS-01; ($2\ 3/8'' \times 0.113''$) nail (roof) ^j	6 ^f	4 <u>6</u> ^f
32	$1\ 1/8'' - 1\ 1/4''$	10d common ($3'' \times 0.148''$) nail; or 8d ($2\ 1/2'' \times 0.131''$) deformed nail	6	12

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s; 1 ksi = 6.895 MPa.

f. For wood structural panel roof sheathing attached to gable end roof framing and to intermediate supports within 48 inches of roof edges and ridges, nails shall be spaced at ~~6~~ 4 inches on center where the ultimate design wind speed is less than 130 mph and shall be spaced ~~4~~ 6 inches on center where the ultimate design wind speed is 130 mph or greater but less than 140 mph; greater than 130 mph in Exposure B or greater than 110 mph in Exposure C.

Reason: AWC submitted two proposals on roof sheathing nailing last cycle, RB222-16 that included modifications for ASCE 7-16 wind loads and RB221-16 that included modifications for ASCE 7-10 wind loads. AWC requested disapproval of the ASCE 7-16 wind load version based on the approval of RB221-16 which updated roof sheathing nailing in Table R602.3(1) to ASCE 7-10 wind loads. AWC is now resubmitting a proposal to update roof sheathing nailing in Table R602.3(1) to be based on ASCE 7-16 wind loads and to agree with roof sheathing nailing in the 2018 Wood Frame Construction Manual. Wind uplift nailing requirements for common species of roof framing with specific gravities of 0.42 or greater (e.g. SPF, Hem-Fir) are the basis of the proposed nail spacing requirements in Table R602.3(1) to meet the wind uplift loading requirements per ASCE 7-16 without being overly complex in specification of roof sheathing nailing. The basic nailing proposed is 6" o.c. at panel edges and 6" o.c. at intermediate supports in the field of the panel. As shown in the boxed cells

of 2018 WFCM, Table 3.10A for the common case of roof framing spaced at 24 inches on center, nailing at intermediate supports in the interior portions of the roof is 6" o.c. for wind speeds within the scope of IRC. The 6" o.c. spacing is also appropriate for edge zones except where ultimate wind speeds equal or exceed 130 mph in Exposure B and 110 mph in Exposure C where 4" o.c. nailing is needed. These special cases are addressed by the proposed modification to footnote f.

Table 3.10A Roof Sheathing Attachment Requirements for Wind Loads (7/16", PANEL SG=0.50)



(Prescriptive Alternative to Table 3.10)

Wind Speed 3-second gust (mph) (See Figure 1.1)			90	95	100	105	110	115	120	130	140	150						
STRUCTURAL SHEATHING																		
Sheathing Location ¹	Rafter/Truss Framing Specific Gravity, G	Rafter/Truss Spacing (in.)	Maximum Nail Spacing for 8d Common Nails, or 10d Box Nails (in)															
			E	F	E	F	E	F	E	F	E	F	E	F	E	F	E	F
Interior Zone	0.49	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12
		16	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12
		19.2	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12
		24	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12
	0.42	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12
		16	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12
		19.2	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	6
		24	6	12	6	12	6	12	6	12	6	12	6	6	6	6	6	6
Perimeter Edge Zone	0.49	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12
		16	6	12	6	12	6	12	6	12	6	12	6	6	6	6	6	
		19.2	6	12	6	12	6	12	6	12	6	12	6	6	6	6	6	
		24	6	12	6	12	6	12	6	12	6	6	6	6	6	6	E	
	0.42	12	6	12	6	12	6	12	6	12	6	12	6	12	6	6	6	6
		16	6	12	6	12	6	12	6	12	6	6	6	6	6	6	6	
		19.2	6	12	6	12	6	12	6	12	6	6	6	6	6	6	4	4
		24	6	12	6	6	6	6	6	6	6	6	6	6	6	4	4	E
Gable Endwall Rake or Rake Truss with up to 9" Rake Overhang	0.49	-	6	6	6	6	6	6	6	6	6	6	6	6	6	6		
	0.42	-	6	6	6	6	6	6	6	6	6	6	6	6	6	4		
BOARD SHEATHING																		
Sheathing Size	Rafter/Truss Spacing (in.)	Minimum Number of 8d Common Nails Per Support ⁴																
1x6 or 1x8 Sheathing	12-19.2	2	2	2	2	2	2	2	2	2	2	2	2	2	2			
1x10 or Larger Sheathing	12-19.2	3	3	3	3	3	3	3	3	3	3	3	3	3	3			

- E - Nail spacing at panel edges (in.)
 - F - Nail spacing at intermediate supports in the panel field (in.)
- 1 For roof sheathing within 4 feet of the perimeter edge of the roof, including 4 feet on each side of the roof peak, the 4 foot perimeter edge shall be used.
 - 2 For wind speeds greater than 130 mph, blocking is required which transfers lateral load to two additional joists (3 joists total).
 - 3 See Table 3.10 for other fastener and sheathing combinations.
 - 4 Tabulated values for 8d common and 10d box nails are applicable to carbon steel nails (bright or galvanized).

Table 3.10A Roof Sheathing Attachment Requirements for Wind Loads (7/16", PANEL G=0.50)
(Prescriptive Alternative to Table 3.10)

Wind Speed 3-second gust (mph) (See Figure 1.1)			90	95	100	105	110	115	120	130	140	150								
			STRUCTURAL SHEATHING																	
Sheathing Location ¹	Rafter/Truss Framing Specific Gravity, G	Rafter/Truss Spacing (in.)	E	F	E	F	E	F	E	F	E	F	E	F	E	F	E	F		
			Maximum Nail Spacing for 8d Common Nails, or 10d Box Nails (in.)																	
Interior Zone	0.49	12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	
		16	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12
		19.2	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 6	6 6
	0.42	12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12
		16	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 6	6 6	6 6
		19.2	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 6	6 6	6 6	6 6	6 6
Perimeter Edge Zone	0.49	12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 6	6 6	6 6	6 6	6 6	
		16	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 6	6 6	6 6	6 6	6 6	6 6	
		19.2	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6
	0.42	12	6 12	6 12	6 12	6 12	6 12	6 12	6 12	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6
		16	6 12	6 12	6 6	6 6	6 6	6 6	6 12	6 6	6 6	6 6	6 6	6 6	6 6	6 6	4 4	4 4	4 4	4 4
		19.2	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	4 4	4 4	4 4	4 4	4 4
Gable Endwall Rake or Rake Truss with up to 9" Rake Overhang	0.49	-	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	4		
	0.42	-	6	6	6	6	6	6	6	6	4	4	4	4	4	4	4	3		

BOARD SHEATHING

Sheathing Size	Rafter/Truss Spacing (in.)	Minimum Number of 8d Common Nails Per Support ⁴										
1x6 or 1x8 Sheathing	12-19.2	2	2	2	2	2	2	2	2	2	2	2
1x10 or Larger Sheathing	12-19.2	3	3	3	3	3	3	3	3	3	3	3

- E - Nail spacing at panel edges (in.)
- F - Nail spacing at intermediate supports in the panel field (in.)
- 1 For roof sheathing within 4 feet of the perimeter edge of the roof, including 4 feet on each side of the roof peak, the 4 foot perimeter edge z shall be used.
- 2 For wind speeds greater than 130 mph, blocking is required which transfers lateral load to two additional joists (3 joists total).
- 3 See Table 3.10 for other fastener and sheathing combinations.
- 4 Tabulated values for 8d common and 10d box nails are applicable to carbon steel nails (bright or galvanized).

Cost Impact: The code change proposal will increase the cost of construction. The change in the spacing of the nails for the small portions of roofs will result in an increase in the cost due to the increased number of nails and the time to install them, but that cost should be negligible when considering the overall cost for the construction of a dwelling.

RB197-19

IRC: TABLE R602.3(2)

Proponent: Rick Allen, International Staple, Nail and Tool Association, representing International Staple, Nail and Tool Association (rallen@isanta.org)

2018 International Residential Code

Revise as follows:

**TABLE R602.3(2)
ALTERNATE ATTACHMENTS TO TABLE R602.3(1)**

Portions of table not shown remain unchanged.

NOMINAL MATERIAL THICKNESS (inches)	DESCRIPTION ^{a, b} OF FASTENER AND LENGTH (inches)	SPACING ^c OF FASTENERS	
		Edges (inches)	Intermediate supports (inches)
NOMINAL MATERIAL THICKNESS (inches)	DESCRIPTION ^{a, b} OF FASTENER AND LENGTH (inches)	Edges (inches)	Body of panel ^d (inches)
Floor underlayment; plywood-hardboard-particleboard ^f -fiber-cement ^h			
Fiber-cement			
1/4	3d, 1-1/4" x 0.099" corrosion-resistant, ring shank nails (finished flooring other than tile)	3	6
	Staple 18 ga., 7/8 long, 1/4 crown (finished flooring other than tile)	3	6
	1 1/4 long x .121 shank x .375 head diameter corrosion-resistant (galvanized or stainless steel) roofing nails (for tile finish)	8	8
	1 1/4 long, No. 8 x .375 head diameter, ribbed wafer-head screws(for tile finish)	8	8
Hardboard ^f			
0.200	1 1/2 x 0.080" long ring-grooved-shank underlayment nail	6	6
	4d 1 3/8" x 0.080" polymer cement-coated sinker nail	6	6
	Staple 18 ga., 7/8 long (plastic coated)	3	6
Particleboard			
1/4	4d 1 1/2" x 0.099" ring-grooved shank underlayment nail	3	6
	Staple 18 ga., 7/8 long, 3/16 crown	3	6
3/8	6d 2" x 0.120" ring-grooved shank underlayment nail	6	10
	Staple 16 ga., 1 1/8 long, 3/8 crown	3	6
1/2, 5/8	6d 2" x 0.120" ring-grooved shank underlayment nail	6	10
	Staple 16 ga., 1 5/8 long, 3/8 crown	3	6

For SI: 1 inch = 25.4 mm.

- a. Nail is a general description and shall be permitted to be T-head, modified round head or round head.
- b. Staples shall have a minimum crown width of $7/16$ -inch ~~on diameter~~ except as noted.
- c. Nails or staples shall be spaced at not more than 6 inches on center at all supports where spans are 48 inches or greater. Nails or staples shall be spaced at not more than 12 inches on center at intermediate supports for floors.
- d. Fasteners shall be placed in a grid pattern throughout the body of the panel.
- e. For 5-ply panels, intermediate nails shall be spaced not more than 12 inches on center each way.
- f. Hardboard underlayment shall conform to CPA/ANSI A135.4
- g. Specified alternate attachments for roof sheathing shall be permitted where the ultimate design wind speed is less than 130 mph. Fasteners attaching wood structural panel roof sheathing to gable end wall framing shall be installed using the spacing listed for panel edges.
- h. Fiber-cement underlayment shall conform to ASTM C1288 or ISO 8336, Category C.

Reason: Under Floor Underlayment - Fiber Cement - 1/4 thick

The description '3d' does not describe an actual length and shank diameter of the nail. These dimensions have been added to provide the requirements of the nails.

Under Floor Underlayment - Hardboard - .200 thick

a 1½ long ring grooved underlayment nail is an incomplete and incorrect description. A shank diameter needs to be provided and per ASTM F1667 a diameter of 0.080 is provided, which matches the diameter of the sinker nail on the second line of the table. The term "ring-grooved" should read "ring shank" to be consistent with other descriptions in the code.

a 4d sinker nail is 1³/₈" long x 0.080" shank diameter. Providing dimensions of 1³/₈ x 0.080" will be consistent with other descriptions in the code. The term "cement" coated has been removed from ASTM F1667 and replaced with "polymer" coated

Under Floor Underlayment - Particle board - all three material thickness, the terms 4d and 6d underlayment nail are not referenced in ASTM F1667 and the descriptions do not provide dimensional requirements for the nails. The correct designation is 1½" x 0.099" and 2" x 0.120" respectively. The term ring-grooved should read ring shank to be consistent with other descriptions in the code.

Footnote b., staple crowns are not "on diameter". Simply stating the crown width is corrects.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. These changes just provide clarity to incorrect or incomplete descriptions and do not affect the cost of construction.

Proposal # 3883

RB197-19

RB198-19

IRC®: TABLE R602.3(2)

Proponent: James Smith, American Wood Council, representing American Wood Council (jsmith@awc.org)

2018 International Residential Code

TABLE R602.3(2)
ALTERNATE ATTACHMENTS TO TABLE R602.3(1)

Portions of table not shown remain unchanged.

NOMINAL MATERIAL THICKNESS (inches)	DESCRIPTION ^{a, b} OF FASTENER AND LENGTH (inches)	SPACING ^c OF FASTENERS	
		Edges (inches)	Intermediate supports (inches)
Wood structural panels subfloor, roof^g and wall sheathing to framing and particleboard wall sheathing to framing^f			
Up to 1/2	Staple 15 ga. 1 ³ / ₄	4	8
	0.097 - 0.099 Nail 2 ¹ / ₄	3	6
	Staple 16 ga. 1 ³ / ₄	3	6
19/32 and 5/8	0.113 Nail 2	3	6
	Staple 15 and 16 ga. 2	4	8
	0.097 - 0.099 Nail 2 ¹ / ₄	4	8
23/32 and 3/4	Staple 14 ga. 2	4	8
	Staple 15 ga. 1 ³ / ₄	3	6
	0.097 - 0.099 Nail 2 ¹ / ₄	4	8
	Staple 16 ga. 2	4	8
1	Staple 14 ga. 2 ¹ / ₄	4	8
	0.113 Nail 2 ¹ / ₄	3	6
	Staple 15 ga. 2 ¹ / ₄	4	8
	0.097 - 0.099 Nail 2 ¹ / ₂	4	8

For SI: 1 inch = 25.4 mm.

- Nail is a general description and shall be permitted to be T-head, modified round head or round head.
- Staples shall have a minimum crown width of 7/16-inch on diameter except as noted.
- Nails or staples shall be spaced at not more than 6 inches on center at all supports where spans are 48 inches or greater. Nails or staples shall be spaced at not more than 12 inches on center at intermediate supports for floors.
- Fasteners shall be placed in a grid pattern throughout the body of the panel.
- For 5-ply panels, intermediate nails shall be spaced not more than 12 inches on center each way.
- Hardboard underlayment shall conform to CPA/ANSI A135.4
- ~~Specified alternate attachments for roof sheathing shall be permitted where~~ Where the ultimate design wind speed is less than 130 mph. ~~Fasteners attaching wood structural panel roof~~

sheathing to gable end wall framing shall be installed using the spacing listed for panel edges. or equal to 110 mph, roof sheathing attachment using the specified alternate fasteners shall be permitted where fasteners are installed 3 inches on center at all supports.

- h. Fiber-cement underlayment shall conform to ASTM C1288 or ISO 8336, Category C.

Reason: The proposed revision to footnote g is intended to update the alternative fastening to uplift loading requirements per ASCE 7-16 without being overly complex in specification of roof sheathing attachment schedules. The reference calculation leading to use of 3" o.c. spacing at all locations is based on the 0.099" diameter and 0.113" diameter nail shank withdrawal from wood framing with specific gravity equal to 0.42 and pre-calculated wind uplift loads in WFCM Table 3.10. The use of a single 3" spacing at all supports was extended to staples based on the assumption that the ASCE 7-16 load increase would similarly require reduced spacing. This assumption was applied to staples because a withdrawal value is not available for staples in the NDS.

Cost Impact: The code change proposal will increase the cost of construction. The reduced spacing of fasteners to meet wind uplift loading will increase cost of construction, but given the increase only applies to the roof, that cost increase should be negligible when considering the overall cost for the construction of a dwelling.

Proposal # 5529

RB198-19

RB199-19

IRC: R602.10.1.2

Proponent: Kelly Cobeen, representing self (KCobeen@wje.com)

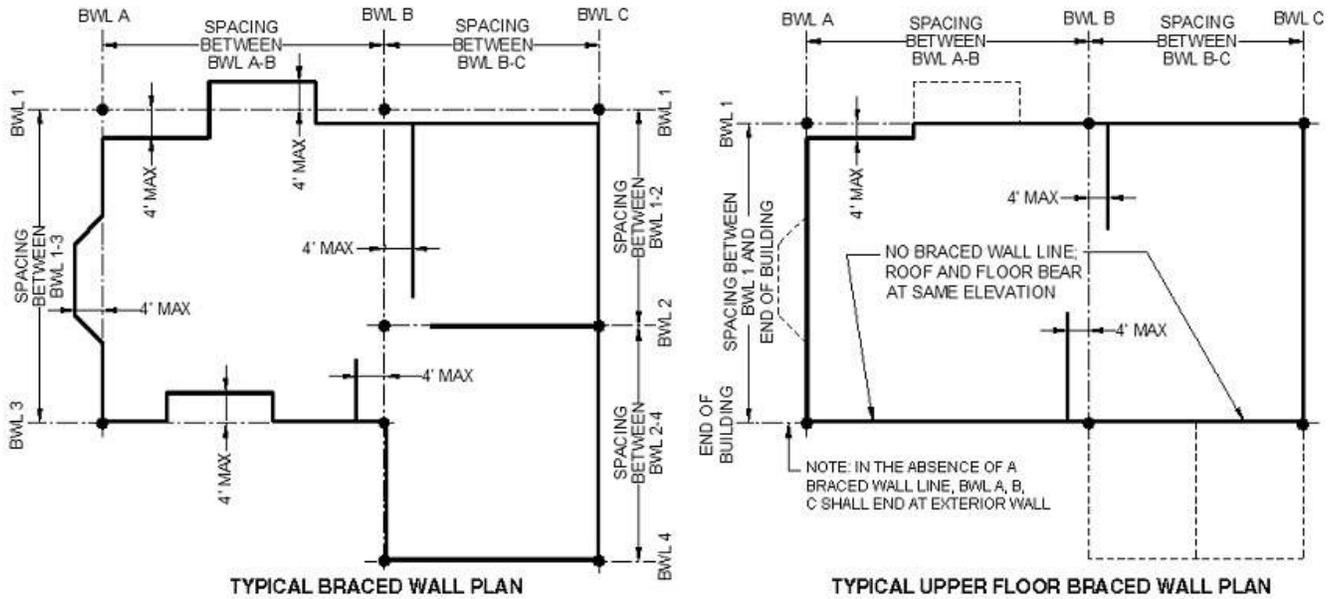
2018 International Residential Code

Revise as follows:

R602.10.1.2 ~~Offsets along a~~ Location of braced wall line- lines and permitted offsets. Where braced wall panels along a braced wall line fall in a single line, the braced wall line shall be located at those braced wall panels. Where braced wall panels are offset out of plane, the braced wall line shall be located at or between the braced wall panels, and the braced wall line shall not be located outboard or inboard of all the braced wall panels in that braced wall line. Where 2/3 or more of the length of braced wall panels in a braced wall line fall in a single line, the braced wall line shall be located at those braced wall panels; or the braced wall line shall be located at the centroid of the braced wall panels, as seen in Figure R602.10.1.1. Exterior braced wall panels parallel to a *braced wall line* shall be offset not more than 4 feet (1219 mm) from the designated *braced wall line* location as shown in Figure R602.10.1.1.

Exterior walls parallel to a *braced wall line* shall be offset not more than 4 feet (1219 mm) from the designated *braced wall line* location as shown in Figure R602.10.1.1.

Interior walls used as bracing shall be offset not more than 4 feet (1219 mm) from a *braced wall line* through the interior of the building as shown in Figure R602.10.1.1.



For SI: 1 foot = 304.8 mm.

**FIGURE R602.10.1.1
BRACED WALL LINES**

Reason: Over a series of cycles, changes to the IRC Section R602.10 wall bracing provisions have caused some of the important concepts fundamental to the development of the bracing provisions to be lost. This was highlighted in a recent request for interpretation of the location of braced wall lines relative to exterior walls. Going back to the 2006 IRC, and previous IRC and legacy codes, braced wall panels were required at the exterior walls, and additional interior braced wall panels and lines were required when needed to meet braced wall line spacing requirements. The concept that exterior walls are to be braced appears to not be specifically stated in the IRC from the 2009 edition forward. With this concept not included, these provisions are lacking specific requirements as to where the braced wall lines are to be located.

This proposal fills this gap by adding discussion of the location of braced wall lines relative to the braced wall panels. The current provisions discussing the location of braced wall lines relative to exterior walls are retained as these will control permitted locations of exterior walls if other than at the braced wall panels.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal is editorial to clarify the intent of the current provisions.

Proposal # 5272

RB199-19

RB200-19

IRC®: R602.10.2.2, R602.10.2.2.1

Proponent: Randy Shackelford, Simpson Strong-Tie Co., representing Simpson Strong-Tie Co.
(rshackelford@strongtie.com)

2018 International Residential Code

Revise as follows:

R602.10.2.2 Locations of braced wall panels. A braced wall panel shall begin within 10 feet (3810 mm) from each end of a braced wall line as determined in Section R602.10.1.1. The distance between adjacent edges of braced wall panels along a braced wall line shall be not greater than 20 feet (6096 mm) as shown in Figure R602.10.2.2.

Exceptions:

1. Braced wall panels in Seismic Design Categories D₀, D₁, and D₂ shall comply with Section R602.10.2.2.1.
2. Braced wall panels with continuous sheathing in Seismic Design Categories A, B, or C shall comply with Section R602.10.7.

R602.10.2.2.1 Location of braced wall panels in Seismic Design Categories ~~D₀~~, D₁ and D₂. Braced wall panels shall be located at each end of a braced wall line.

~~Exception~~ Exceptions:

1. Braced wall panels constructed of Method WSP or BV-WSP and continuous sheathing methods as specified in Section R602.10.4 shall be permitted to begin not more than 10 feet (3048 mm) from each end of a braced wall line provided that each end complies with one of the following:

- ~~1.1.~~ A minimum 24-inch-wide (610 mm) panel for Methods WSP, CS-WSP, CS-G and CS-PF is applied to each side of the building corner as shown in End Condition 4 of Figure R602.10.7.
- ~~1.2.~~ The end of each braced wall panel closest to the end of the braced wall line shall have an 1,800 lb (8 kN) hold-down device fastened to the stud at the edge of the braced wall panel closest to the corner and to the foundation or framing below as shown in End Condition 5 of Figure R602.10.7.

2. Braced wall panels constructed of Method PFH or ABW, or of Method BV-WSP where a hold-down is provided in accordance with Table R602.10.6.5, shall be permitted to begin not more than 10 feet from each end of a braced wall line.

Reason: The goal of this code change is to resolve conflicts in the code and prevent confusion on how to interpret this section.

This section deals with placement of braced wall panels on a wall. The main requirement is that the panel can be placed up to 10 feet from the wall. But there are two exceptions. One is the SDC D₀, D₁, and D₂ requirements of the next section, and the other are the continuous sheathing requirements that are located pages and pages away in the code. Since they conflict, it make sense to combine them into one section so that they work together. By adding the exceptions, it clarifies in which case each of the rules on corner panels is to be applied.

The second part of this change is to clarify the exception in R602.10.2.2.1 for bracing in Seismic Design Categories D0, D1, and D2. Braced wall panels are allowed to be located up to 10 feet from the corner when the braced wall panel has an 1800 pound hold-down. There are certain kinds of braced wall panels that already have a hold-down of this capacity or higher. ABW has a minimum of an 1800 pound hold-down required, and PFH has a 3500 pound hold-down required. Also, most cases of BW-WSP require a hold-down with a capacity in excess of 1800 pounds. However, there is one case where BV-WSP does not require a hold-down, to that is taken into account here by adding the wording "where a hold-down is provided in accordance with Table R602.10.6.5."

The purpose of the corner panels or hold-downs in this section is to restrain the first braced wall panel from overturning, either by having it located at a corner, or by providing a hold-down. These braced wall panel methods that already have the hold-down are restrained from overturning so they can be located away from the corner.

This change also attempts to answer the question that arises sometimes of whether the capacity of the hold-down of an ABW, PFH, or BV-WSP needs to be increased by 1800 pounds when it is located up to 10 feet from a corner. The intent is for the ABW, PFH, or BV-WSP to be adequate as specified. That is why they are broken out into a second exception.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The goal of this change is just to clarify the code. No additional requirements are added.

Proposal # 5168

RB200-19

RB201-19

IRC@: TABLE R602.10.3(2), TABLE R602.10.3(4)

Proponent: Ralph Leyva, APA- The Engineered Wood Assoc, representing APA- The Engineered Wood Assoc (ralph.leyva@apawood.org); Borjen Yeh, representing APA - The Engineered Wood Association (borjen.yeh@apawood.org)

2018 International Residential Code

Revise as follows:

TABLE R602.10.3(2)

WIND ADJUSTMENT FACTORS TO THE REQUIRED LENGTH OF WALL BRACING

Portions of table not shown remain unchanged.

ITEM NUMBER	ADJUSTMENT BASED ON	STORY/SUPPORTING	CONDITION	ADJUSTMENT FACTOR ^a , ^b [multiply length from Table R602.10.3(1) by this factor]	APPLICABLE METHODS
8	Horizontal blocking	Any story	Horizontal block is omitted	2.0	WSP, SFB , PBS , HPS , CS-WSP

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound = 4.48 N.

- a. Linear interpolation shall be permitted.
- b. The total adjustment factor is the product of all applicable adjustment factors.
- c. The adjustment factor is permitted to be 1.0 when determining bracing amounts for intermediate braced wall lines provided the bracing amounts on adjacent braced wall lines are based on a spacing and number that neglects the intermediate braced wall line.
- d. The same adjustment factor shall be applied to all braced wall lines on all floors of the structure, based on the worst-case exposure category.

TABLE R602.10.3(4)

SEISMIC ADJUSTMENT FACTORS TO THE REQUIRED LENGTH OF WALL BRACING

Portions of table not shown remain unchanged.

ITEM NUMBER	ADJUSTMENT BASED ON	STORY	CONDITION	ADJUSTMENT FACTOR ^a , ^b [Multiply length from Table R602.10.3(3) by this factor]	APPLICABLE METHODS
10	Horizontal blocking	Any story	Horizontal blocking omitted	2.0	WSP, SFB , PBS , HPS , CS-WSP

For SI: 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

- a. Linear interpolation shall be permitted.
- b. The total length of bracing required for a given wall line is the product of all applicable adjustment factors.

- c. The length-to-width ratio for the floor/roof diaphragm shall not exceed 3:1.
- d. Applies to stone or masonry veneer exceeding the first story height.
- e. The adjustment factor for stone or masonry veneer shall be applied to all exterior braced wall lines and all braced wall lines on the interior of the building, backing or perpendicular to and laterally supporting veneered walls.
- f. See Section R602.10.6.5 for requirements where stone or masonry veneer does not exceed the first-story height.

Reason: While the current adjustment factor is based on blocked and unblocked full-scale wood structural panel testing, it is only logical that other panel products, including SFB, PBS, and HPS, would respond to the same nailing omissions. It is also reasonable to conclude that these other panel products would be equally affected by omitting panel blocking at horizontal joints. As it stands, the SFB, PBS, and HPS can be used without horizontal blocking and do not need to take the same reduction as wood structural panels. This is not supported by testing or common sense, is not conservative, and needs to be updated. This code change adds SFB, PBS, and HPS to both wind and seismic adjustment tables.

Cost Impact: The code change proposal will increase the cost of construction. This code change could increase the cost of construction when using the SFB, HPS, and PBS products as it requires additional nailing and blocking at horizontal panel joints. It does however clarify the intent of the code over a wider range of panel products, common or otherwise.

Proposal # 4697

RB201-19

RB202-19

IRC®: TABLE R602.10.3(3)

Proponent: Kelly Cobeen, representing self (KCobeen@wje.com)

2018 International Residential Code

Revise as follows:

**TABLE R602.10.3(3)
BRACING REQUIREMENTS BASED ON SEISMIC DESIGN CATEGORY**

Portions of table not shown remain unchanged.

<ul style="list-style-type: none"> • SOIL CLASS D^b • WALL HEIGHT = 10 FEET • 10 PSF FLOOR DEAD LOAD • 15 PSF ROOF/CEILING DEAD LOAD • BRACED WALL LINE SPACING ≤ 25 FEET 			MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE^{a, f}				
Seismic Design Category ^b	Story Location	Braced Wall Line Length (feet) ^c	Method LIB ^d	Method GB	Methods DWB, SFB, PBS, PCP, HPS, CS-SFB ^e	Method WSP	Methods CS-WSP, CS-G, CS-PF

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

NP = Not Permitted.

- a. Linear interpolation shall be permitted.
- b. ~~Wall bracing lengths are based on a soil site class "D."~~ Interpolation of bracing length between the S_{ds} values associated with the seismic design categories shall be permitted when a site-specific S_{ds} value is determined in accordance with Section 1613.2 of the International Building Code.
- c. Where the braced wall line length is greater than 50 feet, braced wall lines shall be permitted to be divided into shorter segments having lengths of 50 feet or less, and the amount of bracing within each segment shall be in accordance with this table.
- d. Method LIB shall have gypsum board fastened to not less than one side with nails or screws in accordance with Table R602.3(1) for exterior sheathing or Table R702.3.5 for interior gypsum board. Spacing of fasteners at panel edges shall not exceed 8 inches.
- e. Methods PFG and CS-SFB do not apply in Seismic Design Categories D₀, D₁ and D₂.
- f. Where more than one bracing method is used, mixing methods shall be in accordance with Section R602.10.4.1.

Reason: As of the last code update cycle, the Seismic Design Categories were no longer based exclusively on

site class D, so this statement is in error. Because it is not needed for application of the provisions, this statement can be deleted. It is still permitted to determine Seismic Design Category per the provisions of the IBC, so footnote b is retained and is now referenced from the top of the Seismic Design Category column.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal is an editorial clarification of existing provisions and has no cost impact.

Proposal # 5273

RB202-19

RB203-19

IRC®: TABLE R602.10.3(3)

Proponent: Randy Shackelford, representing Simpson Strong-Tie Co. (rshackelford@strongtie.com)

2018 International Residential Code

Revise as follows:

TABLE R602.10.3(3)
BRACING REQUIREMENTS BASED ON SEISMIC DESIGN CATEGORY

Portions of table not shown remain unchanged.

• SOIL CLASS D ^b • WALL HEIGHT = 10 FEET• 10 PSF FLOOR DEAD LOAD• 15 PSF ROOF/CEILING DEAD LOAD• BRACED WALL LINE SPACING ≤ 25 FEET			MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE ^{a, f}				
Seismic Design Category	Story Location	Braced Wall Line Length (feet) ^c	Method LIB ^d	Method GB	Methods DWB, SFB, PBS, PCP, HPS, CS-SFB ^e	Methods WSP, PFH, PFG ^e , and ABW	Methods CS-WSP, CS-G, CS-PF

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

NP = Not Permitted.

- a. Linear interpolation shall be permitted.
- b. Wall bracing lengths are based on a soil site class “D.” Interpolation of bracing length between the S_{ds} values associated with the seismic design categories shall be permitted when a site-specific S_{ds} value is determined in accordance with Section 1613.2 of the International Building Code.
- c. Where the braced wall line length is greater than 50 feet, braced wall lines shall be permitted to be divided into shorter segments having lengths of 50 feet or less, and the amount of bracing within each segment shall be in accordance with this table.
- d. Method LIB shall have gypsum board fastened to not less than one side with nails or screws in accordance with Table R602.3(1) for exterior sheathing or Table R702.3.5 for interior gypsum board. Spacing of fasteners at panel edges shall not exceed 8 inches.
- e. Methods PFG and CS-SFB do not apply in Seismic Design Categories D0, D1 and D2.
- f. Where more than one bracing method is used, mixing methods shall be in accordance with Section R602.10.4.1.

Reason:

Last cycle, the tables for Bracing Requirements Based on Wind Speed and Bracing Requirements Based on Seismic Design Category were revised so that they included all the permissible bracing methods. For some reason, three permissible bracing methods were left off of Table R602.10.3(3). So we are proposing to add methods ABW, PFH, and PFG in to the table in the WSP column heading. ABW, PFH, and PFG are intermittent bracing methods that have amounts of bracing based on their equivalency to a WSP braced wall panel.

Note that Method PFG is only permitted in Seismic Design Categories A, B, and C per Section R602.10.6, but footnote e already reflects that. so the only action needed is to add the reference to footnote e. This method has to be listed because there are also requirements for Townhouses in SDC C in this table.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal is meant to only clarify that Braced Wall Panel methods ABW, PFH, and PFG are permitted to be used in SDC C townhomes and that ABW and PFH are permitted to be used in Seismic Design Categories D0, D1, and D2. If anything, there could be a decrease in cost if builders were able to use a more economical method because of this clarification.

Proposal # 5106

RB203-19

RB204-19

IRC@: TABLE R602.10.3(3), TABLE R602.10.3(4), TABLE R602.10.6.5

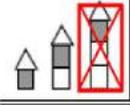
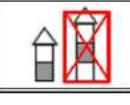
Proponent: Kelly Cobeen, Wiss Janney Elstner Associates, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (KCobeen@wje.com); Julie Furr, Rimkus Consulting Group, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (jfurr@rimkus.com); Michael Mahoney, representing Federal Emergency Management Agency (mike.mahoney@fema.dhs.gov)

2018 International Residential Code

Revise as follows:

TABLE R602.10.3(3)
BRACING REQUIREMENTS BASED ON SEISMIC DESIGN CATEGORY

Portions of table not shown remain unchanged.

• SOIL CLASS D ^b • WALL HEIGHT = 10 FEET• 10 PSF FLOOR DEAD LOAD• 15 PSF ROOF/ CEILING DEAD LOAD• BRACED WALL LINE SPACING ≤ 25 FEET			MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE ^{a, f}				
Seismic Design Category	Story Location	Braced Wall Line Length(feet) ^c	Method LIB ^d	Method GB	MethodsD WB, SFB, PBS, PCP, HPS, CS-SFB ^e	Method WSP	Methods CS-WSP, CS-G, CS-PF
D ₂		10	NP	4.0	4.0	2.5	2.1
		20	NP	8.0	8.0	5.0	4.3
		30	NP	12.0	12.0	7.5	6.4
		40	NP	16.0	16.0	10.0	8.5
		50	NP	20.0	20.0	12.5	10.6
		10	NP	7.5	7.5	5.5	4.7
		20	NP	15.0	15.0	11.0	9.4
		30	NP	22.5	22.5	16.5	14.0
		40	NP	30.0	30.0	22.0	18.7
		50	NP	37.5	37.5	27.5	23.4
		10	NP	NP	NP	NP	NP
		20	NP	NP	NP	NP	NP
		30	NP	NP	NP	NP	NP
		40	NP	NP	NP	NP	NP
		50	NP	NP	NP	NP	NP
	Cripple wall below one- or two-story dwelling	10	NP	NP	NP	7.5	6.4
		20	NP	NP	NP	15.0	12.8
		30	NP	NP	NP	22.5	19.1
		40	NP	NP	NP	30.0	25.5
		50	NP	NP	NP	37.5	31.9

g. One- and two-family dwellings in Seismic Design Category D₂ exceeding two stories shall be designed in accordance with accepted engineering practice.

TABLE R602.10.3(4)
SEISMIC ADJUSTMENT FACTORS TO THE REQUIRED LENGTH OF WALL BRACING

ITEM NUMBER	ADJUSTMENT BASED ON	STORY ^a	CONDITION	ADJUSTMENT FACTOR ^{a, b} [Multiply length from Table R602.10.3(3) by this factor]	APPLICABLE METHODS
1	Story height (Section 301.3)	Any story	≤ 10 feet	1.0	All methods
			> 10 feet and ≤ 12 feet	1.2	
2	Braced wall linespacing, townhouses in SDC C	Any story	≤ 35 feet	1.0	
			> 35 feet and ≤ 50 feet	1.43	
3	Braced wall linespacing, in SDC D ₀ , D ₁ , D ₂ ^c	Any story	> 25 feet and ≤ 30 feet	1.2	
			> 30 feet and ≤ 35 feet	1.4	
4	Wall dead load	Any story	> 8 psf and < 15 psf	1.0	
			< 8 psf	0.85	
5	Roof/ceiling dead load for wall supporting	1-, 2- or 3-story building	≤ 15 psf	1.0	
		2- or 3-story building	> 15 psf and ≤ 25 psf	1.1	

		1-story building or top story	> 15 psf and ≤ 25 psf	1.2	
6	Walls with stone masonry veneer, townhouses in SDCC ^{d, e}			1.0	All methods
				1.5	
				1.5	
7	Walls with stone masonry veneer, detached one- and two-family dwellings in SDC D ₀ – D ₂ ^{d, f}	Any story	See Table R602.10.6.5		BV-WSP
8	Walls with stone masonry veneer, detached one- and two-family dwellings in SDC D ₀ – D ₂ ^{d, f}	First and second story of two-story dwelling	See Table R602.10.6.5	1.2	WSP, CS-WSP
9	Interior gypsum board finish (or equivalent)	Any story	Omitted from inside face of braced wall panels	1.5	DWB, WSP, SFB, PBS, PCP, HPS, CS-WSP, CS-G, CS-SFB
10	Horizontal blocking	Any story	Horizontal blocking omitted	2.0	WSP, CS-WSP

For SI: 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

- a. Linear interpolation shall be permitted.
- b. The total length of bracing required for a given wall line is the product of all applicable adjustment factors.
- c. The length-to-width ratio for the floor/roof diaphragm shall not exceed 3:1.
- d. Applies to stone or masonry veneer exceeding the first story height.
- e. The adjustment factor for stone or masonry veneer shall be applied to all exterior braced wall lines and all braced wall lines on the interior of the building, backing or perpendicular to and laterally supporting veneered walls.
- f. See Section R602.10.6.5 for requirements where stone or masonry veneer does not exceed the first-story height.
- g. One- and two-family dwellings in Seismic Design Category D₂ exceeding two stories shall be designed in accordance with accepted engineering practice.

**TABLE R602.10.6.5
METHOD BV-WSP WALL BRACING REQUIREMENTS**

Portions of table not shown remain unchanged.

SEISMIC DESIGN CATEGORY	STORY	BRACED WALL LINE LENGTH (FEET)					SINGLE-STORY HOLD-DOWN FORCE (pounds) ^a _b	CUMULATIVE HOLD-DOWN FORCE (pounds) _c
		10	20	30	40	50		
		Minimum Total Length (feet) of Braced Wall Panels Required Along each Braced Wall Line						
D ₂ ^a	Edit figure by deleting 3-story stack	5.5	11.0	16.5	22.0	27.5	2300	—
	Edit figure by deleting 3-story stack	5.5	11.0	16.5	22.0	27.5	3900	6200
	Delete figure and replace with "Three-story dwelling"	NP	NP	NP	NP	NP	NA	NA

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.479 kPa, 1 pound-force = 4.448 N.
NP = Not Permitted.

NA = Not Applicable.

a. One- and two-family dwellings in Seismic Design Category D₂ exceeding two stories shall be designed in accordance with accepted engineering practice.

~~a.~~ b. Hold-down force is minimum allowable stress design load for connector providing uplift tie from wall framing at end of braced wall panel at the noted story to wall framing at end of braced wall panel at the story below, or to foundation or foundation wall. Use single-story hold-down force where edges of braced wall panels do not align; a continuous load path to the foundation shall be maintained.

~~b.~~ c. Where hold-down connectors from stories above align with stories below, use cumulative hold-down force to size middle- and bottom-story hold-down connectors.

Reason: Table R602.10.3(3): This proposal is editorial. Table symbols are modified to clarify intent and for consistency with modifications proposed to Table R602.10.6.5, as discussed in the reason for Part 3. A footnote is added to call the designer's attention to the existing limitation.

Table R602.10.3(4): This proposal is editorial. A footnote is added to call the designer's attention to the existing limitation in a location that benefits the user.

Table R602.10.6.5: This is an editorial clarification of existing provisions. The proposed modification to the table symbols clarifies that in SDC D₂ these bracing provisions are only applicable to one- and two-story dwellings. This proposal is prompted by comment from the Brick Industry Association that the table may be mistakenly interpreted to permit prescriptive bracing of dwellings with veneer in the second and third stories of three story buildings. The original intent and justification for the provisions, however, only permitted use with one- and two-story dwellings, as demonstrated by the historical description that follows.

The BV-WSP bracing provisions were brought into the IRC in the 2006 Edition as a collaborative effort involving BIA and FEMA/BSSC-CRSC, among others. The justification included engineering calculations to support the bracing requirements and hold-down forces. Because of this basis and the seismic forces calculated, prescriptive bracing requirements in SDC D₂ were limited to one- and two-story dwellings. The proposed modification will make clear this intent.

The following is as adopted in the 2006 IRC.

TABLE R703.7(2)
STONE OR MASONRY VENEER LIMITATIONS AND REQUIREMENTS, ONE- AND TWO-FAMILY DETACHED DWELLINGS, WOOD FRAMING, SEISMIC DESIGN CATEGORIES D₀, D₁, AND D₂

SEISMIC DESIGN CATEGORY	NUMBER OF WOOD FRAMED STORIES ^a	MAXIMUM HEIGHT OF VENEER ABOVE NONCOMBUSTIBLE FOUNDATION OR FOUNDATION WALL (feet)	MAXIMUM NOMINAL THICKNESS OF VENEER (inches)	MAXIMUM WEIGHT OF VENEER (psf) ^b	WOOD FRAMED STORY	MINIMUM SHEATHING AMOUNT (percent of braced wall line length) ^c	MINIMUM SHEATHING THICKNESS AND FASTENING	SINGLE STORY HOLD DOWN FORCE (lb) ^d	CUMULATIVE HOLD DOWN FORCE (lb) ^d
D ₀	1	20 ^f	4	40	1 only	35	7/16-inch wood structural panel sheathing with 8d common nails spaced at 4 inches on center at panel edges, 12 inches on center at intermediate supports. 8d common nails at 4 inches on center at braced wall panel end posts with hold down attached.	N/A	—
	2	20 ^f	4	40	top	35		1900	—
					bottom	45		3200	5100
	3	30 ^f	4	40	top	40		1900	—
					middle	45		3500	5400
					bottom	60		3500	8900
D ₁	1	20 ^f	4	40	1 only	45	2100	—	
	2	20 ^f	4	40	top	45	2100	—	
					bottom	45	3700	5800	
	3	20 ^f	4	40	top	45	2100	—	
					middle	45	3700	5800	
					bottom	60	3700	9500	
D ₂	1	20 ^f	3	30	1 only	55	2300	—	
	2	20 ^f	3	30	top	55	2300	—	
					bottom	55	3900	6200	

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.479 kPa, 1 pound-force = 4.448 N.

- a. Cripple walls are not permitted in Seismic Design Categories D₀, D₁ and D₂.
- b. Maximum weight is installed weight and includes weight of mortar, grout and lath, and other materials used for installation.
- c. Applies to exterior and interior braced wall lines.
- d. Hold down force is minimum allowable stress design load for connector providing uplift tie from wall framing at end of braced wall panel at the noted story to wall framing at end of braced wall panel at the story below, or to foundation or foundation wall. Use single story hold down force where edges of braced wall panels do not align; a continuous load path to the foundation shall be maintained. [See Figure R703.7(1)(b)].
- e. Where hold down connectors from stories above align with stories below, use cumulative hold down force to size middle and bottom story hold down connectors. [See Figure R703.7(1)(a)].
- f. The veneer shall not exceed 20 feet in height above a noncombustible foundation, with an additional 8 feet permitted for gable end walls, or 30 feet in height with an additional 8 feet for gable end walls where the lower 10 feet has a backing of concrete or masonry wall. See also story height limitations of Section R301.3.
- g. The veneer shall not exceed 30 feet in height above a noncombustible foundation, with an additional 8 feet permitted for gable end walls. See also story height limitations of Section R301.3.

This information was relocated in from Chapter 7 to Chapter 6 in the 2009 IBC:

TABLE R602.12(2)
STONE OR MASONRY VENEER WALL BRACING REQUIREMENTS,
ONE- AND TWO-FAMILY DETACHED DWELLINGS, SEISMIC DESIGN CATEGORIES D₀, D₁, and D₂

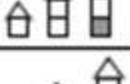
SEISMIC DESIGN CATEGORY	NUMBER OF STORIES ^a	STORY	MINIMUM SHEATHING AMOUNT (length of braced wall line length in feet) ^b	MINIMUM SHEATHING THICKNESS AND FASTENING	SINGLE STORY HOLD DOWN FORCE (lb) ^c	CUMULATIVE HOLD DOWN FORCE (lb) ^d	
D ₀	1	1 only	35	7/16-inch wood structural panel sheathing with 8d common nails spaced at 4 inches on center at panel edges, 12 inches on center at intermediate supports; 8d common nails at 4 inches on center at braced wall panel end posts with hold down attached	N/A	—	
	2	top	35		1900	—	
		bottom	45		3200	5100	
	3	top	40		1900	—	
		middle	45		3500	5400	
		bottom	60		3500	8900	
D ₁	1	1 only	45		7/16-inch wood structural panel sheathing with 8d common nails spaced at 4 inches on center at panel edges, 12 inches on center at intermediate supports; 8d common nails at 4 inches on center at braced wall panel end posts with hold down attached	2100	—
	2	top	45			2100	—
		bottom	45			3700	5800
	3	top	45			2100	—
		middle	45			3700	5800
		bottom	60			3700	9500
D ₂	1	1 only	55	7/16-inch wood structural panel sheathing with 8d common nails spaced at 4 inches on center at panel edges, 12 inches on center at intermediate supports; 8d common nails at 4 inches on center at braced wall panel end posts with hold down attached		2300	—
	2	top	55			2300	—
		bottom	55			3900	6200

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.479 kPa, 1 pound-force = 4.448 N.

- a. Cripple walls are not permitted in Seismic Design Categories D₀, D₁, and D₂.
- b. Applies to exterior and interior braced wall lines.
- c. Hold down force is minimum allowable stress design load for connector providing uplift tie from wall framing at end of braced wall panel at the noted story to wall framing at end of braced wall panel at the story below, or to foundation or foundation wall. Use single story hold down force where edges of braced wall panels do not align; a continuous load path to the foundation shall be maintained. [See Figure R602.12].
- d. Where hold down connectors from stories above align with stories below, use cumulative hold down force to size middle and bottom story hold down connectors. (See Figure R602.12).

Presentation of the information was editorially modified by code change RB107-09/10 to the current presentation. The proposal was AM at the committee hearings and was on the consent agenda for the public comment hearings.

TABLE R602.10.6.5
METHOD BY-WSP WALL BRACING REQUIREMENTS

SEISMIC DESIGN CATEGORY	STORY	BRACED WALL LINE LENGTH (FEET)					SINGLE-STORY HOLD-DOWN FORCE (pounds) ^a	CUMULATIVE HOLD-DOWN FORCE (pounds) ^a
		10	20	30	40	50		
		Minimum Total Length (feet) of Braced Wall Panels Required Along each Braced Wall Line						
D ₁		4.0	7.0	10.5	14.0	17.5	NA	—
		4.0	7.0	10.5	14.0	17.5	1900	—
		4.5	9.0	13.5	18.0	22.5	3500	5400
		6.0	12.0	18.0	24.0	30.0	3500	8900
D ₂		4.5	9.0	13.5	18.0	22.5	2100	—
		4.5	9.0	13.5	18.0	22.5	3700	5800
		6.0	12.0	18.0	24.0	30.0	3700	9500
D ₃		5.5	11.0	16.5	22.0	27.5	2300	—
		5.5	11.0	16.5	22.0	27.5	3900	6200
		NP	NP	NP	NP	NP	NA	NA

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.479 kPa, 1 pound-force = 4.448 N.

NP = Not Permitted.

NA = Not Applicable.

- Hold-down force is minimum allowable stress design load for connector providing uplift tie from wall framing at end of braced wall panel at the story level to wall framing at end of braced wall panel at the story below, or to foundation or foundation wall. The single-story hold-down force when edges of braced wall panels do not align; a continuous load path to the foundation shall be maintained.
- When hold-downs connectors from stories above align with stories below, use cumulative hold-down force to size middle- and bottom-story hold-down connectors.

The reason statement of RB107-09/10 indicates that (with minor noted exceptions) it is intended to be an editorial code change. There was no discussion of intent to permit three story BV-WSP dwellings in SDC D₂.

Reason: Last cycle, the special wall bracing requirements for wood-framed buildings with stone or masonry veneer were moved from Section R703.7 to Section R602.12, so they would follow the rest of the wall bracing provisions. This was a substantial clarification to the code. However, with the changes introduced by the Ad-Hoc Wall Bracing Committee to introduce tables of seismic adjustment factors, bracing methods, and other improvements, an opportunity now exists to further simplify matters, bring the special veneer provisions into the main bracing section, and remove duplicated text. As such, this proposal implements the following changes:

1. A new intermittent method, BV-WSP, is defined. The basic sheathing and nailing requirements are relocated from Section R602.12.1.3 to a new row in Table R602.10.2. The hold-down requirement is relocated from Section R602.12.1.3 to Section R602.10.1.4. The reference to Table R602.3(5), the wood stud table, is no longer needed. Once this language was moved to Section R602, that table automatically governs.
2. A new exception is added to R602.10.1.2, replacing the original charging language for R602.12. The remaining SDC-specific requirements are incorporated into new Section R602.10.3.5.
3. A reference to Method BV-WSP is added to the high-seismic end panel location requirements of Section R602.10.1.4.1. The duplicate language in Section R602.12.1.2 is no longer required and can be deleted.
4. The adjustments for SDC A, B, and C are inserted directly into Table R602.10.1.2(3), the seismic adjustment factor, Table R602.12(1) is no longer required and can be deleted.
5. A reference to Method BV-WSP is added to the minimum braced wall panel length requirements of Section R602.10.3 and to Table R602.10.3.1. The duplicate language in Section R602.12.1.4 is no longer required and can be deleted.
6. A new Section R602.10.3.5 is added for the new Method BV-WSP. The requirements of R602.12, R602.12.1, and R602.12.1.1 are moved into the new section. A subsection, R602.10.3.5.1, is defined for the length of bracing, with language similar to Section R602.10.1.2. Figure R602.12 is moved to the new section.
7. Table R602.12(2) is moved to Section R602.10.3.5 and revised to convert the percentages to lengths, similar to Table R602.10.1.2(2).
8. Figure R602.12 is replaced by new Figure R602.10.3.5, which provides a number of clarifications regarding the location and type of hold-down devices.
9. Since BV-WSP is now defined as its own separate intermittent bracing method, Sections R602.10.1.5 and R602.12.1.6 are no longer needed and can be deleted.

This change represents an editorial relocation and reorganization of the special wall bracing provisions for structures with veneer. Section R602.12 is effectively deleted and all of its provisions incorporated under the scope of Section R602.10. While the intent was purely editorial, two minor technical changes were made. First, the previous provisions do not indicate whether a gypsum board finish is required. But, Method BV-WSP is essentially a fully-restrained engineered shear wall segment, and typically the effect of finishes is not incorporated in such designs. Thus, we believe the interior finish is not required, and amend Section R602.10.2.1 accordingly. Second, in the new Table R602.10.3.5, which replaces Table R602.12(2), the hold-down requirements were combined as part of the reformatting to make the table look like Table R602.10.1.2(2). In the process, the 3200 lb and 5100 lb hold-downs for a bottom of two-story are now required to be 3500 lb and 5400 lb respectively. However, this does not change the actual required strap or hold-down size which a user would select from a connector manufacturer's catalog.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

ICCFILENAME: BAJNAI-AHWB-RB-4-R602.10

ICC PUBLIC HEARING ::: October 2009

IRC- RB143

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is a editorial clarification of the intent of existing provisions.

Proposal # 4579

RB204-19

RB205-19

IRC®: TABLE R602.10.4 (New)

Proponent: Rick Allen, International Staple, Nail and Tool Association, representing International Staple, Nail and Tool Association (rallen@isanta.org)

2018 International Residential Code

Revise as follows:

**TABLE R602.10.4
BRACING METHODS**

Portions of table not shown remain unchanged.

METHODS, MATERIAL		MINIMUM THICKNESS	FIGURE	CONNECTION CRITERIA ^a	
				Fasteners	Spacing
Intermittent Bracing Methods	PCP Portland cement plaster	See Section R703.6 for maximum 16" stud spacing		1 1/2" long, 11 gage, <u>0.120" dia.</u> , 7/16" dia. head nail or 7/8" long, 16 gage staples	6" o.c. on all framing members

Reason: ASTM F1667-18 requires that when gage is used as a diameter for nails, a decimal equivalent must also be shown. This requirement was put in place because of the multiple and conflicting wire gage tables that are used in the manufacturing of nails.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal will not change the cost of production. It only provides clarification required by ASTM F1667-18

Proposal # 4083

RB205-19

RB206-19

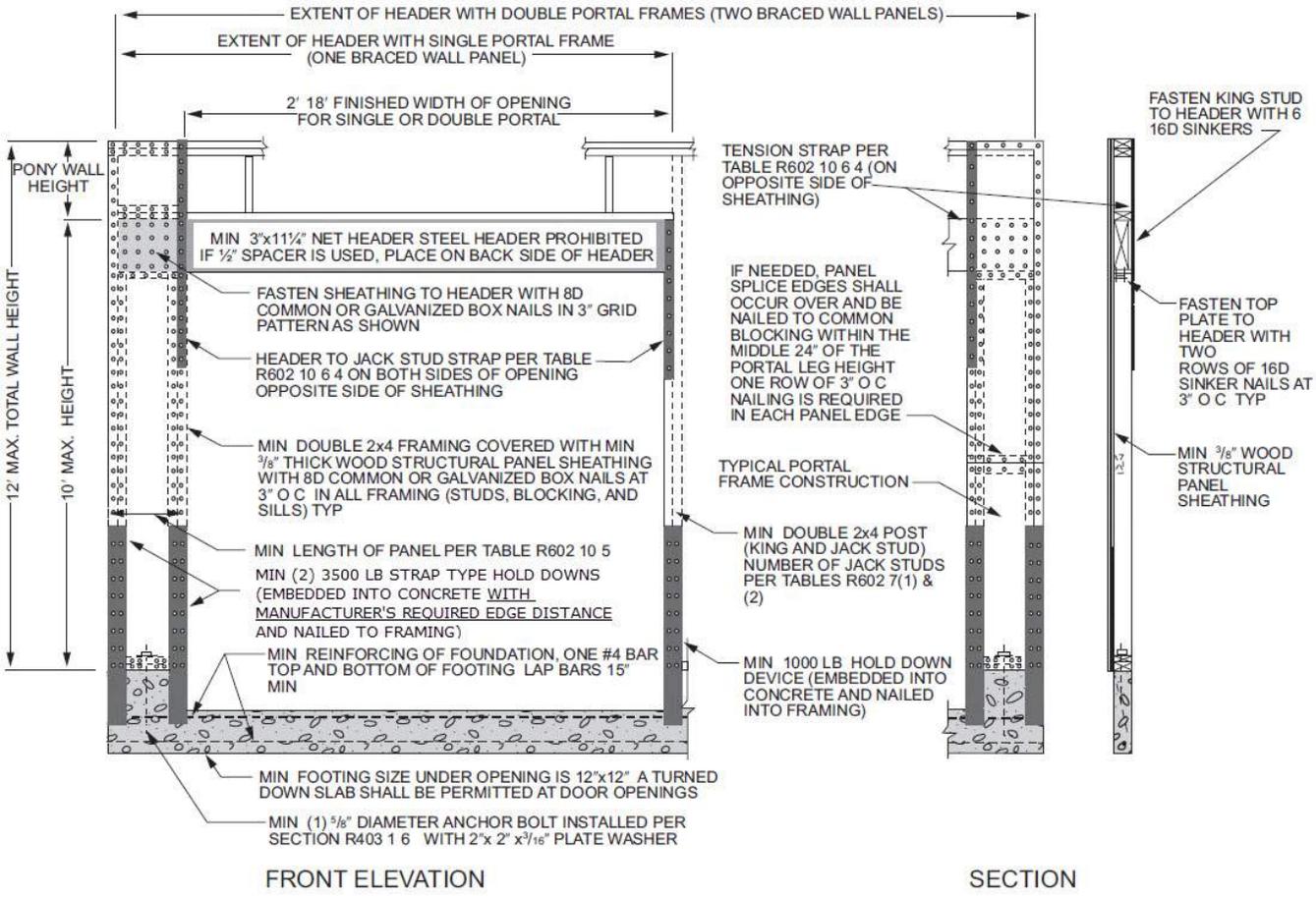
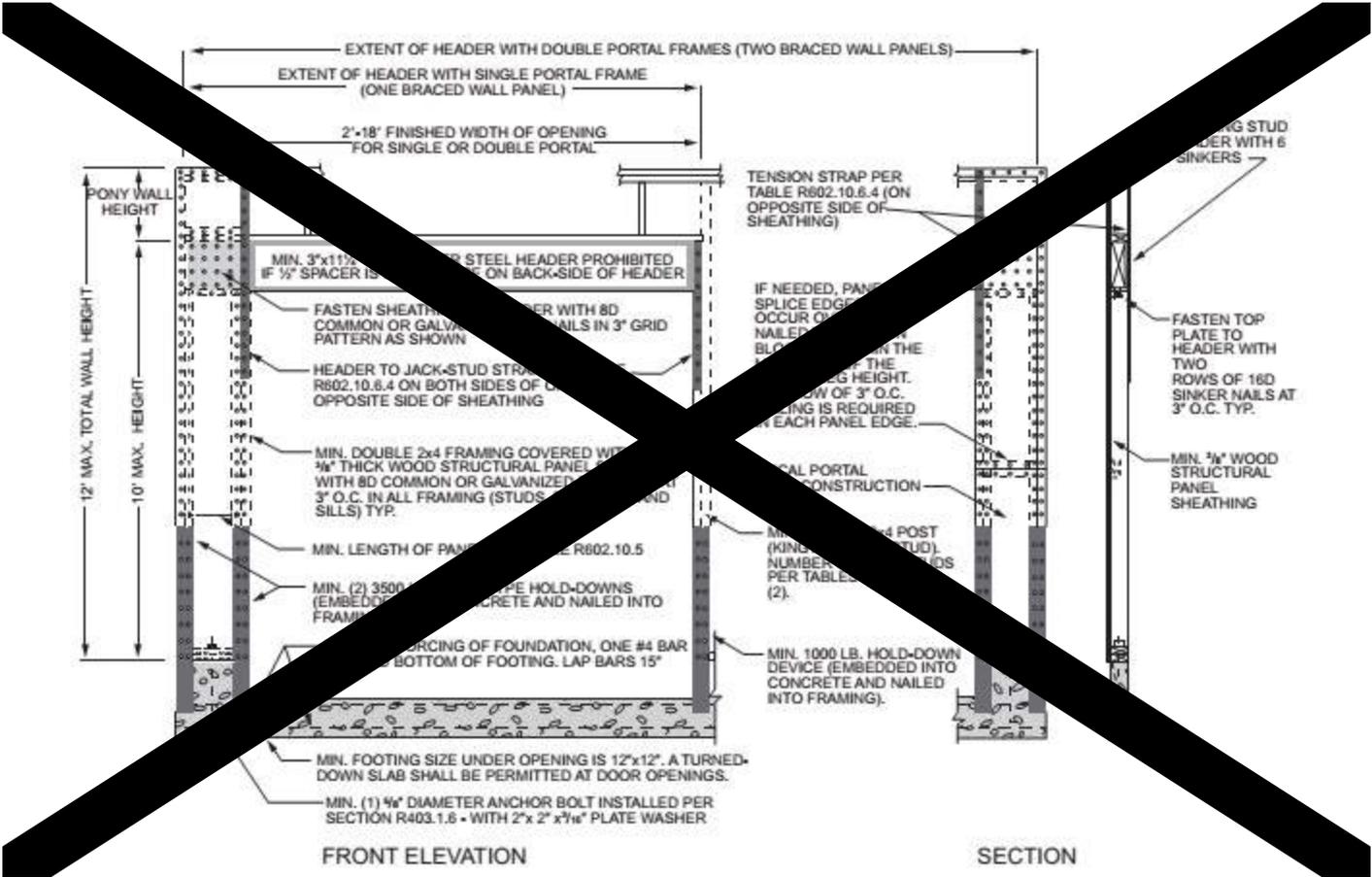
IRC: FIGURE R602.10.6.2

Proponent: Randy Shackelford, P.E., Simpson Strong-Tie Co., representing Simpson Strong-Tie Co.
(rshackelford@strongtie.com)

2018 International Residential Code

R602.10.6.2 Method PFH: Portal frame with hold-downs. Method PFH *braced wall panels* shall be constructed in accordance with Figure R602.10.6.2.

Revise as follows:



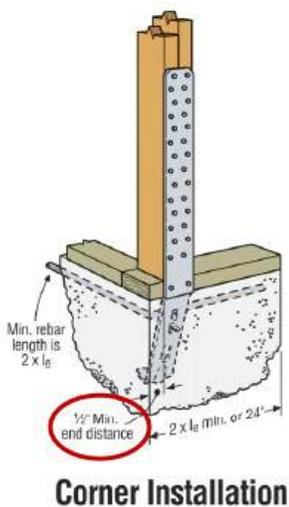
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

FIGURE R602.10.6.2 METHOD PFH—PORTAL FRAME WITH HOLD-DOWNS

Reason: The purpose of this code change is to caution the user regarding the installation of the strap-type hold-down for the Method PFH Portal Frame braced wall panel. Method PFH requires a 3600 pound embedded strap-type hold-down at each edge to restrain the frame against overturning. The drawing gives the impression that the hold-down can be installed right at the edge of the concrete.

However, the two major manufacturers of this type of hold-down, Simson Strong-Tie and USP/MiTek, both require that the hold-down be installed a minimum of 1/2 inch from the edge of the concrete in order to achieve the published allowable loads. There may be other manufacturers that have different required edge distances, though, so instead of specifying the 1/2 inch it was just modified to require the Manufacturer's Required Edge Distance.

Here is the installation detail from Simpson Strong-Tie showing the required edge distance.



Here is the installation footnotes from the MiTek Evaluation Report for the Strap-Type Hold-down

- 1) Predrilled holes are not required.
- 2) Wood thickness shall be no less than 3" (2 - 2x members).
- 3) Corner strap location implies that the distance from the corner of the wall to the edge of the strap is no less than 1/2".
- 4) Middle strap location implies that the minimum distance from the corner of the wall to the centerline of the strap is no less than 1.5 times the embed.
- 5) For edge distances between 1/2" and 1.5 x IE calculate loads using straight line interpolation.
- 6) Minimum anchor spacing for full capacity is 2 x IE. For spacing less than that reduce capacity proportionally.
- 7) Allowable tension loads are for Doug-Fir, Southern Pine, Spruce-Pine-Fir and Hem Fir.
- 8) The strap should be fastened with nails starting from lowest pair of nail holes and working up towards the top of the strap. In many cases, not all nail holes are needed to be filled.
- 9) Minimum concrete strength $f'c = 2,500$ psi.
- 10) Minimum 1-#4 rebar shall be installed in the shear cone.
- 11) Deflection at highest allowable loads for installation over wood double studs are as follows:
LSTAD8 = 0.037", STAD8 = 0.048", STAD10 = 0.059", STAD14 = 0.122".
- 12) **NAILS:** 16d sinkers are 0.148" dia. x 3-1/4" long. 10d common (0.148" dia. x 3" long) nails may be substituted with no load reduction.

Bibliography: Simpson Strong-Tie Co., Inc. ICC-Es Evaluation Report number ESR-2920
MiTek USA, Inc. ICC-ES Evaluation Report number ESR-2787

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The main impact of this is to ensure that if a Method PFH braced wall panel is used, the strap style hold down is located at least 1/2" from the corner, in accordance with the manufacturer's instructions. If that forces the

builder to build their foundation 1/2" wider, then it could increase costs. If the builder just moves the garage door location over by 1/2", though, then there is no impact on cost. If the builder installs the strap right next to the edge of the foundation, and then is failed on inspection because the hold down is not installed per the manufacturer's instructions, then there is a large increase in cost for the builder to fix the issue.

Proposal # 5108

RB206-19

RB207-19

IRC@: R602.10.6.4, R602.12.6.2

Proponent: Ralph Leyva, representing APA- The Engineered Wood Assoc (ralph.leyva@apawood.org); Borjen Yeh, APA - The Engineered Wood Association, representing APA - The Engineered Wood Association (borjen.yeh@apawood.org)

2018 International Residential Code

Revise as follows:

R602.10.6.4 Method CS-PF: Continuously sheathed portal frame. Continuously sheathed portal frame *braced wall panels* shall be constructed in accordance with Figure R602.10.6.4 and Table R602.10.6.4. ~~The number of continuously sheathed portal frame panels in a single *braced wall line* shall not exceed four.~~

R602.12.6.2 Method CS-PF. Braced wall panels constructed as Method CS-PF in accordance with Section R602.10.6.4 shall be permitted where all framed portions of all exterior walls are sheathed with wood structural panels. Each CS-PF panel shall equal 0.75 bracing units. ~~Not more than four CS-PF panels shall be permitted on all segments of walls parallel to each side of the circumscribed rectangle.~~ Segments of wall that include a Method CS-PF panel shall meet the requirements of Section R602.10.4.2.

Reason: This provision first appeared in the 2009 IRC and was based on full-scale, whole-house testing conducted at the APA Research Center in Tacoma, Washington. In testing conducted in 2007 (APA Report T2007-73, <https://www.apawood.org/data/tsd-links/t2007-73-3d-house-test-results.pdf>), a single wall was tested with 9 each 16-inch long CS-PFs in line for a total braced length of 12 ft. This testing was compared with 3 each 48-inch long Type WSP walls, also a total length of 12 ft. The results of this testing showed the CS-PF wall had a significantly higher strength at 2.5% drift and stiffer than the equivalent length Type WSP walls. The evidence was considered sufficient by the then Wall Bracing Ad Hoc Committee to support its inclusion in the 2009 IRC, with the limitation of 4 CS-PFs in any single wall even though the testing was conducted with 9 CS-PFs. This provision was added because the portal frame concept was quite original and the committee wanted a little more experience before expanding the number of permitted CS-PFs. Fast forward to 2019 and we are writing provisions for the 2021 IRC in which the current limitation of a maximum of 4 CS-PFs per wall will have been in the IRC for 10 years and can no longer be considered as original. During the last decade, APA has not been apprised of any problems associated with this provision. It is inconceivable that there will be more than 9 CS-PFs in a given wall line within the scope of the IRC. As a result, APA proposes to remove the limitation for the number of CS-PFs.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This change proposal will not add cost to the design and construction of a new home.

Proposal # 5532

RB207-19

RB208-19

IRC@: R602.10.6.5

Proponent: Kelly Cobeen, Wiss Janney Elstner Associates, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (KCobeen@wje.com); Julie Furr, Rimkus Consulting Group, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (jfurr@rimkus.com); Michael Mahoney, representing Federal Emergency Management Agency (mike.mahoney@fema.dhs.gov)

2018 International Residential Code

Revise as follows:

R602.10.6.5 Wall bracing for dwellings with stone and masonry veneer in Seismic Design Categories D₀, D₁ and D₂. Townhouses in Seismic Design Categories D₀, D₁ and D₂ with stone or masonry veneer exceeding the first-story height shall be designed in accordance with accepted engineering practice.
One- and two-family dwellings in Seismic Design Category D₂ exceeding two stories and having stone or masonry veneer shall be designed in accordance with accepted engineering practice.

Where stone and masonry veneer are installed in accordance with Section R703.8, wall bracing on exterior *braced wall lines* and *braced wall lines* on the interior of the building, backing or perpendicular to and laterally supporting veneered walls shall comply with this section.

Where dwellings in Seismic Design Categories D₀, D₁ and D₂ have stone or masonry veneer installed in accordance with Section R703.8, and the veneer does not exceed the first-story height, wall bracing shall be in accordance with Section R602.10.3.

Where detached one- or two-family dwellings in Seismic Design Categories D₀, D₁ and D₂ have stone or masonry veneer installed in accordance with Section R703.8, and the veneer exceeds the first-story height, wall bracing at exterior *braced wall lines* and *braced wall lines* on the interior of the building shall be constructed using Method BV-WSP in accordance with this section and Figure R602.10.6.5. Cripple walls shall not be permitted, and required interior *braced wall lines* shall be supported on continuous foundations.

Where detached one- or two-family dwellings in Seismic Design Categories D₀, D₁ and D₂ have exterior veneer installed in accordance with Section R703.8 and are braced in accordance with Method WSP or CS-WSP, veneer shall be permitted in the second story in accordance with Item 1 or 2, provided that the dwelling does not extend more than two stories above grade plane, the veneer does not exceed 5 inches (127 mm) in thickness, the height of veneer on gable-end walls does not extend more than 8 feet (2438 mm) above the bearing wall top plate elevation, and the total length of *braced wall panel* specified by Table R602.10.3(3) is multiplied by 1.2 for each first- and second-story *braced wall line*.

1. The total area of the veneer on the second-story exterior walls shall be permitted to extend up to 25 percent of the occupied second floor area.
2. The veneer on the second-story exterior walls shall be permitted to cover one side of the dwelling, including walls on bay windows and similar appurtenances within the one dwelling side.

~~Townhouses in Seismic Design Categories D₀, D₁ and D₂ with stone or masonry veneer exceeding the first-story height shall be designed in accordance with accepted engineering practice.~~

Reason: This proposal provides editorial clarification of existing provisions. Townhouses exceeding the first

story are currently scoped out of the R602.10.6.5 provisions permitting veneer in SDC D0, D₁, and D₂; relocating this limitation to the front of the section places it where it is of most benefit to the designer. Similarly, a sentence is added communicating the current Table R602.10.6.5 limitations for veneer on one- and two-family dwellings that exceed two stories in SDC D₂, again to clearly communicate scope limitations to the designer.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
No cost impact. This is an editorial clarification of the intent of current provisions.

Proposal # 4580

RB208-19

RB209-19

IRC: TABLE R602.10.3(4), TABLE R602.10.4, R602.10.6.5, Figure R602.10.6.5, R602.10.6.5.1, R602.10.6.5.2 (New), R602.10.6.5.3 (New), R602.10.6.5.4 (New)

Proponent: Randy Shackelford, Simpson Strong-Tie Co., representing Simpson Strong-Tie Co. (rshackelford@strongtie.com)

2018 International Residential Code

R602.10.6 Construction of Methods ABW, PFH, PFG, CS-PF and BV-WSP. Methods ABW, PFH, PFG, CS-PF and BV-WSP shall be constructed as specified in Sections R602.10.6.1 through R602.10.6.5.

Revise as follows:

R602.10.6.5 Wall bracing for dwellings with stone and masonry veneer in Seismic Design Categories

D0, D₁ and D₂. Where stone and masonry veneer are installed in accordance with Section R703.8, wall bracing on exterior *braced wall lines* and *braced wall lines* on the interior of the building, backing or perpendicular to and laterally supporting veneered walls shall comply with this section.

~~Where dwellings in Seismic Design Categories D0, D₁ and D₂ have stone or masonry veneer installed in accordance with Section R703.8, and the veneer does not exceed the first-story height, wall bracing shall be in accordance with Section R602.10.3. Where detached one- or two-family dwellings in Seismic Design Categories D0, D₁ and D₂ have stone or masonry veneer installed in accordance with Section R703.8, and the veneer exceeds the first-story height, wall bracing at exterior *braced wall lines* and *braced wall lines* on the interior of the building shall be constructed using Method BV-WSP in accordance with this section and Figure R602.10.6.5. Cripple walls shall not be permitted, and required interior *braced wall lines* shall be supported on continuous foundations. Where detached one- or two-family dwellings in Seismic Design Categories D0, D₁ and D₂ have exterior veneer installed in accordance with Section R703.8 and are braced in accordance with Method WSP or CS-WSP, veneer shall be permitted in the second-story in accordance with Item 1 or 2, provided that the dwelling does not extend more than two stories above grade plane, the veneer does not exceed 5 inches (127 mm) in thickness, the height of veneer on gable-end walls does not extend more than 8 feet (2438 mm) above the bearing wall top plate elevation, and the total length of *braced wall panel* specified by Table R602.10.3(3) is multiplied by 1.2 for each first- and second-story *braced wall line*.~~

- ~~1. The total area of the veneer on the second-story exterior walls shall be permitted to extend up to 25 percent of the occupied second-floor area.~~
- ~~2. The veneer on the second-story exterior walls shall be permitted to cover one side of the dwelling, including walls on bay windows and similar appurtenances within the one dwelling side.~~

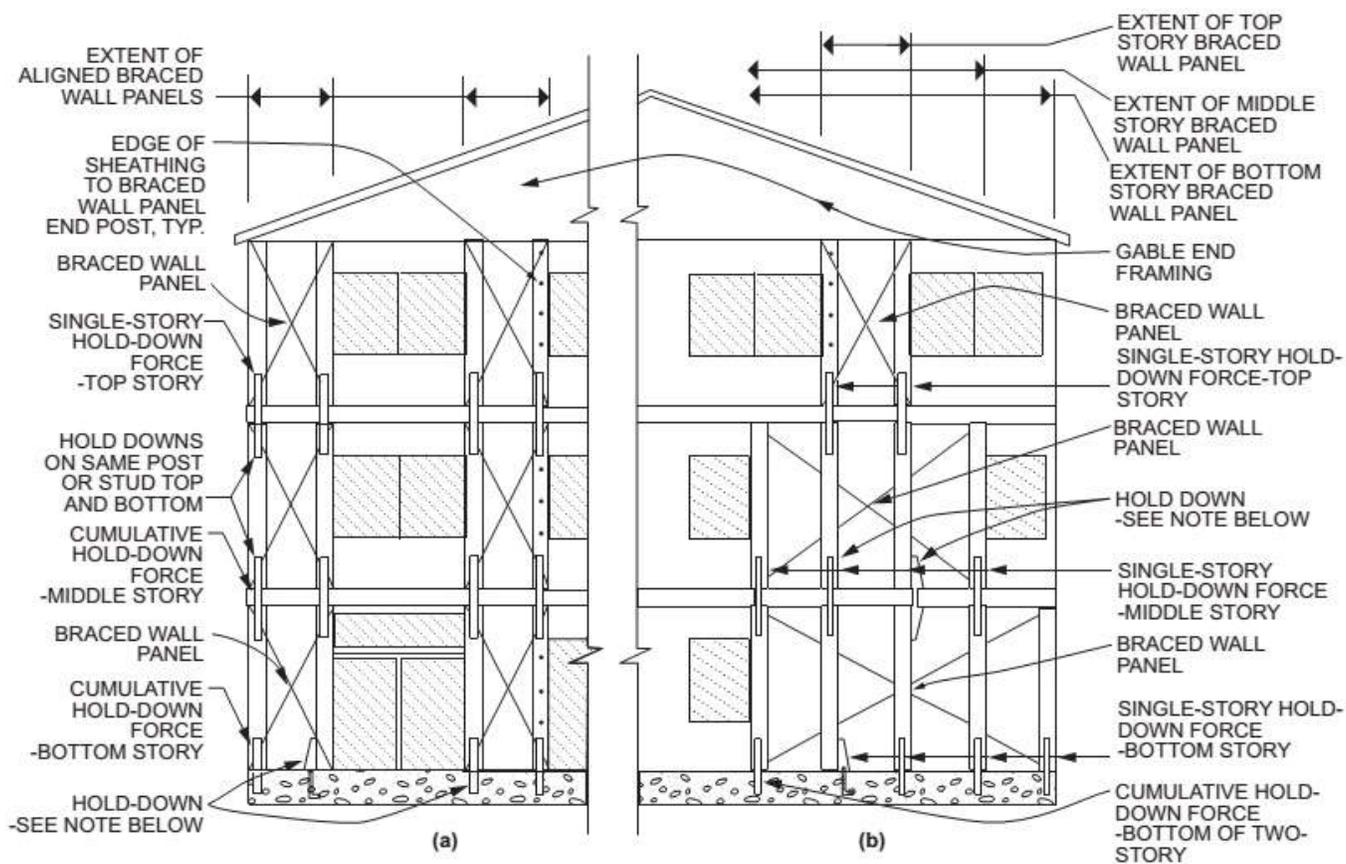
~~Townhouses in Seismic Design Categories D0, D₁ and D₂ with stone or masonry veneer exceeding the first-story height shall be designed in accordance with accepted engineering practice.~~

Add new text as follows:

R602.10.6.5.1 Veneer on First Story Only. Where dwellings in Seismic Design Categories D0, D₁ and D₂ have stone or masonry veneer installed in accordance with Section R703.8, and the veneer does not exceed the first-story height, wall bracing shall be in accordance with Section R602.10, exclusive of this section.

R602.10.6.5.2 Veneer Exceeding First Story Height. Where detached one- or two-family dwellings in Seismic Design Categories D0, D₁ and D₂ have stone or masonry veneer installed in accordance with Section R703.8, and the veneer exceeds the first-story height, wall bracing at exterior *braced wall lines* and *braced wall lines* on the interior of the building shall be constructed using Method BV-WSP in accordance with this section and

Figure R602.10.6.5.2. Cripple walls shall not be permitted, and required interior *braced wall lines* shall be supported on continuous foundations.



(a) Braced wall panels stacked (aligned story to story). Use cumulative hold-down force.
 (b) Braced wall panels mixed stacked and not stacked. Use hold-down force as noted.
 Note: Hold downs should be strap ties, tension ties, or other approved hold-down devices and shall be installed in accordance with the manufacturer's instructions.

FIGURE R602.10.6.5 R602.10.6.5.2

METHOD BV-WSP—WALL BRACING FOR DWELLINGS WITH STONE AND MASONRY VENEER IN SEISMIC DESIGN CATEGORIES D0, D₁ and D₂

Add new text as follows:

R602.10.6.5.3 Limited Veneer Exceeding First Story Height. Where detached one- or two-family *dwelling*s in Seismic Design Categories D0, D₁ and D₂ have exterior veneer installed in accordance with Section R703.8 and brick veneer installed above the first story height meets the following limitations, bracing in accordance with Method WSP or CS-WSP shall be permitted provided the total length of *braced wall panels* specified by Table R602.10.3(3) is multiplied by 1.2 for each first- and second-story *braced wall line*.

1. The *dwelling* does not extend more than two stories above grade plane.
2. The veneer does not exceed 5 inches (127 mm) in thickness.
3. The height of veneer on gable-end walls does not extend more than 8 feet (2438 mm) above the bearing wall top plate elevation.
4. Where veneer is installed on multiple walls above the first story, the total area of the veneer on the second-story exterior walls shall not exceed 25 percent of the occupied second floor area.
5. Where the veneer is installed on one entire second-story exterior wall, including walls on bay windows and similar appurtenances, brick veneer shall not be installed on any of the other walls on that floor.

R602.10.6.5.4 Townhouses. Townhouses in Seismic Design Categories D0, D₁ and D₂ with stone or masonry veneer exceeding the first-story height shall be designed in accordance with accepted engineering practice.

Revise as follows:

R602.10.6.5.1 R602.10.6.5.5 Length of bracing. The length of bracing along each *braced wall line* shall be the greater of that required by the ultimate design wind speed and *braced wall line* spacing in accordance with Table R602.10.3(1) as adjusted by the factors in Table R602.10.3(2) or the seismic design category and *braced wall line* length in accordance with either Table ~~R602.10.6.5~~ **R602.10.6.5.5** when using Method BV-WSP, or Table R602.10.3(3) as adjusted by the factors in Table R602.10.3(4) when using Method WSP or CS-WSP. Angled walls shall be permitted to be counted in accordance with Section R602.10.1.4, and *braced wall panel* location shall be in accordance with Section R602.10.2.2. Spacing between *braced wall lines* shall be in accordance with Table R602.10.1.3. The seismic adjustment factors in Table R602.10.3(4) shall not be applied to the length of bracing determined using Table R602.10.6.5, except that the bracing amount increase for *braced wall line* spacing greater than 25 feet (7620 mm) in accordance with Table R602.10.1.3 shall be required. The minimum total length of bracing in a *braced wall line*, after all adjustments have been taken, shall be not less than 48 inches (1219 mm) total.

**TABLE R602.10.6.5 R602.10.6.5.5
METHOD BV-WSP WALL BRACING REQUIREMENTS**

Portions of table not shown remain unchanged.

SEISMIC DESIGN CATEGORY	STORY	BRACED WALL LINE LENGTH (FEET)					SINGLE-STORY HOLD-DOWN FORCE (pounds) ^a	CUMULATIVE HOLD-DOWN FORCE (pounds) ^b
		10	20	30	40	50		
		Minimum Total Length (feet) of Braced Wall Panels Required Along each Braced Wall Line						

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.479 kPa, 1 pound-force = 4.448 N.
NP = Not Permitted.

NA = Not Applicable.

- a. Hold-down force is minimum allowable stress design load for connector providing uplift tie from wall framing at end of braced wall panel at the noted story to wall framing at end of braced wall panel at the story below, or to foundation or foundation wall. Use single-story hold-down force where edges of braced wall panels do not align; a continuous load path to the foundation shall be maintained.
- b. Where hold-down connectors from stories above align with stories below, use cumulative hold-down force to size middle- and bottom-story hold-down connectors.

**TABLE R602.10.3(4)
SEISMIC ADJUSTMENT FACTORS TO THE REQUIRED LENGTH OF WALL BRACING**

ITEM NUMBER	ADJUSTMENT BASED ON	STORY	CONDITION	ADJUSTMENT FACTOR ^{a, b} [Multiply length from Table R602.10.3(3) by this factor]	APPLICABLE METHOD
7	Walls with stone masonry veneer, detached one- and two-family dwellings in SDC D ₀ – D ₂ ^{d, f}	Any story	See Table R602.10.6.5 <u>Section R602.10.6.5.5</u>		BV-WSP

8	Walls with stone or masonry veneer, detached one- and two-family dwellings in SDC D ₀ – D ₂ ^{d, f}	First and second story of two-story dwelling	Limited Brick Veneer on Second Story. See Table R602.10.6.5 Section R602.10.6.5.3	1.2	WSP, CS-WSP
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For SI: 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

- a. Linear interpolation shall be permitted.
- b. The total length of bracing required for a given wall line is the product of all applicable adjustment factors.
- c. The length-to-width ratio for the floor/roof diaphragm shall not exceed 3:1.
- d. Applies to stone or masonry veneer exceeding the first story height.
- e. The adjustment factor for stone or masonry veneer shall be applied to all exterior braced wall lines and all braced wall lines on the interior of the building, backing or perpendicular to and laterally supporting veneered walls.
- f. See Section R602.10.6.5 for requirements where stone or masonry veneer does not exceed the first-story height.

**TABLE R602.10.4
BRACING METHODS**

Portions of table not shown remain unchanged.

METHODS, MATERIAL		MINIMUM THICKNESS	FIGURE	CONNECTION CRITERIA ^a	
				Fasteners	Spacing
Intermittent Bracing Methods	BV-WSP^a Wood structural panels with stone or masonry veneer (See Section R602.10.6.5)	7/16"	See Figure R602.10.6.5 <u>R602.10.6.5.2</u>	8d common (2 1/2" x 0.131) nails	4" at panel edges 12" at intermediate supports 4" at braced wall panel end posts

Reason: The purpose of this change is to clarify wall bracing of dwellings that have brick veneer. Last cycle a section was added to permit limited brick veneer on the second story without triggering the use of BV-WSP, but there were conflicts in how this was to be applied. The main goal is to clarify this application.

Table R602.10.3(4) is proposed to be modified to refer to Section R602.10.6.5.3, which states when methods WSP and CS-WSP can be used to brace brick veneer, instead of Table R602.10.6.5, which gives bracing amounts for Method BV-WSP bracing. The assumption I make here is that the intent was that when this limited brick veneer was installed, then the bracing lengths in Table R602.10.3(3) were to be used for the WSP and CS-WSP bracing, adjusted by the 1.2 factor, and *not* the BV-WSP bracing amounts.

Section R602.10.6.5 is broken into several sub-sections in order to make it easier to read and use. Except for clarifying the bracing length to use for WSP and CS-WSP, there is no intent to make any substantive changes, just re-wording. The long paragraph of limitations in new R602.10.6.5.3 is broken into a list for clarification and ease of use.

Finally, Section R602.10.6.5.5 (formerly R602.10.6.5.1) is clarified along the lines stated above to specify which table to use to calculate the required length of bracing for each permitted method. If this is not changed, then

the WSP and CS-WSP would be required to use the BV-WSP bracing amounts in Table R602.0.6.5 for seismic bracing.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The main intent of this code change is to clarify the section and not make any technical changes.

Proposal # 5197

RB209-19

RB210-19

IRC@: TABLE R602.10.6.5

Proponent: Ralph Leyva, APA- The Engineered Wood Assoc, representing APA- The Engineered Wood Assoc (ralph.leyva@apawood.org); Borjen Yeh, representing APA - The Engineered Wood Association (borjen.yeh@apawood.org)

2018 International Residential Code

Revise as follows:

**TABLE R602.10.6.5
METHOD BV-WSP WALL BRACING REQUIREMENTS^c**

Portions of table not shown remain unchanged.

SEISMIC DESIGNCATEGORY	STORY	BRACED WALL LINE LENGTH (FEET)					SINGLE-STORYHOLD- DOWNFORCE(pounds) ^a	CUMULATIVEHOLD- DOWNFORCE(pounds) ^b
		10	20	30	40	50		
		Minimum Total Length (feet) of Braced Wall Panels Required Along each Braced Wall Line						

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.479 kPa, 1 pound-force = 4.448 N.
NP = Not Permitted.

NA = Not Applicable.

a. Hold-down force is minimum allowable stress design load for connector providing uplift tie from wall framing at end of braced wall panel at the noted story to wall framing at end of braced wall panel at the story below, or to foundation or foundation wall. Use single-story hold-down force where edges of braced wall panels do not align; a continuous load path to the foundation shall be maintained.

b. Where hold-down connectors from stories above align with stories below, use cumulative hold-down force to size middle- and bottom-story hold-down connectors.

c. Interpolation between braced wall lengths is permitted.

Reason: Table and section does not state one way or another on interpolation and needs clarification. Based on the way the table was developed, the interpolation should be permitted.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal permits interpolation between specified braced wall lengths and will not increase the construction cost.

Proposal # 4693

RB210-19

RB211-19

IRC@: R602.10.10.1

Proponent: Kelly Cobeen, Wiss Janney Elstner Associates, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (KCobeen@wje.com); Julie Furr, Rimkus Consulting Group, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (jfurr@rimkus.com); Michael Mahoney, representing Federal Emergency Management Agency (mike.mahoney@fema.dhs.gov)

2018 International Residential Code

Revise as follows:

R602.10.10.1 Cripple wall bracing for Seismic Design Categories D0 and D₁ and townhouses in Seismic Design Category C. In addition to the requirements in Section R602.10.10, cripple wall bracing shall comply with the following:

1. Cripple wall sheathing shall be limited to methods WSP and CS-WSP.
2. Cripple walls in one-story dwellings shall be braced with the length and method of bracing required for the first story of a two-story dwelling.
3. Cripple walls in two-story dwellings shall be braced with the length and methods of bracing required for the first story of a three-story dwelling.
4. Cripple walls in three-story dwellings shall be braced with the length and the method of bracing required for this first story of a three-story dwelling, further multiplied by 1.5.
5. The multiplication factor of 1.15 in Section R602.10.10 is not required.
6. Where gypsum wall board is not used on the inside of the cripple wall bracing, the length adjustments for the elimination of the gypsum wallboard, or equivalent, shall be applied as indicated in Tables R602.10.3(2) and R602.10.3(4) to the length of cripple wall bracing required.
7. The distance between adjacent edges of braced wall panels for cripple walls along a braced wall line shall be 14 feet (4267 mm) maximum.
8. Where braced wall lines at interior walls are not supported on a continuous foundation below, the adjacent parallel cripple walls, where provided, shall be braced with Method WSP or Method CS-WSP in accordance with Section R602.10.4. The have the length of bracing required in accordance with Table R602.10.3(3) for the cripple walls Items 2 through 4 and shall be further multiplied by 1.5. Where the cripple walls do not have sufficient length to provide the required bracing, the spacing of panel edge fasteners shall be reduced to 4 inches (102 mm) on center and the required bracing length adjusted multiplied by 0.7. If the required length can still not be provided, the cripple wall shall be designed in accordance with accepted engineering practice.

Reason: This proposal requires the use of wood structural panel (plywood or OSB) sheathing on cripple walls for townhouses in SDC C and all dwellings in SDC D₀ and D₁. This extends a requirement already in place for dwellings in SDC D₂. In addition, the length of sheathing is specified based on the cripple wall being an additional story below the occupied stories. This is consistent with the seismic demand that the cripple walls resist.

This change is proposed because recent studies have reconfirmed the need for and benefit of providing wood structural panel sheathing on cripple walls in regions of moderate to high seismic hazard. As part of work contributing to the FEMA P-1100 (*Vulnerability-Based Seismic Assessment and Retrofit of One- and Two-Family Dwellings Volume 1 - Prestandard*), it was identified that the use of wood structural panel sheathing is needed for cripple walls in light-frame dwellings in order to meet the seismic performance objectives targeted by the residential and building codes. This is believed to be largely due to there being significantly less total wall length

and little or no finish material contribution to seismic bracing at the cripple wall level. As a result cripple walls subject to earthquake loading must withstand higher shear forces and significantly greater horizontal displacement levels than the stories above. The need for and improvement provided with the addition of wood structural panel cripple wall bracing was demonstrated in numerical studies by the probability of collapse reducing by one-half to two-thirds with the addition of wood structural panel sheathing. Given that the cost of providing wood structural panel sheathing is estimated to be less than one percent of the construction cost of the home, the benefit significantly outweighs the cost.

Cost Impact: The code change proposal will increase the cost of construction. This will modestly increase the cost of dwellings in moderate and high seismic hazard regions by requiring the use of wood structural panel sheathing on the cripple walls. This is estimated to be less than one percent of the construction cost of the dwelling.

Proposal # 4577

RB211-19

RB212-19 Part I

PART I — IRC: R602.13 (New)

PART II — IECC: R402.1.6 (New), TABLE R402.1.2

Proponent: Vladimir Kochkin, Home Innovation Research Labs, representing Home Innovation Research Labs (vkochkin@homeinnovation.com); Patricia Gunderson, Home Innovation Research Labs, representing Home Innovation Research Labs (pgunderson@homeinnovation.com)

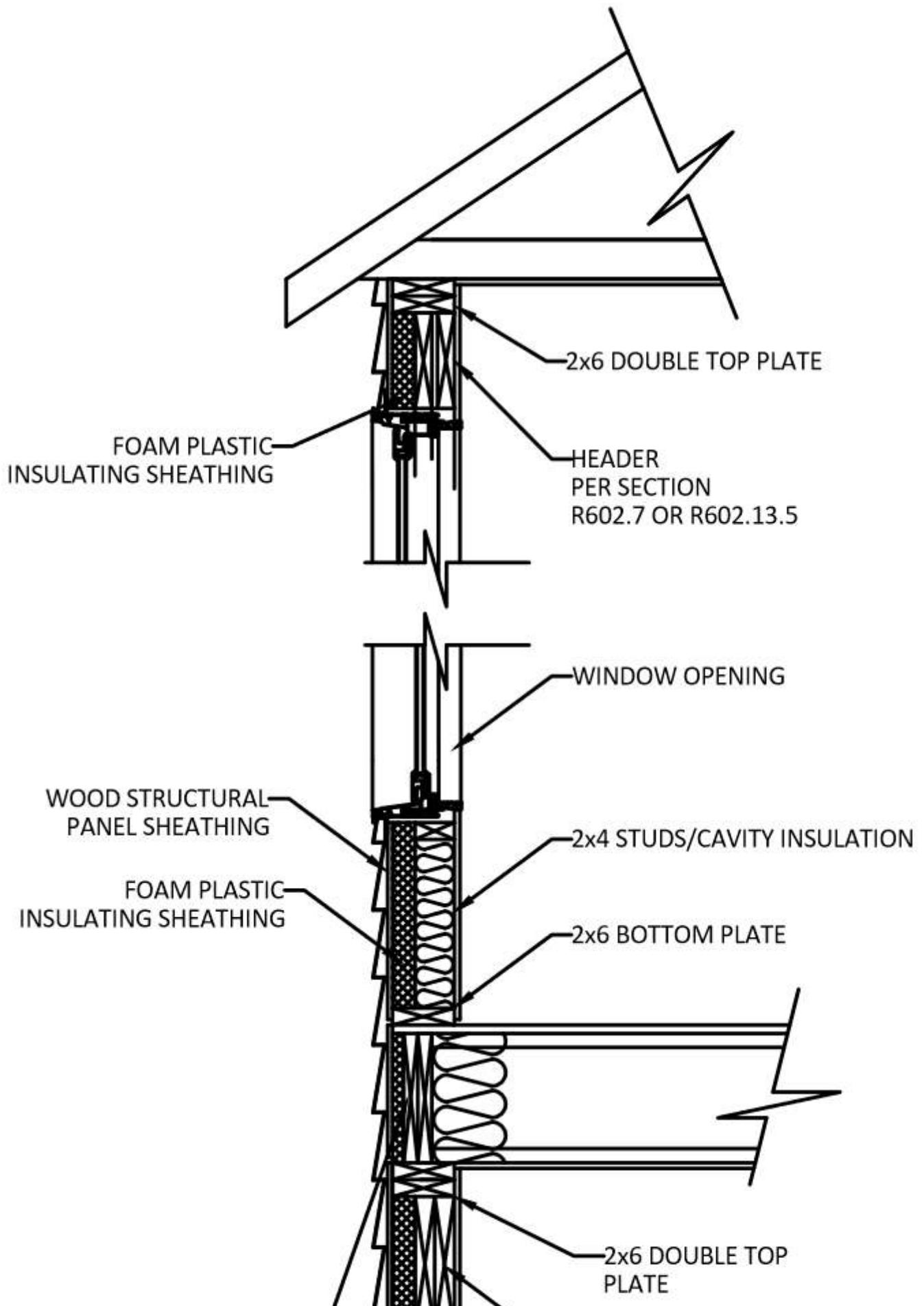
THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IRC-BUILDING COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL ENERGY COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Residential Code

Add new text as follows:

R602.13 Extended Plate Wall. Extended plate wall (EPW) construction shall comply with all applicable provisions of Sections R602.1 through R602.12 as modified by the provisions of Section R602.13. EPW shall be limited to Seismic Design Categories A, B, and C for detached one- and two-family dwellings and to Seismic Design Categories A and B for townhomes.

R602.13.1 Framing. The 2x6 top and bottom plates and 2x4 studs shall be used in accordance with Figures R602.13.1(1) and R602.13.1(2). A single top plate shall not be permitted.



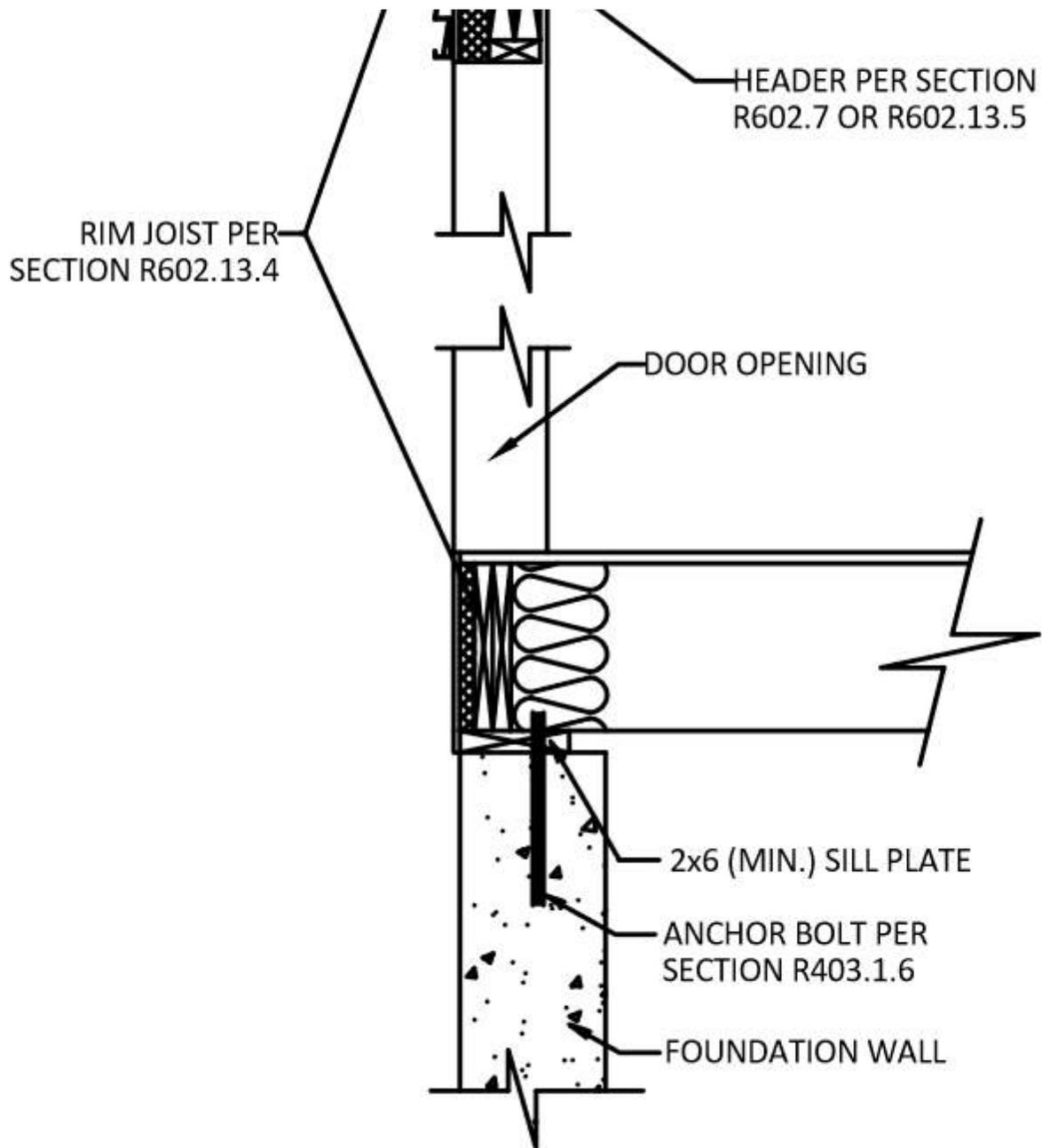


Figure R602.13.1(1)
Extended Plate Wall (EPW) System, Section View

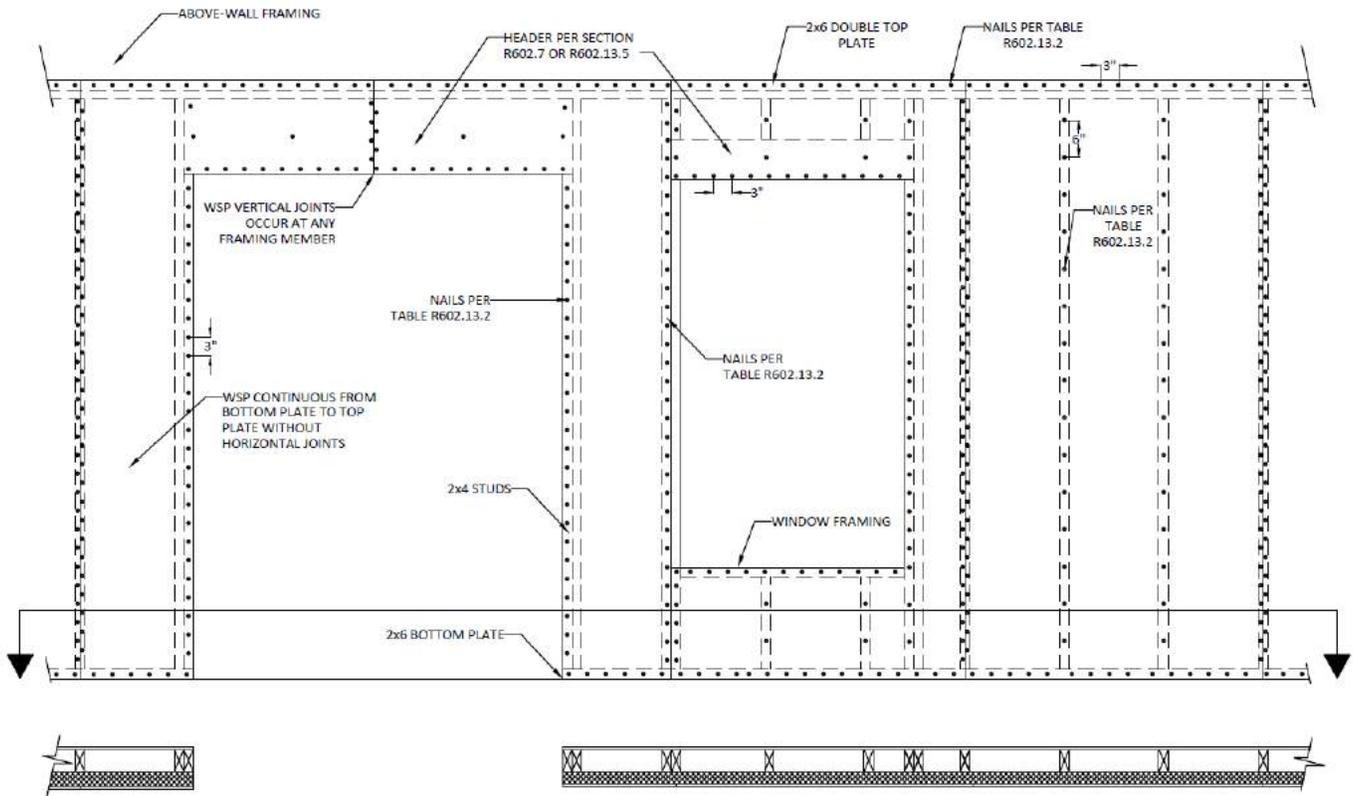


Figure R602.13.1(2)
Extended Plate Wall, Elevation View

R602.13.2 Wood structural panel sheathing. Wood structural panel sheathing with a minimum nominal thickness of 7/16-inch (11 mm) shall be installed vertically and attached to wall plates and studs per Table R602.13.2 and Figure R602.13.1(2). The vertical joints between adjacent wood structural panels shall occur only at framing members. Where used as part of wall bracing, each wood structural panel shall be continuous, without horizontal joints between the extended top and bottom plates.

TABLE R602.13.2.
Sheathing Fastener Requirements for EPW

Minimum Nail Length and Diameter	Maximum Fastener Spacing	
	At Perimeter of Wood Structural Panels (inches)	In Field of Wood Structural Panels (inches)
No. 37 Power-tool Driven Common Nail (3-1/2" x 0.131") ^{a,b,c,d}	3 O.C.	6 O.C.
16d Box Nail (3-1/2" x 0.135") ^{a,b,d}	3 O.C.	6 O.C.

For SI: 1-inch = 25.4 mm

a. Where wood structural panel nominal thickness exceeds 1/2 inch (13 mm), the minimum nail length shall be increased by 1/4 inch (6 mm).

b. At top and bottom plates where the wood structural panel is in direct contact with the framing, 8d common nail (2-1/2" x 0.131") shall be permitted.

c. Full round head nail with minimum head diameter of 0.281 inches (7 mm).

d. Nails are in accordance with ASTM F1667.

R602.13.3 Wall bracing. Wall bracing for EPW shall be in accordance with the requirements for WSP or CS-WSP or CS-G bracing methods in Section R602.10 except the sheathing fasteners shall be in accordance with Table R602.13.2.

R602.13.3.1 Simplified wall bracing. With the exception of Section R602.12.2 Item 2, provisions of Section R602.12 shall be applicable to the EPW. The fastening schedule for wood structural panels shall be in accordance with Table R602.13.2.

R602.13.4 Rim joist. Sawn 2x lumber or engineered wood rim board shall be used to construct rim joists. Engineered wood rim board shall be in compliance with Section R602.1.7. The minimum bearing length requirements for the floor joists shall be satisfied or joists shall be supported with metal hangers. Rim joist (band joist) supporting an EPW shall be in accordance with one of the following methods.

1. A double member rim joist installed flush to the exterior face of the wall in accordance with Figure R602.13.4(1). The thickness of individual rim joist members shall not be less than 1-1/2 inches (38 mm).
2. A double member rim joist recessed by 1 inch (25 mm) from the exterior face of the wall in accordance with Figure R602.13.4(2). The thickness of individual rim joist members shall not be less than 1 inch (25 mm). Foam plastic insulative sheathing shall be installed in the 1 inch (25 mm) recess.
3. Approved engineered design.

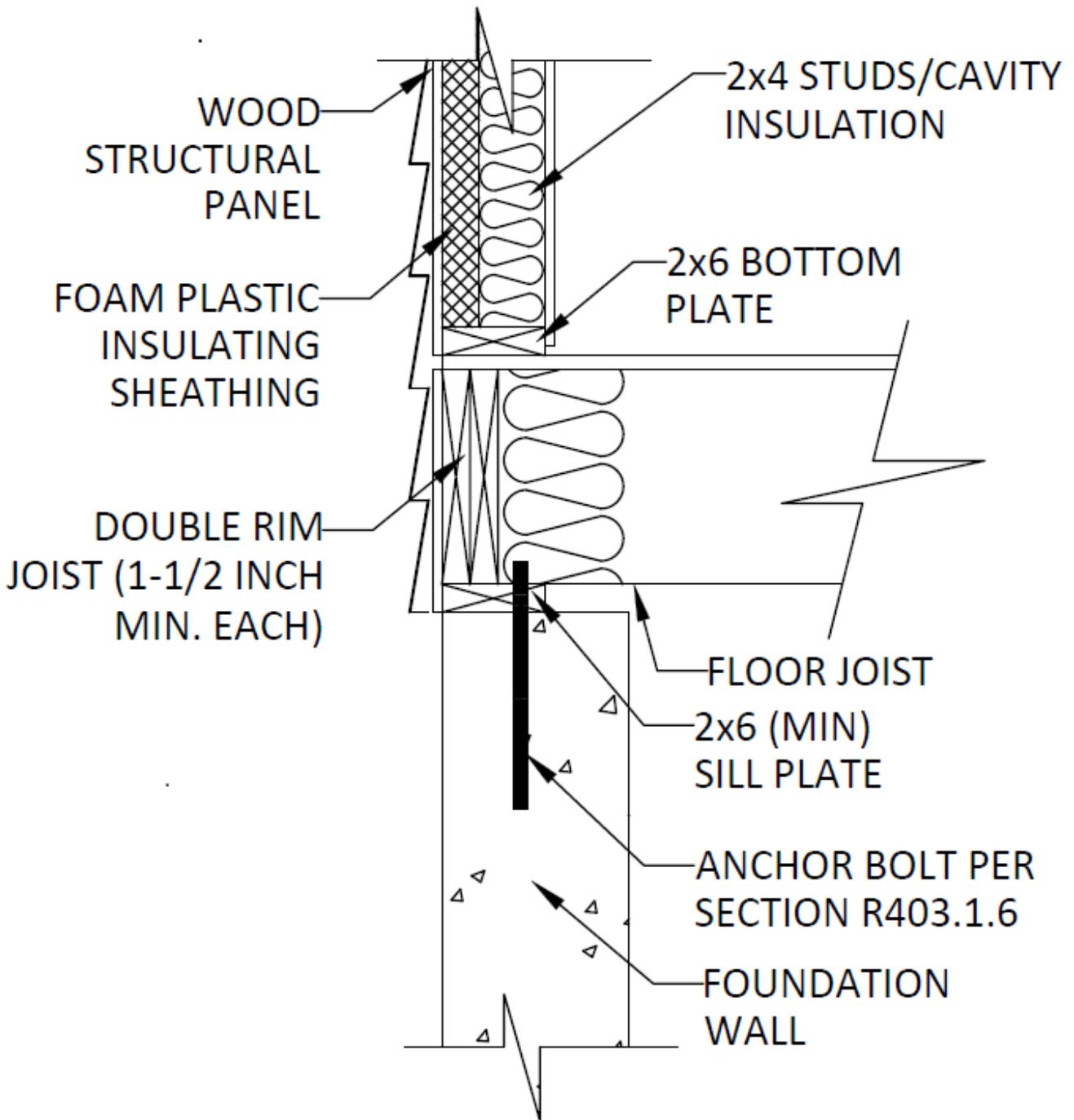


Figure R602.13.4(1)
Rim Joist Construction for EPW – Double Member

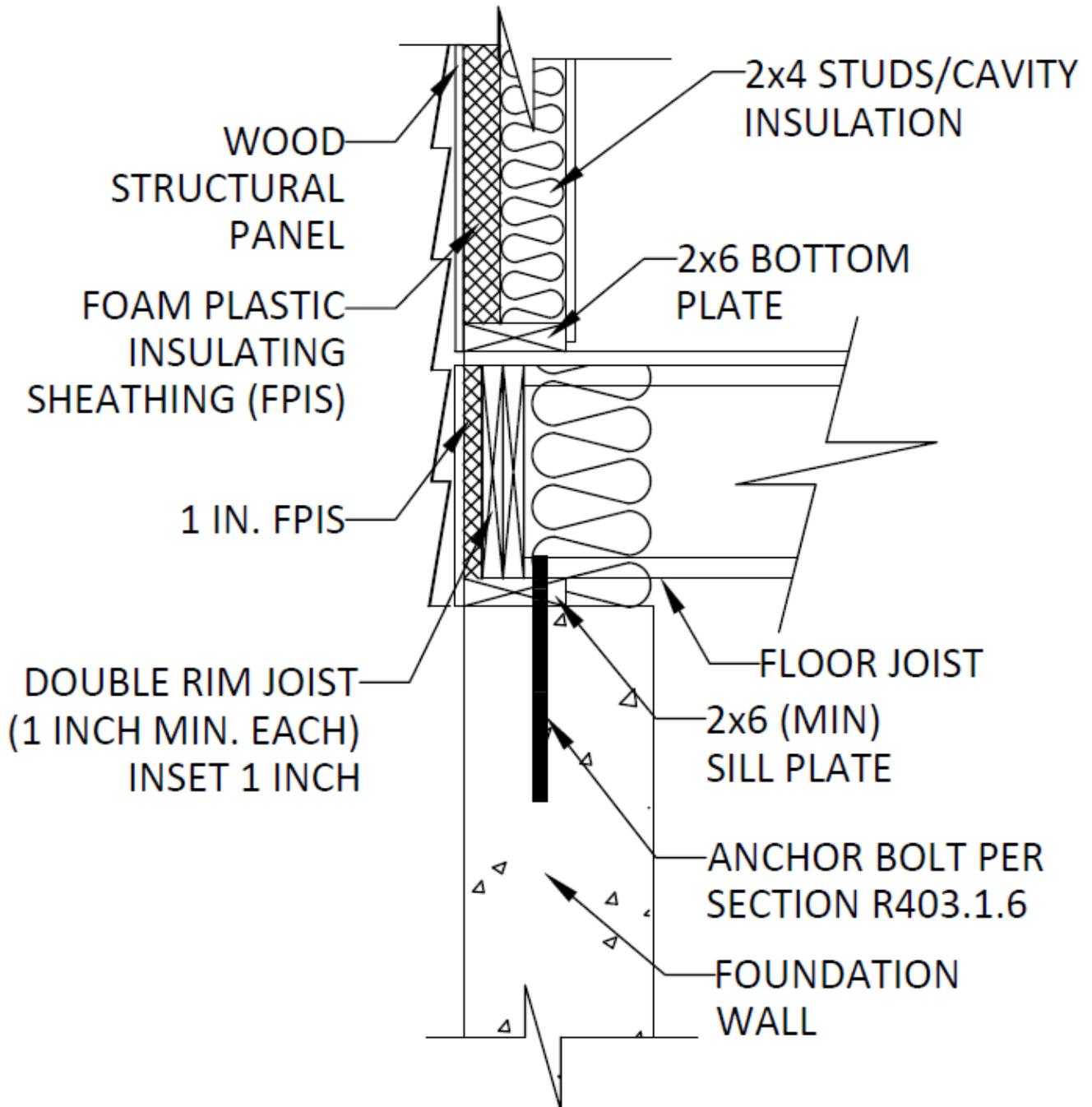


Figure R602.13.4(2)
Rim Joist Construction for EPW – Inset Double Member

R602.13.5 Rim joist used as rim header. Wood rim boards, or band joists, that serve as rim board headers shall be constructed in accordance with Section R602.7.2.

R602.13.6 Foam plastic insulating sheathing. Foam plastic insulating sheathing (FPIS) with a total thickness of 2 inches (51 mm) shall be installed between top and bottom plates directly to the exterior surface of studs and flush with the 2x6 top and bottom plates. FPIS shall comply with ASTM C578 or ASTM C1289, with a minimum compressive strength of 15 psi. FPIS shall be permitted to be installed in one or more layers.

R602.13.7 Wall coverings. Interior and exterior coverings and wall finishes shall be in accordance with all applicable provisions of Sections R701 through R703 as modified by the provisions of Sections R602.13.7.1 and

R602.13.7.2.

R602.13.7.1 Vapor retarder. A vapor retarder on the interior side of the EPW frame shall be in accordance with Section R702.7. Where a Class III interior vapor retarder is used in accordance with Table R702.7.1, EPW shall be designated as a 2x4 wall with continuous insulation and, in Climate Zones 4, 5, 6, 7, and 8, the foam plastic insulating sheathing layer including any facers or surface film shall have a water vapor permeance of less than or equal to 1.5 perms.

R602.13.7.2 Cladding attachment. Cladding shall be specified and installed in accordance with Section R703 and one of the following:

1. Table R703.3.3 for siding attachment to wood structural panels only.
2. Table R703.8.4(2) for brick tie-spacing and attachment to wood structural panels only.
3. Fastening schedule and fasteners as required by Table R703.3.(1), except fastener length shall be selected to meet or exceed the minimum required penetration into framing.

R602.13.8 Uplift connections. Where roof uplift tie-downs are selected in accordance with Section R802.11, the roof tie-downs shall be fastened to either side of the double top plate or, if required to be fastened to studs, shall be installed from the interior face of the wall in accordance with manufacturer's installation instructions. Where uplift forces determined in accordance with R602.3.5 require approved uplift connectors between floors or between foundation and the floor, these uplift connectors shall not rely on wood structural panel sheathing for resisting roof wind uplift forces.

Proposal # 4671

RB212-19 Part I

RB212-19 Part II

IECC: R402.1.6 (New), TABLE R402.1.2

Proponent: Vladimir Kochkin, Home Innovation Research Labs, representing Home Innovation Research Labs (vkochkin@homeinnovation.com); Patricia Gunderson, Home Innovation Research Labs, representing Home Innovation Research Labs (pgunderson@homeinnovation.com)

2018 International Energy Conservation Code

Add new text as follows:

R402.1.6 Extended Plate Wall (EPW). EPW wall systems constructed in accordance with all applicable provisions of Sections R602.1 through R602.13 of the International Residential Code shall be considered to be in compliance with continuous insulation provisions of Table R402.1.2. For use with the prescriptive minimum insulation requirements, the foam plastic insulating sheathing layer installed outboard of the studs and the cavity insulation shall be in accordance with the required levels of insulation specified in Table R402.1.2.

**TABLE R402.1.2
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a**

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U- FACTOR	GLAZED FENESTRATION SHGC ^{b, e}	CEILING R- VALUE	WOODFRAME WALL R- VALUE	MASSWAL R-VALUE
1	NR	0.75	0.25	30	13	3/4
2	0.40	0.65	0.25	38	13	4/6
3	0.32	0.55	0.25	38	20 or 13+5 ^h	8/13
4 except Marine	0.32	0.55	0.40	49	20 or 13+5 ^{h,i}	8/13
5 and Marine 4	0.30	0.55	NR	49	20 or 13+5 ^{h,i}	13/17
6	0.30	0.55	NR	49	20+5 ^{h,i} or 13+10 ^{h,i}	15/20
7 and 8	0.30	0.55	NR	49	20+5 ^{h,i} or 13+10 ^{h,i}	19/21

NR = Not Required. For SI: 1 foot = 304.8 mm.

- R*-values are minimums. U-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.
- The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

Exception: In Climate Zones 1 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

- “10/13” means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation on the interior of the basement wall. “15/19” means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. Alternatively, compliance with “15/19” shall be R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home.

- d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation *R*-value for slabs, as indicated in the table. The slab edge insulation for heated slabs shall not be required to extend below the slab.
- e. There are no SHGC requirements in the Marine Zone.
- f. Basement wall insulation is not required in warm-humid locations as defined by Figure R301.1 and Table R301.1.
- g. Alternatively, insulation sufficient to fill the framing cavity and providing not less than an *R*-value of R-19.
- h. The first value is cavity insulation, the second value is continuous insulation. Therefore, as an example, “13+5” means R-13 cavity insulation plus R-5 continuous insulation.
- i. Mass walls shall be in accordance with Section R402.2.5. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.
- j. EPW wood-frame wall system utilizing foam plastic and cavity insulation equal to or exceeding the prescribed R-values shall satisfy the prescriptive minimum insulation requirements for CZ 3-8.

Proposal # 5800

RB212-19 Part II

RB213-19

IRC@: R608.1

Proponent: Samuel Steele, representing Seattle Department of Construction and Inspection (SDCI)
(samuel.steele@seattle.gov)

2018 International Residential Code

Revise as follows:

R608.1 General. Exterior concrete walls shall be designed and constructed in accordance with the provisions of this section or in accordance with the provisions of PCA 100, ~~or ACI 318,~~ or ACI 332. Where PCA 100, ACI 318, ACI 332 or the provisions of this section are used to design concrete walls, project drawings, typical details and specifications are not required to bear the seal of the architect or engineer responsible for design, unless otherwise required by the state law of the jurisdiction having authority.

Reason: This change updates the exterior concrete wall construction section, R608.1, by including a reference to ACI 332 Residential Code Requirements for Structural Concrete. ACI 332 addresses the design and construction concrete basement or foundation walls constructed with removable forms or with flat insulating concrete forms. ACI 332 is already a referenced standard in section R404.1.3 of the 2018 IRC which also deals with the design of concrete foundation walls.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. It simply puts in a reference to a standard that was overlooked.

Proposal # 4347

RB213-19

RB214-19

IRC@: R609.1

Proponent: Jeff Inks, WDMA, representing Window and Door Manufacturers Association (jinks@wdma.com); Jennifer Hatfield, representing American Architectural Manufacturers Association (jen@jhatfieldandassociates.com)

2018 International Residential Code

Revise as follows:

R609.1 General. This section prescribes performance and construction requirements for exterior windows and doors installed in walls. Windows and doors shall be ~~installed and flashed anchored~~ in accordance with ~~the fenestration manufacturer's written instructions. Section R609.7.~~ Window and door openings shall be flashed in accordance with Section R703.4. ~~Written installation~~ Installation instructions shall be provided by the fenestration manufacturer for each window or door.

Reason: The long standing intent of Section R609 is to provide the appropriate performance and construction requirements for window and door products, and anchoring requirements with respect to the installation of them. As the general provision for Section R609, R609.1 should make that clear and for further clarification, make clear that flashing requirements for the window and door opening are provided in Chapter 7 Wall Coverings where they belong and manufacturers are still required to provide installation instructions. As currently written, the inclusion of flashing requirements in this section is not necessary and more importantly conflicts with the provisions of Section R703.4 which does not restrict builders from using other proper flashing installation methods in addition to those included in the manufacturer's instructions when those instructions may not cover a particular installation aspect/s. This proposal corrects that and brings the general provisions of R609.1 back in-line with the intent of Section R609 on the whole by clarifying anchoring must comply with Section R609.7 and flashing of the opening with Section R703.4. The requirement that manufacturers must provide installation instructions remains and more clearly reflects how installation instructions are being provided by manufacturers.

Cost Impact: The code change proposal will decrease the cost of construction

This amendment will reduce the cost of construction when alternatives to the flashing instructions provided by the manufacturer are needed or preferred by the builder because of project specific conditions. Section R703.4 allows the builder to use alternative, code compliant methods under those circumstances. If the flashing provisions of this section are enforced over the flashing provisions of section R703.4, the manufacturer would need to develop project specific alternatives which is costly, results in construction delays, and not practical.

Proposal # 5390

RB214-19

RB215-19

IRC: R609.4.1 (New)

Proponent: T. Eric Stafford, representing Insurance Institute for Business and Home Safety
(testafford@charter.net)

2018 International Residential Code

R609.4 Garage doors. Garage doors shall be tested in accordance with either ASTM E330 or ANSI/DASMA 108, and shall meet the acceptance criteria of ANSI/DASMA 108.

Add new text as follows:

R609.4.1 Garage door labeling. Garage doors shall have a permanent label identifying the garage door manufacturer, the garage door model/series number, the positive and negative design wind pressure rating, the installation instruction drawing reference number, and the applicable test standard.

Reason: This proposal is one of several that are addressing labeling of critical components of the building envelope. The primary purpose of this code change is to require that garage doors have a permanent label that provides a way for building owners, homeowners, and others to be able to determine their performance characteristics after the building has been occupied. The 2018 IRC does not require any type of label for garage doors. For products that don't have permanent labels, it becomes nearly impossible for the owner to determine the structural wind load resistance and/or energy efficiency of the garage doors after they've occupied the building. This proposal would simply require some type of permanent marking on the garage door indicating the manufacturer and model/series number, and performance characteristics so that the specific performance characteristics could be retrieved at a later date.

This same proposal was submitted for the 2018 IRC but was not approved by the IRC B Committee. However, it was nearly unanimously approved at the final action hearings, but did not get the required majority during the OGVC.

For the past 10-15 years, there has been a push towards considering sustainability in the way our buildings are constructed in this country. If this goal is to be successful and building owners and occupants increasingly want more information about the sustainability of the buildings they occupy, they need to be provided with information needed to determine how critical components are expected to perform in the buildings they use. Garage doors are important components of the building envelope and their performance is critical in preventing wind and water infiltration as well as to maintaining the overall structural integrity of the building.

Some manufacturers already include permanent labels on their products that provide traceability to the manufacture and the product characteristics. The Florida Building Code has required this type of label since the 2007 edition and has continued to require it in subsequent editions. The following is the relevant text from the 6th Edition (2017) Florida Building Code, Residential:

R612.4.1 Garage door labeling. Garage doors shall be labeled with a permanent label provided by the garage door manufacturer. The label shall identify the garage door manufacturer, the garage door model/series number, the positive and negative design pressure rating, indicate impact rated if applicable, the installation instruction drawing reference number, the Florida Product Approval or Miami-Dade Product Approval number if applicable, and the applicable test standards. The required garage door components for an approved garage door assembly may be indicated using a checklist form on the label. If a checklist format is used on the label, the door installer or the garage door manufacturer shall mark the selected components on the checklist that are required to assemble an approved garage door system. The installation instructions shall be provided and available on the job site.

Also, Oklahoma Uniform Building Code Commission Rules in their Appendix Y require that garage doors be wind rated to 135 mph. Having a permanent label will facilitate verification that the right type of garage door is installed.

Another consideration is that insurance incentives are now being offered in some states for homes, new and existing, that comply with certain levels of the Fortified program administered by IBHS. The Fortified program is a set of engineering and building standards designed to help strengthen new and existing homes through system-specific building upgrades to minimum building code requirements that will reduce damage from specific natural hazards. Fortified offers three different levels of designation (bronze, silver, and gold) depending on the extent of the recommended “upgrades” to the building’s wind resistance. To qualify for a designation, the home has to be inspected. Without a permanent label indicating the manufacturer and product model/series number, the performance characteristics often cannot be determined, and certain Fortified designations become difficult or impossible to be given.

Approval of this proposal will assure, going forward, that new or replaced garage doors will be labeled such that building owners and those considering the purchase of buildings with these products will be able to obtain information necessary for determining the expected performance of these critical components of the building envelope.

Cost Impact: The code change proposal will increase the cost of construction. It will impact cost for some manufacturers. The code does not currently require a permanent label. However, some garage door manufacturers voluntarily apply a permanent label that identifies the critical performance characteristics. There will be no cost impact to those manufacturers.

Proposal # 4360

RB215-19

RB216-19

IRC: TABLE R702.3.5

Proponent: Rick Allen, International Staple, Nail and Tool Association, representing International Staple, Nail and Tool Association (rallen@isanta.org)

2018 International Residential Code

Revise as follows:

TABLE R702.3.5

MINIMUM THICKNESS AND APPLICATION OF GYPSUM BOARD AND GYPSUM PANEL PRODUCTS

Portions of table not shown remain unchanged.

THICKNESS OF GYPSUM BOARD OR GYPSUM PANEL PRODUCTS (inches)	APPLICATION	ORIENTATION OF GYPSUM BOARD OR GYPSUM PANEL PRODUCTS TO FRAMING	MAXIMUM SPACING OF FRAMING MEMBERS (inches o.c.)	MAXIMUM SPACING OF FASTENERS (inches)	
				Nails ^a	Screws
Application without adhesive					
3/8	Ceiling ^d	Perpendicular	16	7	12
	Wall	Either direction	16	8	16
1/2	Ceiling	Either direction	16	7	12
	Ceiling ^d	Perpendicular	24	7	12
	Wall	Either direction	24	8	12
	Wall	Either direction	16	8	16

$\frac{5}{8}$	Ceiling	Either direction	16	7	12
	Ceiling	Perpendicular	24	7	12
	Type X at garage ceiling beneath habitable rooms	Perpendicular	24	6	6
	Wall	Either direction	24	8	12
	Wall	Either direction	16	8	16

For SI: 1 inch = 25.4 mm.

- a. For application without adhesive, a pair of nails spaced not less than 2 inches apart or more than $2\frac{1}{2}$ inches apart shall be permitted to be used with the pair of nails spaced 12 inches on center.
- b. Screws shall be in accordance with Section R702.3.5.1. Screws for attaching gypsum board or gypsum panel products to structural insulated panels shall penetrate the wood structural panel facing not less than $\frac{7}{16}$ inch.
- c. Where cold-formed steel framing is used with a clinching design to receive nails by two edges of metal, the nails shall be not less than $\frac{5}{8}$ inch longer than the gypsum board or gypsum panel product thickness and shall have ringed shanks. Where the cold-formed steel framing has a nailing groove formed to receive the nails, the nails shall have barbed shanks or be 5d, $13\frac{1}{2}$ gage, $1\frac{5}{8}$ inches long, $\frac{15}{64}$ -inch head for $\frac{1}{2}$ -inch gypsum board or gypsum panel product; and

6d, 13 gage, 1⁷/₈ inches long, 1⁵/₆₄-inch head for 5/8-inch gypsum board or gypsum panel product.

- d. Three-eighths-inch-thick single-ply gypsum board or gypsum panel product shall not be used on a ceiling where a water-based textured finish is to be applied, or where it will be required to support insulation above a ceiling. On ceiling applications to receive a water-based texture material, either hand or spray applied, the gypsum board or gypsum panel product shall be applied perpendicular to framing. Where applying a water-based texture material, the minimum gypsum board thickness shall be increased from 3/8 inch to 1/2 inch for 16-inch on center framing, and from 1/2 inch to 5/8 inch for 24-inch on center framing or 1/2-inch sag-resistant gypsum ceiling board shall be used.

Reason: renaming to "ring shank" from "annular ringed" to be consistent with existing terminology in the code.

For the 5/8" Type X at garage ceiling, the description of a 1⁷/₈" **6d coated** nail does not provide a complete description.

Providing a nail diameter (0.099 inches) and "galvanized" provides a complete description for the nail.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. These changes provide clarification to existing language and will not affect cost.

Proposal # 3875

RB216-19

RB217-19

IRC: R702.7, R702.7.1(New)

Proponent: Cesar Lujan, representing National Association of Home Builders (clujan@nahb.org); Gary Ehrlich, representing National Association of Home Builders (gehrlich@nahb.org)

2018 International Residential Code

Revise as follows:

R702.7 Vapor retarders. Vapor retarders on the interior side of frame walls shall be installed in accordance with this section. Class I or II vapor retarders ~~are required~~ shall be provided on the interior side of frame walls in Climate Zones 5, 6, 7, 8 and Marine 4.

Exceptions:

1. Basement walls.
2. Below-grade portion of any wall.
3. Construction where accumulation, condensation, or freezing of moisture or its freezing will not damage the materials.

Add new text as follows:

702.7.1 Class I and II vapor retarders. Class I and II vapor retarders shall not be provided on the interior side of frame walls in Climate Zone 1A, 2A, and portions of Climate Zone 3A south of the warm-humid line.

Reason: The purpose of this code change is to provide appropriate limitations on the use of Class I or II interior vapor retarders in the warm-humid climate zones. The intent of providing a vapor retarder in the wall assembly is to control the migration of moisture from the warm side of the wall assembly to the colder side, where it can condense against colder surfaces and, if trapped within a portion of the wall assembly, cause mold growth or material decay. The existing vapor retarder requirements are intended for colder climates where the most concerning direction of vapor drive is from the warm inside of the house towards the colder outside, occurring during the heating (winter) season. In warmer climates, the direction of concern would be from the warm outside towards the colder inside of the house, occurring during the cooling (summer) season. In the latter case, a vapor retarder on the inside of the wall assembly would prevent the wall from drying inwards and could result in condensation occurring on the interior gypsum board or on the back side of the vapor retarder. Either one could result in mold growth and decay. To minimize the risk of interior vapor retarders being installed where they are not necessary, and could cause issues within the wall, an explicit limitation on interior vapor retarders in the warm-humid climate zones is proposed.

The code change also provides several editorial revisions. A separate section under 702.7 for the Class I and II vapor retarder requirements is created, and new charging language for the entire vapor retarder provisions added. The third exception to providing Class I or II vapor retarders is revised to clarify what the moisture conditions of concern are that need to be evaluated in deciding whether a wall assembly can be exempted from the vapor retarder requirements.

The proposed limitations are consistent with industry guidance from Home Innovation Research Labs, Building Science Corporation, DOE's Building America program, NAIMA, and others.

Bibliography: *Moisture Performance of Walls in Energy-Efficient Homes*, prepared by Home Innovation Research Labs for National Association of Home Builders, August 2015.

Building Science Digest 106, *Understanding Vapor Barriers*, Building Science Corporation, October 2006 (Revised April 2011).

NAIMA, *Insulation and Vapor Retarders*, <http://www.naima.org/insulation-knowledge-base/residential-home-insulation/insulation-and-vapor-retarders.html>.

No Class I Vapor Retarders on Interior Side of Exterior Walls in Warm-Humid Climates, Building America Solution Center (<https://basc.pnnl.gov>), August 2013.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code change clarifies when interior vapor retarders are not required, and in fact when they should not be provided. If anything, this code change would reduce the cost of construction if interior vapor retarders are currently being installed where they are not necessary, as well as avoiding the potential cost of mitigating moisture issues down the road.

Proposal # 5033

RB217-19

RB218-19

IRC: R702.7

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com); Gil Rossmiller (gilrossmiller@coloradocode.net)

2018 International Residential Code

SECTION R702 INTERIOR COVERING

Revise as follows:

R702.7 Vapor retarders. Class I or II vapor retarders are required on the interior side of frame walls in Climate Zones 5, 6, 7, 8 and Marine 4. Installation of a Class I vapor retarder shall comply with all of the following:

1. Be sealed to framing with construction adhesive or equivalent at the top and bottom plates, around window and door openings, and other areas where needed to create a tight seal.
2. Be sealed air tight around utility boxes and other penetrations.
3. Seams in the vapor retarder shall be overlapped at least 6 inches (152 mm) and sealed with compatible sealing tape or equivalent.

Exceptions:

1. Basement walls.
2. Below-grade portion of any wall.
3. Construction where moisture or its freezing will not damage the materials.

Reason: I have yet to see manufacture instructions for how to install a class one vapor retarder yet that is what the code relies on. The building science community has studied and reported on the fact that 90 plus percent of the moisture that enters walls or other assemblies is driven there by air leakage not diffusion. If a class one vapor retarder is installed and **not** sealed to prevent the majority of moisture transport via air leakage then it merely is trapping moisture not fully retarding its ability to enter the cavity. Yes, the barrier can substantially stop vapor diffusion which means that it is not forgiving and will not allow water vapor to diffuse back out of an assembly if it were to get in by other means than diffusion. The requirement to install a vapor retarder is reliant that it is installed correctly not only to stop or reduce vapor diffusion but also moisture that travels with air. Minnesota has realized the reality and dichotomy of this situation and therefore has added some basic installation instruction into their adopted code. The language has been adapted here so as to offer guidance that is needed and missing in the industry.

Cost Impact: The code change proposal will increase the cost of construction. Although this proposal should not increase the cost of construction it is expected that it will slightly since the majority of the country does not enforce proper installation of class one vapor retarders.

Proposal # 4842

RB218-19

RB219-19

IRC: R702.7, R702.7.3

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com); Joseph Lstiburek, representing self (joe@buildingsscience.com)

2018 International Residential Code

Revise as follows:

R702.7 Vapor retarders. Class I, or II or III vapor retarders are required on the interior side of frame walls in Climate Zones 5, 6, 7, 8 and Marine 4.

Exceptions:

1. Basement walls.
2. Below-grade portion of any wall.
3. Construction where moisture or its freezing will not damage the materials.

R702.7.1 Class III vapor retarders. Class III vapor retarders shall be permitted where any one of the conditions in Table R702.7.1 is met.

**TABLE R702.7.1
CLASS III VAPOR RETARDERS**

Portions of table not shown remain unchanged.

CLIMATEZONE	CLASS III VAPOR RETARDERS PERMITTED FOR: ^a
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R702.7.2 Material vapor retarder class. The *vapor retarder class* shall be based on the manufacturer's certified testing or a tested assembly.

The following shall be deemed to meet the class specified:

1. Class I: Sheet polyethylene, on perforated aluminum foil.
2. Class II: Kraft-faced fiberglass batts.
3. Class III: Latex or enamel paint.

Revise as follows:

R702.7.3 Minimum clear airspaces and vented openings for vented cladding. ~~For the purposes of this section, vented Vented cladding shall include the following minimum clear airspaces: a minimum 3/16-inch (4.8 mm) airspace. Other openings with the equivalent vent area shall be permitted.~~

- ~~1. Vinyl polypropylene or horizontal aluminum siding applied over a weather-resistive barrier as specified in Table R703.3(1).~~
- ~~2. Brick veneer with a clear airspace as specified in Table R703.8.4.~~
- ~~3. Other approved vented claddings.~~

Reason: First, as written the section title R402.7.3 **Minimum clear airspaces and vented openings for vented cladding** does not match the code language below which is defining vented cladding. It appears that vented cladding is being used as an example of what minimum clear air spaces is but it is very confusing and most are unclear what the section is trying to do. If vented cladding needs to be defined a new section should be create to do so. In my option it does not need to be defined, but the minimum clear airspace certainly does.

As we know vapor retarders are designed to stop or limit the amount of moisture that can diffuse into a building assembly. They however do not stop moisture that moves with air and science has determined that 90 plus percent of the moisture that enters our building assemblies gets there via air leakage vs. vapor diffusion. Therefore, our concern regarding trapping moisture in assemblies and the drying potential of the assemblies we build is on the rise. With that in mind this proposal is striving to attain two things. First a realization that the choice of vapor retarder that is used should be based on the structure and the climate that structure is built in. We should dictate that a vapor retarder is installed, but not proclaim that only one type is best for a specific climate zone. Second, specifically when class three vapor retarders are used it has been shown that the vented space does not need to be more than 3/16 of an inch. The structure of the code does not called out the size of the vented opening which is causing builders to be forced to use class one and two vapor retarders when class three retarders would actually be the best choice for their climate and structure. This occurs because jurisdictions do not have better guidance than some random examples of gaps size behind vented cladding that is currently given in the code. This is especially true in dry climate zones but is an issue everywhere.

In Joe Lstiburek's article titled "Wufi – Barking up the Wrong Tree" he demonstrates that wood siding that is installed over a 3/16" gap has air movement behind it that is equivalent to approximately 20 air changes per hour. See table 2 cladding ventilation/sheathing ventilation. Lstiburek continues in his article titled, "Hockey Pucks and Hydrostatic Pressure" to demonstrate the "you need to install wood siding and trim over a small gap to control hydrostatic pressure. This gap can be as small as 1/4" and the spacer can be a strip of thin foam" such as sill seal which is what is pictured in the photographs that accompany the paper.

Bibliography: BSD-106: Understanding Vapor Barriers, by Joseph Lstiburek
<http://buildingscience.com/documents/digests/bsd-106-understanding-vapor-barriers>

BSI-089: Wufi – Barking up the Wrong Tree, by Joseph Lstiburek

<https://buildingscience.com/documents/building-science-insights-newsletters/bsi-089-wufi%E2%80%94barking-wrong-tree>

BS_057: Hockey Pucks and Hydrostatic Pressure, by Joseph Lstiburek

<https://buildingscience.com/documents/insights/bsi-057-hockey-pucks-and-hydrostatic-pressure>

RR-0999: Drainage Planes and Air Spaces, by Joseph Lstiburek

<https://buildingscience.com/documents/reports/rr-9909-drainage-planes-and-air-spaces/view>

You don't need a Vapor Barrier, By Allison Bailes with the Energy Vanguard

<http://www.energyvanguard.com/blog-building-science-HERS-BPI/bid/54110/You-Don-t-Need-a-Vapor-Barrier-Probably>

Are Vapor Barriers Required or Recommended?

BY JUAN RODRIGUEZ Updated December 30, 2018

<https://www.thebalancesmb.com/what-is-a-vapor-barrier-845075>

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Cost Statement:

There are no construction cost increases associated with the clarification and flexibility that are achieved through this code change proposal

Proposal # 4838

RB219-19

RB220-19

IRC: R702.7, Table R702.7 (New)

Proponent: Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council; Vladimir Kochkin, Home Innovation Research Labs, representing Home Innovation Research Labs (vkochkin@homeinnovation.com)

2018 International Residential Code

Revise as follows:

R702.7 Vapor retarders. Class I or II vapor retarders are required on the interior side of frame walls in Climate Zones 5, 6, 7, 8 and Marine 4. Where a Class II vapor retarder is used in combination with foam plastic insulating sheathing installed as continuous insulation on the exterior side of frame walls, the continuous insulation shall provide the minimum R values indicated in Table R702.7. The Class II vapor retarder shall have a vapor permeance greater than 1 perm when measured by ASTM E96 water method, Procedure B. Use of a Class I interior vapor retarder in frame walls with a Class I vapor retarder on the exterior side shall require an approved design.

Exceptions:

1. Basement walls.
2. Below-grade portion of any wall.
3. Construction where moisture or its freezing will not damage the materials.
4. Conditions where Class III vapor retarders are permitted in Section R702.7.1.

Add new text as follows:

TABLE R702.7
CONTINUOUS INSULATION WITH CLASS II VAPOR RETARDER

CLIMATE ZONE	CLASS II VAPOR RETARDERS PERMITTED FOR ^a
<u>3</u>	<u>Continuous insulation with R-value ≥ 2</u>
<u>4, 5, and 6</u>	<u>Continuous insulation with R-value ≥ 3 over 2x4 wall.</u> <u>Continuous insulation with R-value ≥ 5 over 2x6 wall.</u>
<u>7</u>	<u>Continuous insulation with R-value ≥ 5 over 2x4 wall.</u> <u>Continuous insulation with R-value ≥ 7.5 over 2x6 wall.</u>
<u>8</u>	<u>Continuous insulation with R-value ≥ 7.5 over 2x4 wall.</u> <u>Continuous insulation with R-value ≥ 10 over 2x6 wall.</u>

a. In addition to the vapor retarder, spray foam with a maximum permeance of 1.5 perms at the installed thickness, applied to the interior cavity side of wood structural panels, fiberboard, insulating sheathing or gypsum is deemed to meet the continuous insulation requirement only for the moisture control purposes of this table where the spray foam R-value plus any continuous insulation R-value provided meets or exceeds the specified continuous insulation R-value.

Reason: This proposal is identical to a proposal (FS120-18) approved for the 2021 IBC. It provides needed

requirements for appropriate use of continuous insulation where a Class II vapor retarder is used and conservatively limits use of Class I vapor retarder. These requirements are based on an extensive review of research and code requirements in the U.S. and Canada and also are consistent with the National Building Code of Canada (ABTG, 2015; ASTM 2017). The effectiveness of these requirements have also been confirmed in recent monitoring of actual homes across northern climates of the U.S. by the Home Innovation Research Lab (Kochkin and Shaw, 2017).

Various associations developed proposals to modify the 2021 Group A vapor retarder section which were subsequently approved by the ICC membership. These proposals act as a package of changes that improve the format and content of this code section. The collaborative group believes this package of code changes will result in regulations that adequately address the moisture management in residential buildings. We have submitted a similar grouping of proposals to make a corresponding change to the IRC. The table below correlates the code proposals between the Group A and B hearings.

CORRELATION BETWEEN GROUP A AND B PROPOSALS			
Group A Hearing			
Proposal	IBC Code Section	Proponent	Description
FS-117	1404.3, 1404.3(1) (New), 1404.3(2) (New), TABLE 1404.3.2, 1404.3.2, 1404.3.3, 1404.3.4	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council	Reorganizes and streamlines make requirements more tra
FS-118	1404.3, 1404.3.1	Theresa Weston, DuPont, representing Air Barrier Association	Adds exception describing re Class I and II smart vapor reti than 1 perm per ASTM E96 Pr be allowed in all climate zone
FS-119	1404.3, 1404.3.1, 1404.3.2, 1404.3.3, TABLE 1404.3.3	Kingston Chow, APA - The Engineered Wood Association, representing APA - The Engineered Wood Association; Borjen Yeh (same)	Reorganization (moves vapor classes to first section). Redd changes made in FS-117.
FS-120	1404.3.1, TABLE 1404.3.1 (New), 1404.3.2	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council; Vladimir Kochkin, representing Home Innovation Research Labs	Provides continuous insulatio requirements for use with Cla deletes restriction to Class III Requires approved design for barrer (Class I on interior and
FS-121	1404.3.1, 1404.3.2	Mike Fischer, Kellen Company, representing The Polyisocyanurate Insulation Manufacturers Association	Focuses on deleting the Class and restores code to pre-201
FS-122	1404.3.2, 1404.3.2.1 (New), 1404.3.2.2 (New), 1404.3.2.2.1 (New), TABLE 1404.3.2	Mike Fischer, Kellen Company, representing The Center for the Polyurethanes Industry of the American Chemistry Council	The proposal adds charging l. clarifies how the combinatio insulating methods can provi moisture control so that the t Value can be achieved by cor cavity, or a combination of in strategies.
FS-125	TABLE 1404.3.2, 1404.3.2	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council	Expands Marine 4 to all of CZ use of Class III in CZ 1-3.
		Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of	Separate CZ 8 from Climate Z ensure consistent performanc

FS-127	TABLE 1404.3.2	the American Chemistry Council	
FS-128	TABLE 1404.3.2	Craig Conner, representing self ; Joseph Lstiburek, representing Self	Same as FS127
FS-130	TABLE 1404.3.2	Mike Fischer, Kellen Company, representing The Center for the Polyurethanes Industry of the American Chemistry Council	Adds footnote that prevents use of spray foam and ci R-values for
FS-131	1404.3.3	John Woestman, Kellen Co., representing Extruded Polystyrene Foam Association (XPSA)	Improves requirements for vapor barrier paints to ensure performance compliance with manufacture

Bibliography: Assessment of Water Vapor Control Methods for Modern Insulated Light-Frame Wall Assemblies, ABTG Research Report No. 1410-03, 2015, Applied Building Technology Group LLC, <https://www.appliedbuildingtech.com/rr/1410-03>
Assessment of Hygrothermal Performance and Design Guidance for Modern Light-Frame Wall Assemblies, ASTM STP 1599, Crandell, J.H., 2017, https://www.astm.org/DIGITAL_LIBRARY/STP/PAGES/STP159920160092.htm

Moisture Performance of High-R Wall Systems, Prepared for the US DOE & NAHB by Home Innovation Research Labs, Kochkin, V. and Shah, N. 2017
(<https://www.homeinnovation.com/~media/Files/Reports/Moisture-Performance-of-High-R-Wall-Systems-2018.pdf>)

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The use of a Class I or II vapor retarder are options and other options are unchanged. Also, the proposal provides appropriate guidance for use of continuous insulation that, in many cases will allow less insulation to be used than required with use of a Class III vapor retarder. It will also allow conformance with prescriptive energy code R-value requirements without exceeding those requirements for moisture control purposes. Thus, in many cases this proposal may reduce cost.

RB221-19

IRC: R702.7, R702.7.4(New)

Proponent: Theresa Weston, representing Air Barrier Association of America (ABAA)
(theresa.a.weston@dupont.com)

2018 International Residential Code

Revise as follows:

R702.7 Vapor retarders. Class I or II vapor retarders are required on the interior side of frame walls in Climate Zones 5, 6, 7, 8 and Marine 4 to protect the exterior wall assembly against condensation. Vapor retarders shall be installed in accordance with Section R702.7.4.

Exceptions:

1. Basement walls.
2. Below-grade portion of any wall.
3. Construction where moisture or its freezing will not damage the materials.

Add new text as follows:

702.7.4 Installation Vapor retarders shall be installed in accordance with the manufacturer's instructions or an approved design. The vapor retarder shall be installed as an air barrier or in conjunction with an air barrier.

Reason: For vapor retarders to perform as intended, they need to be installed as or in conjunction with an air barrier.

Air leakage control is currently dealt with in the I-codes based on energy efficiency considerations, but it is also critical to protection against moisture condensation. Air leakage can move 100x more moisture than vapor diffusion, and vapor retarders will not work properly without air leakage control. As stated in the Whole Building Design Guide:

"Moisture contributed by air leakage is a significant source and should be a serious concern in the design of the wall system. In fact, the design of the building envelope for minimizing air leakage is more critical than the design of the vapor barrier. To illustrate this point, consider that the amount of moisture contributed to a building by the air that flows through a crack 1/16th inch thick by 1 foot long is just over 5 pints per day in a light breeze. In contrast, the amount of moisture contributed by vapor diffusion through a 10 foot by 50-foot painted block wall over the same period equals just under 1/3 of a pint (about 5 ounces)."

It is important to include air leakage control in Section R702.7 as it will highlight its importance to moisture management and facilitate the inclusion of air leakage control in water management details.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal should neither increase nor decrease the cost of construction, as its intention is to ensure that an existing requirement is installed in an effective manner.

Proposal # 4947

RB221-19

RB222-19

IRC: R702.7, TABLE R702.7(1) (New), TABLE R702.7(2) (New), R702.7.1, TABLE R702.7.1, R702.7.2, R702.7.3

Proponent: Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council

2018 International Residential Code

Delete and substitute as follows:

~~**R702.7 Vapor retarders.** Class I or II vapor retarders are required on the interior side of frame walls in Climate Zones 5, 6, 7, 8 and Marine 4.~~

Exceptions:

- ~~1. Basement walls.~~
- ~~2. Below-grade portion of any wall.~~
- ~~3. Construction where moisture or its freezing will not damage the materials.~~

R702.7 Vapor retarders. Vapor retarder materials shall be classified in accordance with Table R702.7(1). A vapor retarder shall be provided on the interior side of frame walls in accordance with Table R702.7(2) including compliance with Table R702.7(3) where applicable. Alternatively, an approved design using accepted engineering practice for hygrothermal analysis shall be used. The appropriate climate zone shall be selected in accordance with Section N1101.7 (R301.1).

Exceptions:

1. Basement walls.
2. Below-grade portion of any wall.
3. Construction where accumulation, condensation, or freezing of moisture will not damage the materials.

Add new text as follows:

**TABLE R702.7(1)
VAPOR RETARDER MATERIALS AND CLASSES**

CLASS	ACCEPTABLE MATERIALS
I	Sheet polyethylene, nonperforated aluminum foil, or other approved materials with a perm rating of less than or equal to 0.1.
II	Kraft-faced fiberglass batts, paint, or other approved materials with a perm rating greater than 0.1 and less than or equal to 1.0.
III	Latex paint, enamel paint, or other approved materials with a perm rating of greater than 1.0 and less than or equal to 10.0.

**TABLE R702.7(2)
VAPOR RETARDER OPTIONS**

CLIMATE ZONE	VAPOR RETARDER CLASS
---------------------	-----------------------------

<u>CLIMATE ZONE</u>	<u>CLASS I</u>	<u>CLASS II</u>	<u>CLASS III</u>
1,2	Not Permitted	Not Permitted	Permitted
3, 4 (except Marine 4)	Not Permitted	Permitted	Permitted
Marine 4, 5, 6, 7, 8	Permitted	Permitted	See Table R702.7(3)

Revise as follows:

**TABLE R702.7.1 R702.7(3)
CLASS III VAPOR RETARDERS**

<u>CLIMATE ZONE</u>	<u>CLASS III VAPOR RETARDERS PERMITTED FOR:^{a, b}</u>
Marine 4	Vented cladding over wood structural panels.
	Vented cladding over fiberboard.
	Vented cladding over gypsum.
	Continuous insulation with R-value ≥ 2.5 over 2 x 4 wall.
	Continuous insulation with R-value ≥ 3.75 over 2 x 6 wall.
5	Vented cladding over wood structural panels.
	Vented cladding over fiberboard.
	Vented cladding over gypsum.
	Continuous insulation with R-value ≥ 5 over 2 x 4 wall.
	Continuous insulation with R-value ≥ 7.5 over 2 x 6 wall.
6	Vented cladding over fiberboard.
	Vented cladding over gypsum.
	Continuous insulation with R-value ≥ 7.5 over 2 x 4 wall.
	Continuous insulation with R-value ≥ 11.25 over 2 x 6 wall.
7 and 8	Continuous insulation with R-value ≥ 10 over 2 x 4 wall.
	Continuous insulation with R-value ≥ 15 over 2 x 6 wall.

For SI: 1 pound per cubic foot = 16 kg/m³.

- a. Spray foam with a maximum permeance of 1.5 perms at the installed thickness, applied to the interior cavity side of wood structural panels, fiberboard, insulating sheathing or gypsum is deemed to meet the continuous insulation requirement where the spray foam R-value meets or exceeds the specified continuous insulation R-value.
- b. Vented cladding shall include vinyl, polypropylene, or horizontal aluminum siding, brick veneer with a clear airspace as specified in Table R703.8.4, and other approved vented claddings.

Delete without substitution:

~~**R702.7.1 Class III vapor retarders.** Class III vapor retarders shall be permitted where any one of the conditions in Table R702.7.1 is met.~~

~~**R702.7.2 Material vapor retarder class.** The vapor retarder class shall be based on the manufacturer's certified testing or a tested assembly.~~

~~The following shall be deemed to meet the class specified:~~

- 1- ~~Class I: Sheet polyethylene, on perforated aluminum foil.~~
- 2- ~~Class II: Kraft-faced fiberglass batts.~~
- 3- ~~Class III: Latex or enamel paint.~~

R702.7.3 Minimum clear airspaces and vented openings for vented cladding. For the purposes of this section, vented cladding shall include the following minimum clear airspaces. Other openings with the equivalent vent area shall be permitted.

- 1- ~~Vinyl polypropylene or horizontal aluminum siding applied over a weather-resistive barrier as specified in Table R703.3(1).~~
- 2- ~~Brick veneer with a clear airspace as specified in Table R703.8.4.~~
- 3- ~~Other approved vented claddings.~~

Reason: This proposal reformats the vapor retarder provisions to coordinate the IRC with an identical proposal (FS117-18) that was approved for the 2021 IBC vapor retarder provisions. All of the requirements are arranged for easy “look-up” in tables rather than in text such that requirements for a given climate zone or locality can be easily identified. Also, it is important that the IBC and IRC provisions are coordinated to avoid confusion or contradiction.

Various associations developed proposals to modify the 2021 Group A vapor retarder section which were subsequently approved by the ICC membership. These proposals act as a package of changes that improve the format and content of this code section. The collaborative group believes this package of code changes will result in regulations that adequately address the moisture management in residential buildings. We have submitted a similar grouping of proposals to make a corresponding change to the IRC. The table below correlates the code proposals between the Group A and B hearings.

CORRELATION BETWEEN GROUP A AND B PROPOSALS			
Group A Hearing			
Proposal	IBC Code Section	Proponent	Description
FS-117	1404.3, 1404.3(1) (New), 1404.3(2) (New), TABLE 1404.3.2, 1404.3.2, 1404.3.3, 1404.3.4	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council	Reorganizes and streamlines make requirements more tra
FS-118	1404.3, 1404.3.1	Theresa Weston, DuPont, representing Air Barrier Association	Adds exception describing re Class I and II smart vapor ret than 1 perm per ASTM E96 Pr be allowed in all climate zone
FS-119	1404.3, 1404.3.1, 1404.3.2, 1404.3.3, TABLE 1404.3.3	Kingston Chow, APA - The Engineered Wood Association, representing APA - The Engineered Wood Association; Borjen Yeh (same)	Reorganization (moves vapor classes to first section). Redu changes made in FS-117.
FS-120	1404.3.1, TABLE 1404.3.1 (New), 1404.3.2	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council; Vladimir Kochkin, representing Home Innovation Research Labs	Provides continuous insulatio requirements for use with Cla deletes restriction to Class III Requires approved design for barrer (Class I on interior and
FS-121	1404.3.1, 1404.3.2	Mike Fischer, Kellen Company, representing The Polyisocyanurate Insulation Manufacturers Association	Focuses on deleting the Class and restores code to pre-201

FS-122	1404.3.2, 1404.3.2.1 (New), 1404.3.2.2 (New), 1404.3.2.2.1 (New), TABLE 1404.3.2	Mike Fischer, Kellen Company, representing The Center for the Polyurethanes Industry of the American Chemistry Council	The proposal adds charging li clarifies how the combination insulating methods can provide moisture control so that the t Value can be achieved by cor cavity, or a combination of in strategies.
FS-125	TABLE 1404.3.2, 1404.3.2	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council	Expands Marine 4 to all of CZ use of Class III in CZ 1-3.
FS-127	TABLE 1404.3.2	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council	Separate CZ 8 from Climate Z ensure consistent performanc
FS-128	TABLE 1404.3.2	Craig Conner, representing self ; Joseph Lstiburek, representing Self	Same as FS127
FS-130	TABLE 1404.3.2	Mike Fischer, Kellen Company, representing The Center for the Polyurethanes Industry of the American Chemistry Council	Adds footnote that prevents : spray foam and ci R-values fc
FS-131	1404.3.3	John Woestman, Kellen Co., representing Extruded Polystyrene Foam Association (XPSA)	Improves requirements for va paints to ensure performance compliance with manufacture

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal is a re-org for clarity, ease of use, and coordination with an identical proposal approved for the 2021 IBC.

Proposal # 4517

RB222-19

RB223-19

IRC: R702.7, TABLE R702.7(1) (New), TABLE R702.7(2) (New), TABLE R702.7(4) (New), R702.7.1, TABLE R702.7.1, R702.7.2, R702.7.3

Proponent: Rob Brooks, representing DowDuPont (rob.brooks.mail@gmail.com); Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council (jcrandell@aresconsulting.biz); Mike Fischer (mfischer@kellencompany.com); John Woestman, representing Extruded Polystyrene Foam Association (jwoestman@kellencompany.com)

2018 International Residential Code

Delete and substitute as follows:

~~**R702.7 Vapor retarders.** Class I or II vapor retarders are required on the interior side of frame walls in Climate Zones 5, 6, 7, 8 and Marine 4.~~

Exceptions:

- ~~1. Basement walls.~~
- ~~2. Below-grade portion of any wall.~~
- ~~3. Construction where moisture or its freezing will not damage the materials.~~

R702.7 Vapor retarders. Vapor retarder materials shall be classified in accordance with Table R702.7(1). A vapor retarder shall be provided on the interior side of frame walls of the class indicated in Table R702.7(2), including compliance with Table R702.7(3) or Table R702.7(4) where applicable. An approved design using accepted engineering practice for hygrothermal analysis shall an alternative. The climate zone shall be determined in accordance with Section N1101.7 (R301.1).

Exceptions:

1. Basement walls.
2. Below-grade portion of any wall.
3. Construction where accumulation, condensation, or freezing of moisture will not damage the materials.

Add new text as follows:

R702.7(1)
VAPOR RETARDER MATERIALS AND CLASSES

<u>CLASS</u>	<u>ACCEPTABLE MATERIALS</u>
<u>I</u>	<u>Sheet polyethylene, nonperforated aluminum foil, or other approved materials with a perm rating of less than or equal to 0.1.</u>
<u>II</u>	<u>Kraft-faced fiberglass batts, vapor retarder paint, or other approved materials applied in accordance with the manufacturer's installation instructions for a perm rating greater than 0.1 and less than or equal to 1.0.</u>
<u>III</u>	<u>Latex paint, enamel paint, or other approved materials applied in accordance with the manufacturer's installation instructions for a perm rating of greater than 1.0 and less than or equal to 10.0.</u>

R702.7(2)

VAPOR RETARDER OPTIONS

CLIMATE ZONE	VAPOR RETARDER CLASS		
	CLASS I ^a	CLASS II ^a	CLASS III
1,2	Not Permitted	Not Permitted	Permitted
3	Not Permitted	Permitted ^c	Permitted
4 (except Marine 4)	Not Permitted	Permitted ^c	See Table R702.7(3)
Marine 4, 5, 6, 7, 8	Permitted ^b	Permitted ^c	

a. Class I and II vapor retarders with vapor permeance greater than 1 perm when measured by ASTM E96 water method (Procedure B) shall be allowed on the interior side of any frame wall in all climate zones.

b. Use of a Class I interior vapor retarder in frame walls with a Class I vapor retarder on the exterior side shall require an approved design.

c. Where a Class II vapor retarder is used in combination with foam plastic insulating sheathing installed as continuous insulation on the exterior side of frame walls, the continuous insulation shall comply with Table R702.7(4) and the Class II vapor retarder shall have a vapor permeance greater than 1 perm when measured by ASTM E96 water method (Procedure B).

Revise as follows:

**TABLE ~~R702.7.1~~ R702.7(3)
CLASS III VAPOR RETARDERS**

CLIMATE ZONE	CLASS III VAPOR RETARDERS PERMITTED FOR: ^{a, b}
Marine 4	Vented cladding over wood structural panels.
	Vented cladding over fiberboard.
	Vented cladding over gypsum.
	Continuous insulation with R-value ≥ 2.5 over 2 x 4 wall.
	Continuous insulation with R-value ≥ 3.75 over 2 x 6 wall.
5	Vented cladding over wood structural panels.
	Vented cladding over fiberboard.
	Vented cladding over gypsum.
	Continuous insulation with R-value ≥ 5 over 2 x 4 wall.
	Continuous insulation with R-value ≥ 7.5 over 2 x 6 wall.
6	Vented cladding over fiberboard.
	Vented cladding over gypsum.
	Continuous insulation with R-value ≥ 7.5 over 2 x 4 wall.
	Continuous insulation with R-value ≥ 11.25 over 2 x 6 wall.
7 and 8	Continuous insulation with R-value ≥ 10 over 2 x 4 wall.
	Continuous insulation with R-value ≥ 15 over 2 x 6 wall.
8	Continuous insulation with R-value ≥ 12.5 over 2 x 4 wall.
	Continuous insulation with R-value ≥ 20 over 2 x 6 wall.

For SI: 1 pound per cubic foot = 16 kg/m³.

~~a. Spray foam with a maximum permeance of 1.5 perms at the installed thickness, applied to the interior cavity side of wood structural panels, fiberboard, insulating sheathing or gypsum is deemed to meet the continuous insulation requirement where the spray foam R-value meets or exceeds the specified continuous insulation R-value.~~

a. Vented cladding shall include vinyl, polypropylene, or horizontal aluminum siding, brick veneer with a clear airspace as specified in Table R703.8.4, and other approved vented claddings.

b. The requirements in this table apply only to insulation used to control moisture in order to permit the use of Class III vapor retarders. The insulation materials used to satisfy this option also contribute to but do not supersede the thermal envelope requirements of Chapter 11.

Add new text as follows:

R702.7(4)

CONTINUOUS INSULATION WITH CLASS II VAPOR RETARDER

<u>CLIMATE ZONE</u>	<u>CLASS II VAPOR RETARDERS PERMITTED FOR^a</u>
<u>3</u>	<u>Continuous insulation with R-value ≥ 2</u>
<u>4, 5, and 6</u>	<u>Continuous insulation with R-value ≥ 3 over 2x4 wall.</u>
	<u>Continuous insulation with R-value ≥ 5 over 2x6 wall.</u>
<u>7</u>	<u>Continuous insulation with R-value ≥ 5 over 2x4 wall.</u>
	<u>Continuous insulation with R-value ≥ 7.5 over 2x6 wall.</u>
<u>8</u>	<u>Continuous insulation with R-value ≥ 7.5 over 2x4 wall.</u>
	<u>Continuous insulation with R-value ≥ 10 over 2x6 wall.</u>

a. The requirements in this table apply only to insulation used to control moisture in order to permit the use of Class II vapor retarders. The insulation materials used to satisfy this option also contribute to but do not supersede the thermal envelope requirements of Chapter 11.

Delete and substitute as follows:

~~**R702.7.1 Class III vapor retarders.** Class III vapor retarders shall be permitted where any one of the conditions in Table R702.7.1 is met.~~

R702.7.1 Spray foam plastic insulation for moisture control with Class II and III vapor retarders. For purposes of compliance with Tables R702.7(3) and R702.7(4), spray foam with a maximum permeance of 1.5 perms at the installed thickness applied to the interior side of wood structural panels, fiberboard, insulating sheathing or gypsum shall be deemed to meet the continuous insulation moisture control requirement in accordance with one of the following conditions:

1. The spray foam R-value is equal to or greater than the specified continuous insulation R-value.
2. The combined R-value of the spray foam and continuous insulation is equal to or greater than the specified continuous insulation R-value.

Delete without substitution:

R702.7.2 Material vapor retarder class. The *vapor retarder class* shall be based on the manufacturer's certified testing or a tested assembly.

The following shall be deemed to meet the class specified:

1. Class I: Sheet polyethylene, on perforated aluminum foil.
2. Class II: Kraft-faced fiberglass batts.
3. Class III: Latex or enamel paint.

R702.7.3 Minimum clear airspaces and vented openings for vented cladding. For the purposes of this section, vented cladding shall include the following minimum clear airspaces. Other openings with the equivalent vent area shall be permitted:

1. Vinyl polypropylene or horizontal aluminum siding applied over a weather-resistive barrier as specified in Table R703.3(1).
2. Brick veneer with a clear airspace as specified in Table R703.8.4.
3. Other approved vented claddings.

Reason: This proposal represents a compilation (sum effect) of all vapor retarder proposals approved for the 2021 IBC. This proposal makes no further technical changes to the individual proposals and is intended to demonstrate how all the various individual proposals fit together in a manner consistent with what will appear in the 2021 IBC to ensure consistency between the IBC and the IRC. The justification for the various parts of this "omnibus" proposal are found in the reason statements for the various individual vapor retarder (Section R702.7) proposals which also are submitted here in Group B for the IRC as they were in the prior Group A code development hearing for Chapter 14 of the IBC. However, if this reconciliation proposal is approved, those individual proposals will be moved for disapproval.

Various associations and individuals developed proposals to modify the 2021 Group A vapor retarder section which were subsequently approved by the ICC membership. These proposals act as a package of changes that improve the format and content of this code section. The collaborative group believes this package of code changes will result in regulations that adequately address the moisture management in residential buildings. We have submitted a similar grouping of proposals to make a corresponding change to the IRC. The table below correlates the code proposals between the Group A and B hearings.

CORRELATION BETWEEN GROUP A AND B PROPOSALS			
Group A Hearing			
Proposal	IBC Code Section	Proponent	Description
FS-117	1404.3, 1404.3(1) (New), 1404.3(2) (New), TABLE 1404.3.2, 1404.3.2, 1404.3.3, 1404.3.4	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council	Reorganizes and streamlines make requirements more tra
FS-118	1404.3, 1404.3.1	Theresa Weston, DuPont, representing Air Barrier Association	Adds exception describing re Class I and II smart vapor ret than 1 perm per ASTM E96 Pr be allowed in all climate zone
FS-119	1404.3, 1404.3.1, 1404.3.2, 1404.3.3, TABLE 1404.3.3	Kingston Chow, APA - The Engineered Wood Association, representing APA - The Engineered Wood Association; Borjen Yeh (same)	Reorganization (moves vapor classes to first section). Redu changes made in FS-117.
		Jav Crandell, P.E., ARES Consulting.	Provides continuous insulatio

FS-120	1404.3.1, TABLE 1404.3.1 (New), 1404.3.2	representing Foam Sheathing Committee of the American Chemistry Council; Vladimir Kochkin, representing Home Innovation Research Labs	requirements for use with Class III deletes restriction to Class III Requires approved design for barrier (Class I on interior and
FS-121	1404.3.1, 1404.3.2	Mike Fischer, Kellen Company, representing The Polyisocyanurate Insulation Manufacturers Association	Focuses on deleting the Class and restores code to pre-201
FS-122	1404.3.2, 1404.3.2.1 (New), 1404.3.2.2 (New), 1404.3.2.2.1 (New), TABLE 1404.3.2	Mike Fischer, Kellen Company, representing The Center for the Polyurethanes Industry of the American Chemistry Council	The proposal adds charging l clarifies how the combination insulating methods can provide moisture control so that the t Value can be achieved by cavity, or a combination of in strategies.
FS-125	TABLE 1404.3.2, 1404.3.2	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council	Expands Marine 4 to all of CZ use of Class III in CZ 1-3.
FS-127	TABLE 1404.3.2	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council	Separate CZ 8 from Climate Z ensure consistent performance
FS-128	TABLE 1404.3.2	Craig Conner, representing self ; Joseph Lstiburek, representing Self	Same as FS127
FS-130	TABLE 1404.3.2	Mike Fischer, Kellen Company, representing The Center for the Polyurethanes Industry of the American Chemistry Council	Adds footnote that prevents : spray foam and ci R-values for
FS-131	1404.3.3	John Woestman, Kellen Co., representing Extruded Polystyrene Foam Association (XPSA)	Improves requirements for va paints to ensure performance compliance with manufacture

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The sum effect of the proposal (which represents the compilation of various individual proposals approved for

the 2012 IBC in Group A) is to provide a better and more transparent organization of vapor retarder provisions in a table format for easy selection by climate zone. It also provides expanded and improved options. In some specific cases costs may increase or decrease depending on which options are selected to control water vapor in particular climate zones (e.g., Class III vapor retarder in Climate Zone 8), but there are always options that remain in any climate zone that either have no cost impact or which can reduce cost while maintaining water vapor control.

Proposal # 5438

RB223-19

RB224-19

IRC@: R702.7.1, TABLE R702.7.1

Proponent: Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council

2018 International Residential Code

Revise as follows:

R702.7.1 Class III vapor retarders. Class III vapor retarders shall be permitted in Climate Zones 1 through 3 and where any one of the conditions in Table R702.7.1 is met.

**TABLE R702.7.1
CLASS III VAPOR RETARDERS**

CLIMATEZONE	CLASS III VAPOR RETARDERS PERMITTED FOR: ^a
<Marine> 4	Vented cladding over wood structural panels.
	Vented cladding over fiberboard.
	Vented cladding over gypsum.
	Continuous insulation with R-value ≥ 2.5 over 2 x 4 wall.
	Continuous insulation with R-value ≥ 3.75 over 2 x 6 wall.
5	Vented cladding over wood structural panels.
	Vented cladding over fiberboard.
	Vented cladding over gypsum.
	Continuous insulation with R-value ≥ 5 over 2 x 4 wall.
	Continuous insulation with R-value ≥ 7.5 over 2 x 6 wall.
6	Vented cladding over fiberboard.
	Vented cladding over gypsum.
	Continuous insulation with R-value ≥ 7.5 over 2 x 4 wall.
	Continuous insulation with R-value ≥ 11.25 over 2 x 6 wall.
7 and 8	Continuous insulation with R-value ≥ 10 over 2 x 4 wall.
	Continuous insulation with R-value ≥ 15 over 2 x 6 wall.

For SI: 1 pound per cubic foot = 16 kg/m³.

- a. Spray foam with a maximum permeance of 1.5 perms at the installed thickness, applied to the interior cavity side of wood structural panels, fiberboard, insulating sheathing or gypsum is deemed to meet the continuous insulation requirement where the spray foam *R*-value meets or exceeds the specified continuous insulation *R*-value.

Reason: This proposal coordinates with an identical Group A proposal (FS125-18) approved for the 2021 IBC. It corrects and clarifies appropriate use of a Class III vapor retarder, applying it to all of Climate Zone 4 and permitting its use in Climate Zones 1-3 (not just those climate zones indicated in the table where additional requirements apply).

Various associations developed proposals to modify the 2021 Group A vapor retarder section which were

subsequently approved by the ICC membership. These proposals act as a package of changes that improve the format and content of this code section. The collaborative group believes this package of code changes will result in regulations that adequately address the moisture management in residential buildings. We have submitted a similar grouping of proposals to make a corresponding change to the IRC. The table below correlates the code proposals between the Group A and B hearings.

CORRELATION BETWEEN GROUP A AND B PROPOSALS			
Group A Hearing			
Proposal	IBC Code Section	Proponent	Description
FS-117	1404.3, 1404.3(1) (New), 1404.3(2) (New), TABLE 1404.3.2, 1404.3.2, 1404.3.3, 1404.3.4	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council	Reorganizes and streamlines make requirements more tra
FS-118	1404.3, 1404.3.1	Theresa Weston, DuPont, representing Air Barrier Association	Adds exception describing re Class I and II smart vapor ret: than 1 perm per ASTM E96 Pr be allowed in all climate zone
FS-119	1404.3, 1404.3.1, 1404.3.2, 1404.3.3, TABLE 1404.3.3	Kingston Chow, APA - The Engineered Wood Association, representing APA - The Engineered Wood Association; Borjen Yeh (same)	Reorganization (moves vapor classes to first section). Redu changes made in FS-117.
FS-120	1404.3.1, TABLE 1404.3.1 (New), 1404.3.2	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council; Vladimir Kochkin, representing Home Innovation Research Labs	Provides continuous insulatio requirements for use with Cla deletes restriction to Class III Requires approved design for barrer (Class I on interior and
FS-121	1404.3.1, 1404.3.2	Mike Fischer, Kellen Company, representing The Polyisocyanurate Insulation Manufacturers Association	Focuses on deleting the Class and restores code to pre-201
FS-122	1404.3.2, 1404.3.2.1 (New), 1404.3.2.2 (New), 1404.3.2.2.1 (New), TABLE 1404.3.2	Mike Fischer, Kellen Company, representing The Center for the Polyurethanes Industry of the American Chemistry Council	The proposal adds charging l. clarifies how the combinatio insulating methods can provi moisture control so that the t Value can be achieved by cor cavity, or a combination of in strategies.
FS-125	TABLE 1404.3.2, 1404.3.2	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council	Expands Marine 4 to all of CZ use of Class III in CZ 1-3.
FS-127	TABLE 1404.3.2	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council	Separate CZ 8 from Climate Z ensure consistent performanc
FS-128	TABLE 1404.3.2	Craig Conner, representing self ; Joseph Lstiburek, representing Self	Same as FS127
FS-130	TABLE 1404.3.2	Mike Fischer, Kellen Company, representing The Center for the Polyurethanes Industry of the American Chemistry Council	Adds footnote that prevents a spray foam and ci R-values fc
		John Woestman, Kellen Co., representing Extruded Polystyrene Foam Association	Improves requirements for va paints to ensure performance

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The use of a Class III vapor retarder is optional. However, where it is used, it can reduce cost of construction and this proposal clarifies and extends the applicability.

Proposal # 4524

RB224-19

RB225-19

IRC®: TABLE R702.7.1

Proponent: Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council

2018 International Residential Code

Revise as follows:

**TABLE R702.7.1
CLASS III VAPOR RETARDERS**

CLIMATEZONE	CLASS III VAPOR RETARDERS PERMITTED FOR: ^a
Marine 4	Vented cladding over wood structural panels.
	Vented cladding over fiberboard.
	Vented cladding over gypsum.
	Continuous insulation with R-value ≥ 2.5 over 2 × 4 wall.
	Continuous insulation with R-value ≥ 3.75 over 2 × 6 wall.
5	Vented cladding over wood structural panels.
	Vented cladding over fiberboard.
	Vented cladding over gypsum.
	Continuous insulation with R-value ≥ 5 over 2 × 4 wall.
	Continuous insulation with R-value ≥ 7.5 over 2 × 6 wall.
6	Vented cladding over fiberboard.
	Vented cladding over gypsum.
	Continuous insulation with R-value ≥ 7.5 over 2 × 4 wall.
	Continuous insulation with R-value ≥ 11.25 over 2 × 6 wall.
7 and 8	Continuous insulation with R-value ≥ 10 over 2 × 4 wall.
	Continuous insulation with R-value ≥ 15 over 2 × 6 wall.
<u>8</u>	Continuous insulation with R-value ≥ 12.5 over 2 × 4 wall.
	Continuous insulation with R-value ≥ 20 over 2 × 6 wall.

For SI: 1 pound per cubic foot = 16 kg/m³.

- a. Spray foam with a maximum permeance of 1.5 perms at the installed thickness, applied to the interior cavity side of wood structural panels, fiberboard, insulating sheathing or gypsum is deemed to meet the continuous insulation requirement where the spray foam R-value meets or exceeds the specified continuous insulation R-value.

Reason: This proposal coordinates with an identical proposal (FS127-18) approved for the 2021 IBC. It corrects an inadvertent extension of Climate Zone 7 requirements into Climate Zone 8 when the table was first introduced to the IBC and IRC. It provides consistent requirements and performance for Climate Zone 8 distinct from Climate Zone 7 that accounts for the colder climate in Climate Zone 8.

Various associations developed proposals to modify the 2021 Group A vapor retarder section which were subsequently approved by the ICC membership. These proposals act as a package of changes that improve

the format and content of this code section. The collaborative group believes this package of code changes will result in regulations that adequately address the moisture management in residential buildings. We have submitted a similar grouping of proposals to make a corresponding change to the IRC. The table below correlates the code proposals between the Group A and B hearings.

CORRELATION BETWEEN GROUP A AND B PROPOSALS			
Group A Hearing			
Proposal	IBC Code Section	Proponent	Description
FS-117	1404.3, 1404.3(1) (New), 1404.3(2) (New), TABLE 1404.3.2, 1404.3.2, 1404.3.3, 1404.3.4	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council	Reorganizes and streamlines make requirements more tra
FS-118	1404.3, 1404.3.1	Theresa Weston, DuPont, representing Air Barrier Association	Adds exception describing re Class I and II smart vapor ret than 1 perm per ASTM E96 Pr be allowed in all climate zone
FS-119	1404.3, 1404.3.1, 1404.3.2, 1404.3.3, TABLE 1404.3.3	Kingston Chow, APA - The Engineered Wood Association, representing APA - The Engineered Wood Association; Borjen Yeh (same)	Reorganization (moves vapor classes to first section). Redd changes made in FS-117.
FS-120	1404.3.1, TABLE 1404.3.1 (New), 1404.3.2	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council; Vladimir Kochkin, representing Home Innovation Research Labs	Provides continuous insulatio requirements for use with Cla deletes restriction to Class III Requires approved design for barrer (Class I on interior and
FS-121	1404.3.1, 1404.3.2	Mike Fischer, Kellen Company, representing The Polyisocyanurate Insulation Manufacturers Association	Focuses on deleting the Class and restores code to pre-201
FS-122	1404.3.2, 1404.3.2.1 (New), 1404.3.2.2 (New), 1404.3.2.2.1 (New), TABLE 1404.3.2	Mike Fischer, Kellen Company, representing The Center for the Polyurethanes Industry of the American Chemistry Council	The proposal adds charging l clarifies how the combinatio insulating methods can provi moisture control so that the t Value can be achieved by cor cavity, or a combination of in strategies.
FS-125	TABLE 1404.3.2, 1404.3.2	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council	Expands Marine 4 to all of CZ use of Class III in CZ 1-3.
FS-127	TABLE 1404.3.2	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council	Separate CZ 8 from Climate Z ensure consistent performan
FS-128	TABLE 1404.3.2	Craig Conner, representing self ; Joseph Lstiburek, representing Self	Same as FS127
FS-130	TABLE 1404.3.2	Mike Fischer, Kellen Company, representing The Center for the Polyurethanes Industry of the American Chemistry Council	Adds footnote that prevents a spray foam and ci R-values fo
FS-131	1404.3.3	John Woestman, Kellen Co., representing Extruded Polystyrene Foam Association (XPSA)	Improves requirements for va paints to ensure performance compliance with manufacture

Cost Impact: The code change proposal will increase the cost of construction
The more stringent provisions in Climate Zone 8 are necessary to ensure equivalent vapor/moisture control performance in Climate Zone 8 and will decrease cost in the long run.

Proposal # 4525

RB225-19

RB226-19

IRC: TABLE R702.7.1, R702.7.1.1(New)

Proponent: Mike Fischer, Kellen Company, representing The Center for the Polyurethanes Industry of the American Chemistry Council (mfischer@kellencompany.com)

2018 International Residential Code

R702.7.1 Class III vapor retarders. Class III vapor retarders shall be permitted where any one of the conditions in Table R702.7.1 is met.

Add new text as follows:

R702.7.1.1 Spray foam plastic insulation f or moisture control wit h Class III vapor retarders. For the purposes of compliance with Table R702.7.1, spray foam with a maximum permeance of 1.5 perms at the installed thickness applied to the interior cavity side of wood structural panels, fiberboard, insulating sheathing or gypsum shall be deemed to meet the continuous insulation R-value requirement where the spray foam R-value meets or exceeds the specified continuous insulation R-value.

R702.7.1.2 Hybrid insulation f or moisture control wit h Class III vapor retarders. For the purposes of compliance with Table R702.7.1, the combined R-values of spray foam plastic insulation and continuous insulation shall be permitted to be counted towards the continuous R-value requirement.

Revise as follows:

**TABLE R702.7.1
CLASS III VAPOR RETARDERS**

CLIMATEZONE	CLASS III VAPOR RETARDERS PERMITTED FOR:^a
Marine 4	Vented cladding over wood structural panels.
	Vented cladding over fiberboard.
	Vented cladding over gypsum.
	Continuous insulation with R-value ≥ 2.5 over 2 x 4 wall.
	Continuous insulation with R-value ≥ 3.75 over 2 x 6 wall.
5	Vented cladding over wood structural panels.
	Vented cladding over fiberboard.
	Vented cladding over gypsum.
	Continuous insulation with R-value ≥ 5 over 2 x 4 wall.
	Continuous insulation with R-value ≥ 7.5 over 2 x 6 wall.
6	Vented cladding over fiberboard.
	Vented cladding over gypsum.
	Continuous insulation with R-value ≥ 7.5 over 2 x 4 wall.
	Continuous insulation with R-value ≥ 11.25 over 2 x 6 wall.
7 and 8	Continuous insulation with R-value ≥ 10 over 2 x 4 wall.
	Continuous insulation with R-value ≥ 15 over 2 x 6 wall.

For SI: 1 pound per cubic foot = 16 kg/m³.

~~a. Spray foam with a maximum permeance of 1.5 perms at the installed thickness, applied to the interior cavity side of wood structural panels, fiberboard, insulating sheathing or gypsum is deemed to meet the continuous insulation requirement where the spray foam R -value meets or exceeds the specified continuous insulation R -value.~~

Reason: Table R702.7.1 includes various combinations of continuous insulation used as part of wall assemblies with Class III vapor retarders. Footnote “a” to the table provides an option to use spray foam as an alternative to the continuous insulation requirement. This proposal moves the footnote to the code text and adds an option for hybrid assemblies with a combination of continuous insulation and spray foam. Given that the code permits either option, it is logical that combinations are also acceptable, but that option is not currently included. This proposed requirement is consistent with the provisions for the IBC as approved in proposal FS122-18.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal is an editorial clarification.

Proposal # 5621

RB226-19

RB227-19

IRC®: TABLE R702.7.1

Proponent: Mike Fischer, Kellen Company, representing The Center for the Polyurethanes Industry of the American Chemistry Council (mfischer@kellencompany.com)

2018 International Residential Code

Revise as follows:

**TABLE R702.7.1
CLASS III VAPOR RETARDERS**

CLIMATEZONE	CLASS III VAPOR RETARDERS PERMITTED FOR: ^{a, b}
Marine 4	Vented cladding over wood structural panels.
	Vented cladding over fiberboard.
	Vented cladding over gypsum.
	Continuous insulation with R-value ≥ 2.5 over 2 × 4 wall.
	Continuous insulation with R-value ≥ 3.75 over 2 × 6 wall.
5	Vented cladding over wood structural panels.
	Vented cladding over fiberboard.
	Vented cladding over gypsum.
	Continuous insulation with R-value ≥ 5 over 2 × 4 wall.
	Continuous insulation with R-value ≥ 7.5 over 2 × 6 wall.
6	Vented cladding over fiberboard.
	Vented cladding over gypsum.
	Continuous insulation with R-value ≥ 7.5 over 2 × 4 wall.
	Continuous insulation with R-value ≥ 11.25 over 2 × 6 wall.
7 and 8	Continuous insulation with R-value ≥ 10 over 2 × 4 wall.
	Continuous insulation with R-value ≥ 15 over 2 × 6 wall.

For SI: 1 pound per cubic foot = 16 kg/m³.

a. Spray foam with a maximum permeance of 1.5 perms at the installed thickness, applied to the interior cavity side of wood structural panels, fiberboard, insulating sheathing or gypsum is deemed to meet the continuous insulation moisture control requirement where the spray foam R-value meets or exceeds the specified continuous insulation R-value.

b. The requirements in this table apply only to insulation used to control moisture in order to permit the use of Class III vapor retarders. The insulation materials used to satisfy this option contribute to but do not supersede the thermal envelope requirements of Chapter 11.

Reason: The proposal clarifies that spray foam used to satisfy the continuous insulation requirements is intended to be used for moisture control. It adds an additional footnote to the table to clarify that the provisions of the IECC are not supplanted by this option. This proposal is identical to FS120-18 that has been approved for inclusion in the 2021 IBC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The proposal is editorial.

Proposal # 5630

RB227-19

RB228-19

IRC®: R702.7.2

Proponent: John Woestman, representing Extruded Polystyrene Foam Association
(jwoestman@kellencompany.com)

2018 International Residential Code

Revise as follows:

R702.7.2 Material vapor retarder class. The *vapor retarder class* shall be based on the manufacturer's certified testing or a tested assembly.

The following shall be deemed to meet the class specified:

1. Class I: Sheet polyethylene, on perforated aluminum foil with a perm rating of not more than 0.1.
2. Class II: Kraft-faced fiberglass batts or vapor retarder paint applied in accordance with the manufacturer's instructions for a perm rating greater than 0.1 and not more than 1.0.
3. Class III: Latex or enamel paint applied in accordance with the manufacturer's instructions for a perm rating of greater than 1.0 and not more than 10.0.

Reason: Recommending revisions in the IRC to be consistent with 2021 IBC, as modified by proposal FS131-18.

This proposal clarifies that where paints are used as vapor retarders they must be applied in accordance with the manufacturer's instructions to achieve the required perm rating for the vapor retarder class. Misuse or misapplication of paints that also may not be specifically recommended for use as vapor retarders has been shown to increase the risk of moisture problems in walls with Class III vapor retarders. Cases have been documented where paint applications have a water vapor permeance of more than three times greater than the maximum limit for Class III vapor retarders. As a result, walls intended to rely on Class III vapor retarders can experience an increased risk of moisture accumulation problems. This proposal will provide the ability to avoid this problem.

Also, consistent with the IBC, this proposal includes the appropriate perm ratings in each Class of vapor retarders.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal clarifies the intent of the code and does not impact cost.

Proposal # 5247

RB228-19

RB229-19

IRC®: R702.7.2

Proponent: Cesar Lujan, representing National Association of Home Builders (clujan@nahb.org); Gary Ehrlich, representing National Association of Home Builders (gehrlich@nahb.org)

2018 International Residential Code

Revise as follows:

R702.7.2 Material vapor retarder class. The *vapor retarder class* shall be based on the manufacturer's certified testing or a tested assembly.

The following shall be deemed to meet the class specified:

1. Class I: Sheet polyethylene, or perforated aluminum foil.
2. Class II: Kraft-faced fiberglass batts.
3. ~~Class III: Latex or enamel paint.~~

The vapor retarder class of latex or enamel paint shall be determined based on the perm rating provided by the paint manufacturer.

Reason: The purpose of this code change is to remove the automatic assumption that latex paint and enamel paint meets the requirements of a Class III vapor retarder. Depending on the paint thickness, number of coats, and type of primer used, the actual water vapor permeance can far exceed the 1 perm to 10 perm range which defines a Class III vapor retarder. Field studies using test huts or test houses have shown that a coat of primer and 2 coats of standard latex paint can have a perm rating of as much as 50. In one study using test huts in Climate Zone 4A, wall assemblies consisting of un-faced batt insulation and an interior painted wall developed mold within 6 months. In another recent study of 22 houses in a range of climate zones, some wall assemblies meeting the requirements of Table R702.7.1 but relying on gypsum board and paint as a Class III interior vapor retarder showed high cyclic winter moisture contents.

Some paint manufacturers also produce a paint explicitly formulated to act as a Class II vapor retarder, if not Class I. When installed per the manufacturer's instruction to the specified thickness and number of coats, plus any primer coat, these paints can achieve a tested water vapor permeance per ASTM E96 of less than 1.0 perm, qualifying as a Class II vapor retarder or better. The current code language has resulted in difficulty convincing some building officials to accept low-perm paints as a Class II or better vapor retarder. Removing the automatic classification and allowing the manufacturer's specified perm rating and application instructions to be used is intended to help clarify when paints with high vapor-retarding properties (i.e. low perm ratings) can be used.

Example product data sheets for vapor retarder paint include Glidden 1060 Vapor Barrier Interior Primer Sealer: <https://www.gliddenprofessional.com/datasheets/tds/gp-1060.aspx> and Sherwin-Williams Moisture Vapor Barrier Primer/Finish Interior Latex: <http://www.sherwin-williams.com/document/PDS/en/035777633175/>.

This change will also align the material specifications in Section R702.7.2 with IBC Section 1404.3 as modified for the 2021 IBC by approved proposal FS117-18.

Bibliography: *Moisture Performance of Walls in Energy-Efficient Homes*, prepared by Home Innovation Research Labs for National Association of Home Builders, August 2015.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code change will not increase the cost of construction. Paint manufacturers already provide information on

perm ratings for paints sold as vapor retarding paints.

Proposal # 4738

RB229-19

RB230-19

IRC@: R702.7.3

Proponent: John Woestman, representing Extruded Polystyrene Foam Association
(jwoestman@kellencompany.com)

2018 International Residential Code

Revise as follows:

R702.7.3 Minimum clear airspaces and vented openings for vented cladding. For the purposes of this section, vented cladding shall include the following minimum clear airspaces. Other openings with the equivalent vent area shall be permitted.

1. Vinyl polypropylene or horizontal aluminum siding applied over a weather-resistive barrier as specified in Table R703.3(1).
2. Brick veneer, anchored stone or masonry veneer with a clear airspace as specified in Table R703.8.4(1).
3. Other approved vented claddings.

Reason: Revising Item 2 to use a term defined in the IRC and to be consistent with the veneer included in Section R703.8 (anchored stone and masonry veneer) and which is required to be installed with an airspace, per Table R703.8.4(1), of between 1" and 4 1/2". Retaining "brick veneer" even though redundant with "masonry veneer", for clarity and consistency. It follows that if brick veneer with a (required) airspace per Table R703.8.4(1) is considered vented cladding, then anchored stone or (other) masonry veneer required to be installed with the same airspace requirements should also be considered vented cladding.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal is identifying all the types of (anchored) masonry veneer required by the IRC to be installed with a clear airspace, which results in a vented cladding. This should not increase or decrease the cost of construction.

Proposal # 5226

RB230-19

RB231-19

IRC@: R703.2

Proponent: Paul Coats, representing American Wood Council (pcoats@awc.org)

2018 International Residential Code

Revise as follows:

R703.2 Water-resistive barrier. One layer of No. 15 asphalt felt, free from holes and breaks, complying with ASTM D226 for Type 1 felt or other approved water-resistive barrier shall be applied over studs or sheathing of all exterior walls. No.15 asphalt felt shall be applied horizontally, with the upper layer lapped over the lower layer not less than 2 inches (51 mm). Where joints occur, felt shall be lapped not less than 6 inches (152 mm). Other *approved* materials shall be installed in accordance with the *water-resistive barrier* manufacturer's installation instructions. The No. 15 asphalt felt or other approved *water-resistive barrier* material shall be continuous to the top of walls and terminated at penetrations and building appendages in a manner to meet the requirements of the exterior wall envelope as described in Section R703.1.

Exception: A water-resistive barrier shall not be required in detached accessory structures that are not heated or cooled.

Reason: For many years the code exempted accessory structures from the requirement for a water resistive barrier. The exception was removed from the code in the previous cycle, but the exception that was removed applied to all accessory structures, regardless of their purpose and regardless of whether they were heated or cooled. This proposal will not exempt conditioned (heated or cooled) accessory structures, which are more subject to movement of moisture through the exterior walls than unconditioned ones. Unconditioned detached accessory structures such as sheds and storage structures have a proven record of performance when complying with the normal siding installation requirements without a water resistive barrier as defined in the code. Unconditioned structures are typically used to store yard tools, lawn mowers, tractors, hay, boats, road salts, including certain amounts of fume-producing fuels and lubricants. They often do not have interior wall coverings or insulation, but instead have exposed framing with siding and no wall sheathing. Installing a water resistive barrier directly to framing without wall sheathing is difficult, and the barrier would be easily punctured by yard tools or other objects leaning against the walls. In addition, they could hinder the natural ventilation needed to disperse fumes and heat. Structures that are heated or cooled are more likely to have insulation and therefore the water resistive barrier makes sense, but an exception is needed for unconditioned structures which have been adequately served by the siding provisions in the code.

Cost Impact: The code change proposal will decrease the cost of construction
This may decrease the cost of construction for certain unconditioned accessory structures.

Proposal # 4273

RB231-19

RB232-19

IRC®: R703.2, ASTM Chapter 44 (New)

Proponent: Craig Conner, representing self (craig.conner@mac.com); Joseph Lstiburek, representing self (joe@buildingscience.com)

2018 International Residential Code

Delete and substitute as follows:

~~**R703.2 Water-resistive barrier.** One layer of No. 15 asphalt felt, free from holes and breaks, complying with ASTM D226 for Type 1 felt or other approved water-resistive barrier shall be applied over studs or sheathing of all exterior walls. No.15 asphalt felt shall be applied horizontally, with the upper layer lapped over the lower layer not less than 2 inches (51 mm). Where joints occur, felt shall be lapped not less than 6 inches (152 mm). Other approved materials shall be installed in accordance with the *water-resistive barrier* manufacturer's installation instructions. The No. 15 asphalt felt or other approved *water-resistive barrier* material shall be continuous to the top of walls and terminated at penetrations and building appendages in a manner to meet the requirements of the exterior wall envelope as described in Section R703.1.~~

R703.2 Water-resistive barrier. Not fewer than one layer of water-resistive barrier shall be applied over studs or sheathing with flashing as indicated in Section R703.4, in such a manner as to provide a continuous *water-resistive barrier* behind the *exterior wall* veneer. Water-resistive barrier materials shall comply with one of the following:

1. No. 15 felt complying with ASTM D226, Type 1
2. ASTM E2556, Type 1 or 2
3. ASTM E331 in accordance with Section R703.1.1, or
4. Other approved materials in accordance with the manufacturer's installation instructions.

Add new text as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428

E2556/E2556M-10: Standard Specification for Vapor Permeable Flexible Sheet Water-resistive Barriers Intended for Mechanical Attachment

Reason: Objective: Provide more flexible definition of WRB to account for new innovations that are not sheet applied materials as defined by ASTM D226 or ASTM E2556. Amend IRC R703.2 in Cycle B with same language submitted in cycle A for IBC

The existing code language gives insufficient guidance for other approved materials. The added language addresses this issue and provides a specific performance requirement for water resistance and provides consistency with other sections of the code that relate specifically to water-resistive barriers.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This change gives better guidance for water resistance.

Staff Analysis: The referenced standard, ASTM E2556/E2556M-10, is currently referenced in other 2018 I-codes.

RB233-19

IRC®: R703.2, ASTM Chapter 44 (New)

Proponent: Theresa Weston, representing DuPont Performance Building Solutions
(theresa.a.weston@dupont.com)

2018 International Residential Code

Delete and substitute as follows:

~~**R703.2 Water-resistive barrier.** One layer of No. 15 asphalt felt, free from holes and breaks, complying with ASTM D226 for Type 1 felt or other approved water-resistive barrier shall be applied over studs or sheathing of all exterior walls. No.15 asphalt felt shall be applied horizontally, with the upper layer lapped over the lower layer not less than 2 inches (51 mm). Where joints occur, felt shall be lapped not less than 6 inches (152 mm). Other approved materials shall be installed in accordance with the *water-resistive barrier* manufacturer's installation instructions. The No. 15 asphalt felt or other approved *water-resistive barrier* material shall be continuous to the top of walls and terminated at penetrations and building appendages in a manner to meet the requirements of the exterior wall envelope as described in Section R703.1.~~

R703.2 Water-resistive barrier. Not fewer than one layer of water-resistive barrier shall be applied over studs or sheathing of all exterior walls with flashing as described in Section R703.4, in such a manner as to provide a continuous *water-resistive barrier* behind the *exterior wall veneer*. The *water-resistive barrier* material shall be continuous to the top of walls and terminated at penetrations and building appendages in a manner to meet the requirements of the exterior wall envelope as described in Section R703.1. Water-resistive barrier materials shall comply with one of the following:

1. No. 15 felt complying with ASTM D226, Type 1
2. ASTM E2556, Type I or II
3. ASTM E331 in accordance with Section R703.1.1
4. Other approved materials installed in accordance with the manufacturer's installation instructions.
5. No.15 asphalt felt and water-resistive barriers complying with ASTM E2556 shall be applied horizontally, with the upper layer lapped over the lower layer not less than 2 inches (51 mm), and where joints occur, shall be lapped not less than 6 inches (152 mm).

Add new text as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428

E2556/E2556M—10:: Standard Specification for Vapor Permeable Flexible Sheet Water-resistive Barriers Intended for Mechanical Attachment

Reason: This proposal recognizes the broad range of water-resistive barriers available to the market in addition to the one traditional material currently recognized. This proposal is consistent with a change made to Chapter 14 of the IRC in Group A of this code change cycle, but the change merges that change with more prescriptive language in the IRC

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code change does not add requirements to the code. It explicitly lists the various types of water-resistive barriers which are currently approved through evaluation services reports.

Staff Analysis: The referenced standard, E2556/E2556M—10, is currently referenced in other 2018 I-codes.

Proposal # 5451

RB233-19

RB234-19

IRC: R703.3.1, R703.3.1.1, R703.3.1.2, R704(New)

Proponent: T. Eric Stafford, representing Insurance Institute for Business and Home Safety (testafford@charter.net); Glenn Overcash, AECOM, representing Federal Emergency Management Agency (glenn.overcash@aecom.com)

2018 International Residential Code

Revise as follows:

R703.3.1 Soffit installation. Soffits shall comply with Section R703.3.1.1, ~~Section R703.3.1.2 or the manufacturer's installation instructions. R704.~~

Delete without substitution:

~~**R703.3.1.1 Wood structural panel soffit.** The minimum nominal thickness for wood structural panel soffits shall be $\frac{3}{8}$ inch (9.5 mm) and shall be fastened to framing or nailing strips with 2-inch by 0.099-inch (51 mm x 2.5 mm) nails. Fasteners shall be in spaced not less than 6 inches (152 mm) on center at panel edges and 12 inches (305 mm) on center at intermediate supports.~~

~~**R703.3.1.2 Vinyl soffit panels.** Soffit panels shall be fastened at fascia and wall ends and to intermediate nailing strips as necessary to ensure that there is no unsupported span greater than 16 inches (406 mm), or as specified by the manufacturer's instructions.~~

Add new text as follows:

SECTION R704 SOFFITS

R704.1 General wind limitations. Where the design wind pressure is 30 psf or less, soffits shall comply with Section R704.2. Where the design wind pressure exceeds 30 psf, soffits shall comply with Section R704.3. The design wind pressure on soffits shall be determined using the component and cladding loads specified in Table R301.2(2) for walls using an effective wind area of 10 square feet and adjusted for height and exposure in accordance with Table R301.2(3).

R704.2 Soffit installation where the design wind pressure is 30 psf or less. Where the design wind pressure is 30 psf or less, soffit installation shall comply with Section R704.2.1, Section R704.2.2, Section R704.2.3, or Section R704.2.4.

R704.2.1 Vinyl soffit panels. Vinyl soffit panels shall be installed using fasteners specified by the manufacturer and shall be fastened at both ends to a supporting component such as a nailing strip, fascia or subfascia component. Where the unsupported span of soffit panels is greater than 16 inches, intermediate nailing strips shall be provided in accordance with Figure R704.2.1. Vinyl soffit panels shall be installed in accordance with the manufacturer's installation instructions. Fascia covers shall be installed in accordance with the manufacturer's installation instructions.

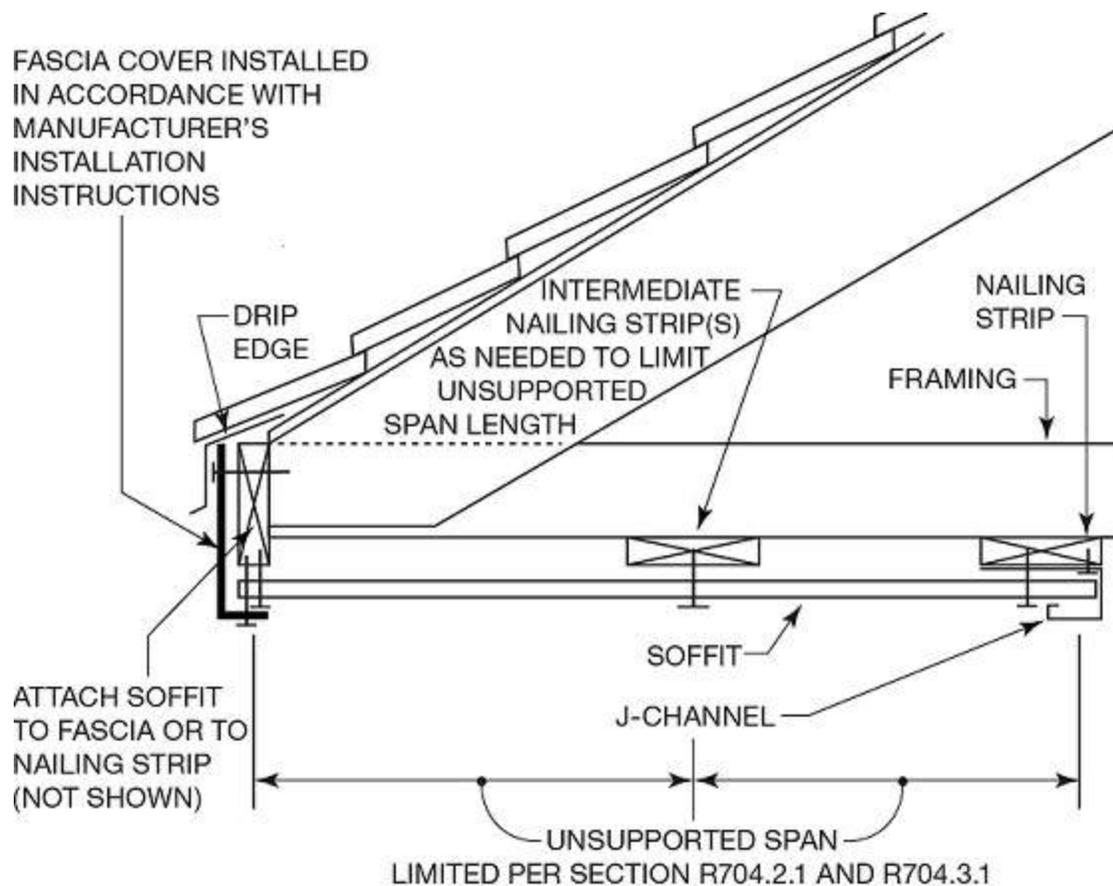


Figure R704.2.1
Typical Vinyl Soffit Panel Support

R704.2.2 Fiber-cement soffit panels Fiber-cement soffit panels shall be a minimum of 1/4 inch in thickness and shall comply with the requirements of ASTM C1186, Type A, minimum Grade II or ISO 8336, Category A, minimum Class 2. Panel joints shall occur over framing or over wood structural panel sheathing. Soffit panels shall be installed with spans and fasteners in accordance with the manufacturer's installation instructions.

R704.2.3 Hardboard soffit panels. Hardboard soffit panels shall be a minimum of 7/16 inch in thickness and shall be fastened to framing or nailing strips with 2 1/2" x 0.113" siding nails spaced not more than 6 inches on center at panel edges and 12 inches on center at intermediate supports.

R704.2.4 Wood structural panel soffit. The minimum nominal thickness for wood structural panel soffits shall be 3/8 inch (9.5 mm) and shall be fastened to framing or nailing strips with 2-inch by 0.099-inch (51 mm x 2.5 mm) nails. Fasteners shall be spaced not less than 6 inches (152 mm) on center at panel edges and 12 inches (305 mm) on center at intermediate supports.

R704.3 Soffit installation where the design wind pressure exceeds 30 psf. Where the design wind pressure is greater than 30 psf, soffit installation shall comply with Section R704.3.1, Section R704.3.2, Section R704.3.3, or Section R704.3.4.

R704.3.1 Vinyl soffit panels. Vinyl soffit panels and their attachments shall be capable of resisting wind loads specified in Table R301.2(2) for walls using an effective wind area of 10 square feet and adjusted for height and exposure in accordance with Table R301.2(3). Vinyl soffit panels shall be installed using fasteners specified by the manufacturer and shall be fastened at both ends to a supporting component such as a nailing strip, fascia or subfascia component. Where the unsupported span of soffit panels is greater than 12 inches, intermediate nailing strips shall be provided in accordance with Figure R704.2.1. Vinyl soffit panels shall be installed in

accordance with the manufacturer's installation instructions. Fascia covers shall be installed in accordance with the manufacturer's installation instructions.

R704.3.2 Fiber-cement soffit panels. Fiber-cement soffit panels shall comply with Section R704.2.2 and shall be capable of resisting wind loads specified in Table R301.2(2) for walls using an effective wind area of 10 square feet and adjusted for height and exposure in accordance with Table R301.2(3).

R704.3.3 Hardboard soffit panels. Hardboard soffit panels shall comply with the manufacturer's installation instructions and shall be capable of resisting wind loads specified in Table R301.2(2) for walls using an effective wind area of 10 square feet and adjusted for height and exposure in accordance with Table R301.2(3).

R704.3.4 Wood structural panel soffit. Wood structural panel soffits shall be capable of resisting wind loads specified in Table R301.2(2) for walls using an effective wind area of 10 square feet and adjusted for height and exposure in accordance with Table R301.2(3). Alternatively, wood structural panel soffits shall be installed in accordance with Table R704.3.4.

**Table R704.3.4
Prescriptive Alternative for Wood Structural Panel Soffit^{b,c,d,e}**

Maximum Design Pressure (+ or - psf)	Minimum Panel Span Rating	Minimum Panel Performance Category	Nail Type and Size	Fastener ^a Spacing Along Edges and Intermediate Supports	
				Galvanized Steel	Stainless Steel
30	24/0	3/8	6d box (2 x 0.099 x 0.266 head diameter)	6 ^f	4
40	24/0	3/8	6d box (2 x 0.099 x 0.266 head diameter)	6	4
50	24/0	3/8	6d box (2 x 0.099 x 0.266 head diameter)	4	4
			8d common (2½ x 0.131 x 0.281 head diameter)	6	6
60	24/0	3/8	6d box (2 x 0.099 x 0.266 head diameter)	4	3
			8d common (2½ x 0.131 x 0.281 head diameter)	6	4
70	24/16	7/16	8d common (2½ x 0.131 x 0.281 head diameter)	4	4
			10d box (3 x 0.128 x 0.312 head diameter)	6	4
80	24/16	7/16	8d common (2½ x 0.131 x 0.281 head diameter)	4	4
			10d box (3 x 0.128 x 0.312 head diameter)	6	4

90	32/16	15/32	8d common (2½ x 0.131 x 0.281 head diameter)	4	3
			10d box (3 x 0.128 x 0.312 head diameter)	6	4

- a. Fasteners shall comply with Sections R703.3.2 and R703.3.3.
- b. Maximum spacing of soffit framing members shall not exceed 24 inches.
- c. Wood structural panels shall be of an exterior exposure grade.
- d. Wood structural panels shall be installed with strength axis perpendicular to supports with a minimum of two continuous spans.
- e. Wood structural panels shall be attached to soffit framing members with specific gravity of at least 0.42. Framing members shall be minimum 2x3 nominal with the larger dimension in the cross section aligning with the length of fasteners to provide sufficient embedment depths.
- f. Spacing at intermediate supports shall not be greater than 12 inches on center.

Reason: The purpose of this code change proposal is to improve the wind performance of soffits by clarifying International Residential Code (IRC) installation requirements for the most common types of manufactured soffits and by providing a prescriptive alternative for wood structural panel soffits that complies with design wind pressures specified in the IRC and ASCE 7. The proposal's sponsor and co-sponsor developed content in collaboration with representatives from American Wood Council, National Association of Home Builders, Vinyl Siding Institute, and other soffit manufacturer groups. The code change refines and further clarifies provisions that were adopted into the 2018 IRC and adds new provisions to address soffit installation in high wind regions. The proposal also moves the clarified soffit provisions to the new Section 704 to better distinguish from exterior wall covering provisions that make up nearly all of Section 703. In addition to separating the clarified soffit provisions to prevent them from being overlooked, new soffit provisions can easily be added as needed with this improved organization and simplified format.

As part of the response to Hurricane Harvey in Texas and Hurricane Irma in Florida, the Federal Emergency Management Agency (FEMA) deployed Mitigation Assessment Teams (MATs) composed of national and regional building science experts to assess the damage in both States. The primary purpose of a MAT is to improve the natural hazard resistance of buildings by evaluating the key causes of building damage, failure, and success, and developing strategic recommendations for improving short-term recovery and long-term disaster resilience from future natural hazard events. The following MAT-related information is included in the FEMA MAT Reports: Hurricane Irma in Florida and Hurricane Harvey in Texas. Links to download the free report will be shared with IRC Committee members for reference upon publication.

The FL MAT observed building envelope damage on both older and newer residential construction, and soffits were among the most frequently observed damaged envelope components. Based on estimated wind speeds at the sites visited, failure occurred to soffit components at wind speeds well below design wind speeds for these areas. The FL MAT observed both vinyl and metal soffit loss, but vinyl soffit panels were the most common product observed, particularly in the Florida Keys where vinyl soffit damage was widespread.

In many cases, inadequate support and attachment at the ends of the soffit panel led to failure of the soffit. The Sugarloaf Key house shown below (FL MAT Report Figure 4-19) lost its vinyl soffit in several areas. The red oval shows where the soffit panel was stripped from the assembly's J-channel, which remains attached along the exterior wall (yellow arrows). The soffit appears to have been fastened to only a single nailing strip across the midpoint of the framing above. Section 704.2.1 (including Figure 704.2.1) of the proposal has been included to clarify that vinyl soffit panels are required to be fastened at each end and the unsupported span cannot exceed specified limits (16 or 12 inches) unless permitted by the manufacturer's product approval.



The red outline shows where the soffit panel was stripped from the assembly's J-channel, which remains attached (yellow arrows).

In some cases, vinyl soffit failure appeared to have been associated with fascia cover loss as shown in the image below from Little Torch Key (FL MAT Report Figure 4-18). Loss of the fascia cover likely increases wind pressures on vinyl soffit where the edges of the soffit are exposed.



The inset shows the remaining exposed soffit edge on the left side of the ridge (yellow outline) and missing vinyl soffit panels on the right side of the ridge (red outline).

The TX MAT observed similar wind damage to residential soffits as indicated below. The dwelling in Cape Valero shown on the left (TX MAT Figure 4-44) lost re-covered vinyl soffit panels (green arrow) to high winds, exposing the vent opening (red arrows) to wind driven rain. The photo on the right (TX MAT Figure 4-45) shows a soffit opening that was previously covered by a ventilating fiber-cement board. Red arrows indicate where the attic is exposed to wind driven rain. As with examples shown from Florida, estimated wind speeds for the sites were below design wind speeds.



FL and TX MAT observations described above along with other examples detailed in the MAT Reports, led to the following conclusions and recommendations:

Conclusion FL-10: The MAT observed evidence of inadequate resistance to wind pressures and improper installation of soffits on residential buildings. Widespread loss of soffits was observed in residential construction, and wind-driven rain infiltrated some areas where soffits were displaced or lost.

Recommendation FL-10a: Designers, contractors, and inspectors should place more emphasis on proper soffit installation to limit wind-driven rain. Proper soffit installation should be emphasized by designers, contractors, and inspectors in order to limit wind-driven rain from entering building envelopes and damaging building

interiors.

Conclusion TX-18: Many soffits lacked adequate wind resistance, typically because the wrong material was used for the region or it was improperly installed. The MAT observed widespread loss of soffits in residential and non-residential construction, generally due to improper materials, lack of fasteners, and/or inadequate framing, and wind-driven rain infiltrated some areas where soffits were displaced or lost. The loss of soffit vents can allow hurricane winds to drive large amounts of water through the openings and soak insulation, which can lead to mold growth and, in some cases, the collapse of ceilings.

Recommendation TX-18: Designers, contractors, and inspectors should place more emphasis on proper soffit installation in high-wind regions. Wind-driven rain should be limited from entering building envelopes and damaging building interiors through proper soffit installation.

In summary, widespread residential soffit damage observed in the wake of the 2017 Hurricane Season indicates the need for clarified installation provisions in the IRC. The proposed provisions apply to design wind pressures realized across the US, but are clearly differentiated where 30 pounds per square foot (psf) or less or where greater than 30 psf, so that installation requirements are tailored for the site-specific pressures. Regardless the soffit design wind pressure, the new provisions will provide greater clarity for the builder to implement code-compliant soffit installation and for the building official to verify code-compliant soffit installation.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code change proposal will not increase the cost of construction for buildings where design wind pressures are 30 psf or less because it only clarifies the existing requirement for soffit installation. The code change proposal may decrease costs for buildings where the design wind pressure exceeds 30 psf because it provides some prescriptive solutions as an alternative to design.

Proposal # 4373

RB234-19

RB235-19

IRC@: R703.3.1.1

Proponent: Borjen Yeh, APA - The Engineered Wood Association, representing APA - The Engineered Wood Association (borjen.yeh@apawood.org); Ralph Leyva, representing APA- The Engineered Wood Assoc (ralph.leyva@apawood.org)

2018 International Residential Code

Revise as follows:

R703.3.1.1 Wood structural panel soffit. The minimum nominal thickness for wood structural panel soffits shall be $\frac{3}{8}$ inch (9.5 mm) and shall be fastened to framing or nailing strips with 2-inch by 0.099-inch (51 mm x 2.5 mm) nails. Fasteners shall be ~~in~~-spaced not ~~less-greater~~ than 6 inches (152 mm) on center at panel edges and 12 inches (305 mm) on center at intermediate supports.

Reason: This proposal is intended to correct an oversight on the fastener spacing for wood structural panel soffit from the last code cycle. The fastener spacing should not be greater than 6 inches on center at panel edges. Otherwise, the fastener spacing could be indefinitely larger than 6 inches on center.

Cost Impact: The code change proposal will increase the cost of construction
This proposal is a correction to an oversight from the last code cycle.

Proposal # 4623

RB235-19

RB236-19

IRC®: R703.4

Proponent: Mike Fischer, Kellen Company, representing The Polyisocyanurate Insulation Manufacturers Association (mfischer@kellencompany.com); Marcin Pazera, representing The Polyisocyanurate Insulation Manufacturers Association (mpazera@pima.org)

2018 International Residential Code

Revise as follows:

R703.4 Flashing. Approved corrosion-resistant flashing shall be applied shingle-fashion in a manner to prevent entry of water into the wall cavity or penetration of water to the building structural framing components. Self-adhered membranes used as flashing shall comply with AAMA 711. Fluid-applied membranes used as flashing in exterior walls shall comply with AAMA 714. The flashing shall extend to the surface of the exterior wall finish or to a water-resistive barrier that complies with Section R703.2 and is part of a means of drainage complying with Section R703.1.1. Approved corrosion-resistant flashings shall be installed at the following locations:

1. Exterior window and door openings. Flashing at exterior window and door openings shall extend to the surface of the exterior wall finish or to the water-resistive barrier complying with Section 703.2 for subsequent drainage. Mechanically attached flexible flashings shall comply with AAMA 712. Flashing at exterior window and door openings shall be installed in accordance with one or more of the following:
 - 1.1. The fenestration manufacturer's installation and flashing instructions, or for applications not addressed in the fenestration manufacturer's instructions, in accordance with the flashing manufacturer's instructions. Where flashing instructions or details are not provided, pan flashing shall be installed at the sill of exterior window and door openings. Pan flashing shall be sealed or sloped in such a manner as to direct water to the surface of the exterior wall finish or to the water-resistive barrier for subsequent drainage. Openings using pan flashing shall incorporate flashing or protection at the head and sides.
 - 1.2. In accordance with the flashing design or method of a registered design professional.
 - 1.3. In accordance with other approved methods.
2. At the intersection of chimneys or other masonry construction with frame or stucco walls, with projecting lips on both sides under stucco copings.
3. Under and at the ends of masonry, wood or metal copings and sills.
4. Continuously above all projecting wood trim.
5. Where exterior porches, decks or stairs attach to a wall or floor assembly of wood-frame construction.
6. At wall and roof intersections.
7. At built-in gutters.

Reason: Item 1 in locations required to be flashed indicates that it is acceptable to direct water to the exterior of the WRB for subsequent drainage to the exterior. That option conflicts with the charging language in R703.4 that does not mention the WRB. This proposal is similar to FS133-18 that was approved as submitted by the ICC FS Committee during the Group A Code Development Cycle in 2018; FS133-18 was Approved as Submitted. This proposal creates consistency between the two codes.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal is a clarification of common practice.

RB237-19

IRC: R703.4, R703.4.1(New)

Proponent: Theresa Weston, representing DuPont Performance Building Solutions
(theresa.a.weston@dupont.com)

2018 International Residential Code

Revise as follows:

R703.4 Flashing. Approved corrosion-resistant flashing shall be applied shingle-fashion in a manner to prevent entry of water into the wall cavity or penetration of water to the building structural framing components. Self-adhered membranes used as flashing shall comply with AAMA 711. Fluid-applied membranes used as flashing in exterior walls shall comply with AAMA 714. The flashing shall extend to the surface of the exterior wall finish. Approved corrosion-resistant flashings shall be installed at the following locations:

1. Exterior window and door openings. Flashing at exterior window and door openings shall be installed in accordance with R703.4.1, extend to the surface of the exterior wall finish or to the water-resistive barrier complying with Section 703.2 for subsequent drainage. Mechanically attached flexible flashings shall comply with AAMA 712. Flashing at exterior window and door openings shall be installed in accordance with one or more of the following:
 - 1.1. ~~The fenestration manufacturer's installation and flashing instructions, or for applications not addressed in the fenestration manufacturer's instructions, in accordance with the flashing manufacturer's instructions. Where flashing instructions or details are not provided, pan flashing shall be installed at the sill of exterior window and door openings. Pan flashing shall be sealed or sloped in such a manner as to direct water to the surface of the exterior wall finish or to the water-resistive barrier for subsequent drainage. Openings using pan flashing shall incorporate flashing or protection at the head and sides.~~
 - 1.2. ~~In accordance with the flashing design or method of a registered design professional.~~
 - 1.3. ~~In accordance with other approved methods.~~
2. At the intersection of chimneys or other masonry construction with frame or stucco walls, with projecting lips on both sides under stucco copings.
3. Under and at the ends of masonry, wood or metal copings and sills.
4. Continuously above all projecting wood trim.
5. Where exterior porches, decks or stairs attach to a wall or floor assembly of wood-frame construction.
6. At wall and roof intersections.
7. At built-in gutters.

Add new text as follows:

R703.4.1 Flashing installation at exterior window and door openings. Flashing at exterior window and door openings shall extend to the surface of the exterior wall finish or to the water-resistive barrier complying with Section 703.2 for subsequent drainage. Mechanically attached flexible flashings shall comply with AAMA 712. Flashing at exterior window and door openings shall be installed in accordance with one or more of the following:

1. The fenestration manufacturer's installation and flashing instructions, or for applications not addressed in the fenestration manufacturer's instructions, in accordance with the flashing manufacturer's instructions. Where flashing instructions or details are not provided, pan flashing shall be installed at the sill of exterior

window and door openings. Pan flashing shall be sealed or sloped in such a manner as to direct water to the surface of the exterior wall finish or to the water resistive barrier for subsequent drainage. Openings using pan flashing shall incorporate flashing or protection at the head and sides.

2. In accordance with the flashing design or method of a registered design professional.
3. In accordance with other approved methods.

Reason: This proposal rearranges the code text for clarity. Currently the list of places in which flashing is required is "broken up" by details on flashing installation at window and door openings. This proposal moves the installation to a later subsection. Therefore, it make the list of required flashing locations. No technical changes are made to the installation details.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal is a text rearrangement to improve clarity. It does not change any technical requirements.

Proposal # 5285

RB237-19

RB238-19

IRC@: R703.4

Proponent: Donald Sivigny, representing State of MN and Association of Minnesota Building Officials
(don.sivigny@state.mn.us)

2018 International Residential Code

Revise as follows:

R703.4 Flashing. Approved corrosion-resistant flashing shall be applied shingle-fashion in a manner to prevent entry of water into the wall cavity or penetration of water to the building structural framing components. Self-adhered membranes used as flashing shall comply with AAMA 711. Fluid-applied membranes used as flashing in exterior walls shall comply with AAMA 714. The flashing shall extend to the surface of the exterior wall finish. Approved corrosion-resistant flashings shall be installed at the following locations:

1. Exterior window and door openings. Flashing at exterior window and door openings shall extend to the surface of the exterior wall finish or to the water-resistive barrier complying with Section 703.2 for subsequent drainage. An insulation stop shall be installed around all window and door openings, 1 to 2 inches inward from the face of the exterior sheathing, to allow for drainage of incidental water at the window or door flashing system. Mechanically attached flexible flashings shall comply with AAMA 712. Flashing at exterior window and door openings shall be installed in accordance with one or more of the following:
 - 1.1. The fenestration manufacturer's installation and flashing instructions, or for applications not addressed in the fenestration manufacturer's instructions, in accordance with the flashing manufacturer's instructions. Where flashing instructions or details are not provided, pan flashing shall be installed at the sill of exterior window and door openings. Pan flashing shall be sealed or sloped in such a manner as to direct water to the surface of the exterior wall finish or to the water-resistive barrier for subsequent drainage. Openings using pan flashing shall incorporate flashing or protection at the head and sides.
 - 1.2. In accordance with the flashing design or method of a registered design professional.
 - 1.3. In accordance with other approved methods.
2. At the intersection of chimneys or other masonry construction with frame or stucco walls, with projecting lips on both sides under stucco copings.
3. Under and at the ends of masonry, wood or metal copings and sills.
4. Continuously above all projecting wood trim.
5. Where exterior porches, decks or stairs attach to a wall or floor assembly of wood-frame construction.
6. At wall and roof intersections.
7. At built-in gutters.

Reason: This change will increase the durability of the wall assembly when integrating a fenestration product into the assembly. This code change will enhance the opportunity for water drainage in accordance with the remainder of Section R703.4 to specifically address water drainage at the pan flashing. This proposal provides the opportunity to install fenestration product in compliance with both the Energy Code and the installation instructions of the fenestration manufacturer, by enhancing the drainage of pan flashed fenestration products. The Energy code requires the fenestration products and the framed openings to be insulated and sealed. The installers of these fenestration units almost exclusively use expanding spray foam as a sealant to meet the Energy Codes. When this expanding foam or other sealant flows outward to, or extends to the exterior nailing flange, it actually blocks the free drainage of water to the exterior, allowing water to collect and wick inward

through capillary action toward the interior of the exterior wall assembly where it will cause degradation of the wall assembly. Maintaining an unobstructed and drainable air space around the perimeter of the fenestration product, and especially the pan flashing, will allow for convective air flow that promotes drying and will elevate water infiltration to the wall assembly. This can be accomplished by installing a barrier or stop to prevent the expanding foam or other sealants from reaching the interior side of the nailing flange where it will create degradation issues within the wall assembly. Unobstructed drainage is essential to the draining of water where the fenestration products interface with the wall assemblies. The existing code language does not have any specific, or enforceable language to require an unobstructed drainage plane at all fenestration products. This code change proposal does not interfere with or override the specific installation instruction of fenestration products into walls assemblies by the manufacturer or the code, but instead, it simply enhances the ability of the wall assembly to drain water and maintain a dry and durable assembly for years to come.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code change proposal initially may increase or decrease the cost of construction slightly in material, depending on the manufacturer's installation instructions, however any increase in these cost will more than recovered in the longevity of the assembly and addressing those problems of degradation of wall assemblies at these openings when it is not allowed to drain fully and stay dry. Remember the cost of a Call back to a home is around \$350 or above on average.

Proposal # 5394

RB238-19

RB239-19

IRC@: R703.5

Proponent: Matthew Hunter, representing American Wood Council (mhunter@awc.org)

2018 International Residential Code

Revise as follows:

R703.5 Wood, hardboard and wood structural panel siding. Wood, hardboard, and wood structural panel siding shall be installed in accordance with this section and Table R703.3(1). Hardboard siding shall comply with CPA/ANSI A135.6. ~~Hardboard siding used as architectural trim shall comply with CPA/ANSI A 135.7.~~

Reason: The Composite Panel Association (CPA) and its trim producing members, view architectural trim as a non-structural decorative accent that should not be required to be certified to voluntary ANSI A135.7-2012 Engineered Wood Trim Standard in the IRC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The code change proposal will not increase the cost of construction.

Proposal # 4282

RB239-19

RB240-19

IRC: TABLE R703.6.3(1), TABLE R703.6.3(2), TABLE R905.7.5(2)

Proponent: Rick Allen, International Staple, Nail and Tool Association, representing International Staple, Nail and Tool Association (rallen@isanta.org)

2018 International Residential Code

Revise as follows:

**TABLE R703.6.3(1)
SINGLE-COURSE SIDEWALL FASTENERS**

SINGLE-COURSE SIDEWALL FASTENERS			
Product type	Nail type, and minimum shank diameter and length (inches)	Minimum head diameter(inches)	Minimum shank thickness(inches)
R & R and sanded shingles			
16" and 18" shingles	3d box 1 ¹ / ₄ x <u>0.076</u>	0.19	0.08
24" shingles	4d box 1 ¹ / ₂ x <u>0.076</u>	0.19	0.08
Grooved shingles			
16" and 18" shingles	3d box 1 ¹ / ₄ x <u>0.076</u>	0.19	0.08
24" shingles	4d box 1 ¹ / ₂ x <u>0.076</u>	0.19	0.08
Split and sawn shakes			
18" straight-split shakes	5d box 1 ³ / ₄ x <u>0.080</u>	0.19	0.08
18" and 24" handsplit shakes	6d box 2 x <u>0.099</u>	0.19	0.0915
24" tapersplit shakes	5d box 1 ³ / ₄ x <u>0.080</u>	0.19	0.08
18" and 24" tapersawn shakes	6d box 2 x <u>0.099</u>	0.19	0.0915

For SI: 1 inch = 25.4 mm.

**TABLE R703.6.3(2)
DOUBLE-COURSE SIDEWALL FASTENERS**

DOUBLE-COURSE SIDEWALL FASTENERS			
Product type	Nail type and minimum shank diameter and length (inches)	Minimum head diameter (inches)	Minimum (
R & R and sanded shingles			

16," & 18" and 24" shingles	5d box $1\frac{3}{4} \times 0.080$ or same size 5d casing nails $1\frac{3}{4} \times 0.080$	0.19	
Grooved shingles			
16," 18" and 24" shingles	5d box $1\frac{3}{4} \times 0.080$	0.19	
Split and sawn shakes			
18" straight-split shakes	7d box $2\frac{1}{4} \times 0.099$ or 8d box $2\frac{1}{2} \times 0.113$	0.19	
18" and 24" handsplit shakes	7d box $2\frac{1}{4} \times 0.099$ or 8d box $2\frac{1}{2} \times 0.113$	0.19	
24" tapersplit shakes	7d box $2\frac{1}{4} \times 0.099$ or 8d box $2\frac{1}{2} \times 0.113$	0.19	
18" and 24" tapersawn shakes	7d box $2\frac{1}{4} \times 0.099$ or 8d box $2\frac{1}{2} \times 0.113$	0.19	

For SI: 1 inch = 25.4 mm.

TABLE R905.7.5(2)
NAIL REQUIREMENTS FOR WOOD SHAKES AND WOOD SHINGLES

SHAKES	<u>NAIL TYPE, AND MINIMUM SHANK DIAMETER AND LENGTH (inches)</u>	MINIMUM HEAD SIZE	MINIMUM SHANK DIAMETER
18" straight-split	5d box $1\frac{3}{4} \times 0.080$	0.19"	.080"
18" and 24" handsplit and resawn	6d box 2×0.099	0.19"	.0915"
24" taper-split	5d box $1\frac{3}{4} \times 0.080$	0.19"	.080"
18" and 24" tapersawn	6d box 2×0.099	0.19"	.0915"
Shingles	<u>Nail Type, and Minimum Shank Diameter and Length (inches)</u>	Minimum Head Size	Minimum Shank Diameter
16" and 18"	3d box $1\frac{1}{4} \times 0.076$	0.19"	.080"
24"	4d box $1\frac{1}{2} \times 0.080$	0.19"	.080"

For SI: 1 inch = 25.4 mm.

Reason: The box nail dimensions listed in Tables do not match those listed in ASTM F1667.

The nominal head diameter of a 3d box, 4d box and 5d box nail is 0.219 inches with a minimum head diameter of 0.197 inches

The nominal head diameter of a 6d and 7d box nail is 0.266 inches. with a minimum head diameter of 0.239 inches

The nominal head diameter of an 8d box nail is 0.297 inches with a minimum head diameter of 0.267 inches

The nominal shank diameter (not shank thickness) of a 3d box nail is 0.076 inches with a minimum of 0.072

inches

The nominal shank diameter (not shank thickness) of a 4d and 5d box nail is 0.080 inches with a minimum of 0.076 inches

The nominal shank diameter (not shank thickness) of a 6d and 7d box nail is 0.099 inches with a minimum of 0.095 inches

The nominal shank diameter (not shank thickness) of an 8d box nail is 0.113 inches with a minimum of 0.109 inches

Listing the nail type (3d box, 4d box, etc.) and then the nominal length and nominal shank diameter provides a correct description of the fastener

The Cedar Shake & Shingle Bureau has listed in their installation manuals the use of box nails for installation these products.

In Table R703.6.3(2) the size of the R&R and sanded shingles should read 16", 18" and 24" not 16", 8" and 24"

Cost Impact: The code change proposal will not increase or decrease the cost of construction
These proposed changes do not change the existing requirements but instead clarify the description of the fasteners

Proposal # 3843

RB240-19

RB241-19

IRC®: R703.7, R703.7.1, R703.7.3, 703.7.3.1 (New)

Proponent: Cesar Lujan, representing National Association of Home Builders (clujan@nahb.org); Gary Ehrlich, National Association of Home Builders, representing National Association of Home Builders (gehrlich@nahb.org)

2018 International Residential Code

R703.7 Exterior plaster (stucco). Installation of exterior plaster shall be in compliance with ASTM C926, ASTM C1063 and the provisions of this code.

Revise as follows:

R703.7.1 Lath. Lath and lath attachments shall be of corrosion-resistant materials in accordance with ASTM C1063, expanded metal, welded wire, or woven wire lath shall be attached to wood framing members with 1¹/₂-inch-long (38 mm), 11-gage nails having a ⁷/₁₆-inch (11.1 mm) head, or ⁷/₈-inch-long (22.2 mm), 16-gage staples, spaced not more than ~~6 7~~ 178 mm) on center vertically and not more than 24 inches on center horizontally, or as otherwise approved. Additional fastening between wood framing members shall not be prohibited. Lath attachments to cold-formed steel framing or to masonry, stone, or concrete substrates shall be in accordance with ASTM C 1063. Where lath is installed directly over foam sheathing, lath connections shall also be in accordance with Sections R703.15, R703.16, or R703.17. Where lath is attached to furring installed over foam sheathing, the furring connections shall be in accordance with Sections R703.15, R703.16, or R703.17.

Exception: Lath is not required over masonry, cast-in-place concrete, precast concrete or stone substrates prepared in accordance with ASTM C1063.

R703.7.3 Water-resistive barriers. Water-resistive barriers shall be installed as required in Section R703.2 and, where applied over wood-based sheathing, shall include a water-resistive, vapor-permeable barrier with a performance at least equivalent to two layers of Grade D paper. The individual layers shall be installed independently such that each layer provides a separate continuous plane and any flashing, installed in accordance with Section R703.4 and intended to drain to the *water-resistive barrier*, is directed between the layers.

Exception: Where the *water-resistive barrier* that is applied over wood-based sheathing has a water resistance equal to or greater than that of 60-minute Grade D paper and is separated from the stucco by an intervening, substantially nonwater-absorbing layer or designed drainage space.

Add new text as follows:

703.7.3.1 Furring Where provided, furring between lath and vertical supports or solid sheathing shall consist of wood furring strips not less than 1 inch by 2 inches (25 mm by 51 mm), minimum ³/₄ inch (19 mm) metal channels, or self-furring lath, and shall be installed in accordance with ASTM C1063. Furring shall be spaced a maximum of 24 inches (600 mm) on center horizontally and, where installed over wood or cold-formed steel framing, shall be fastened into framing members.

Reason: The purpose of this code change is to correlate the requirements for exterior lath and plaster (stucco) with the requirements of ASTM C 926 and C 1063 and recommended practice. The code requirements in the IRC are not in alignment with the reference standards and lack key details needed to insure a good installation and minimize the risk of moisture intrusion.

In particular, the IRC lath attachment requirements state a 6" nail or staple spacing but do not specify direction

or what nailing substrates are permitted. ASTM C 1063 specifies a 7" vertical spacing along and 16" to 24" horizontal spacing into wood studs. Without this clear direction in the code, some stucco is being installed with fasteners in a 6" grid pattern (both horizontal and vertical), leading to fasteners penetrating sheathing and providing a path for moisture intrusion behind the WRB and exterior sheathing and causing decay and water damage. The code user is referred to C 1063 for lath attachment requirements for other substrates, and is allowed to omit the lath when permitted by C 1063 for concrete substrates which have been properly prepared such that the plaster will bond directly to the concrete.

Also, the IRC does not currently provide any details for furring. Minimum sizes consistent with other wood furring requirements in the IRC and the minimum channel size from C 1063 are supplied along with the maximum horizontal spacing. Again, the proposed language underscores that furring attachment to metal or wood framing must be into studs. Where furring is required between lath and vertical supports or solid surfaces varies depending on the type of lath or plaster base used and the type of vertical support or surface. Designers and stucco installers should defer to C 1063 and stucco manufacturer instructions for guidance on where furring is required.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code change aligns the prescriptive language for exterior lath and plaster in the IRC with the ASTM standards referenced in the section. Since compliance with these standards is already required, this change simply provides clarification for builders, stucco installers and building officials and thus does not increase the cost of construction.

Proposal # 4723

RB241-19

RB242-19

IRC: R703.7.3, R703.7.3.1(New), R703.7.3.2(New)

Proponent: Mike Fischer, representing Self (mfischer@kellenccompany.com); Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council (jcrandell@aresconsulting.biz)

2018 International Residential Code

Revise as follows:

R703.7.3 Water-resistive barriers. Water-resistive barriers shall be installed as required in Section R703.2 and, where applied over wood-based sheathing, shall comply with Section R703.7.3.1 or Section R703.7.3.2. ~~include a water-resistive, vapor-permeable barrier with a performance at least equivalent to two layers of Grade D paper. The individual layers shall be installed independently such that each layer provides a separate continuous plane and any flashing, installed in accordance with Section R703.4 and intended to drain to the water-resistive barrier, is directed between the layers.~~

Exception: ~~Where the water-resistive barrier that is applied over wood-based sheathing has a water resistance equal to or greater than that of 60-minute Grade D paper and is separated from the stucco by an intervening, substantially nonwater-absorbing layer or designed drainage space.~~

Add new text as follows:

R703.7.3.1 Dry Climates. In dry (B) climate zones indicated in Figure N1101.7, water-resistive barriers shall comply with one of the following:

1. The water-resistive barrier shall be two layers of 10-minute Grade D paper or have a water resistance equal to or greater than two layers of a water-resistive barrier complying with ASTM E2556, Type I. The individual layers shall be installed independently such that each layer provides a separate continuous plane. Flashing installed in accordance with Section R703.4 and intended to drain to the water-resistive barrier, shall be directed between the layers.
2. The water-resistive barrier shall be 60-minute Grade D paper or have a water resistance equal to or greater than one layer of a water-resistive barrier complying with ASTM E2556, Type II. The water-resistive barrier shall be separated from the stucco by a layer of foam plastic insulating sheathing or other non-water-absorbing layer.

R703.7.3.2 Moist or marine climates. In the moist (A) or marine (C) climate zones indicated in Figure N1101.7, water-resistive barriers shall comply with one of the following:

1. In addition to complying with Section R703.7.3.1, a space not less than 3/16 inch (5 mm) in depth shall be added to the exterior side of the water-resistive barrier.
2. In addition to complying with Section R703.7.3.1 Item 2, a space having a drainage efficiency of not less than 90%, as measured in accordance with ASTM E2273 or Annex A2 of ASTM E2925, shall be added to the exterior side of the water-resistive barrier.

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
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West Conshohocken PA 19428

ASTM E2925-17: Standard Specification for Manufactured Polymeric Drainage and Ventilation Materials Used to Provide a Rainscreen Function

Reason: The proposal does two things. First, it reorganizes the provisions by deleting an exception (which is really a construction option) and replacing it with subsections that indicate different methods of complying with stucco water-resistive barrier requirements. Second, the proposal properly applies requirements in relation to climate -- something that has been missing in the code and is needed to avoid higher risk of moisture problems in climates that are moist/rainy. The proposal will help resolve problems with stucco performance (e.g., moisture problems over wood-based sheathings) and avoid impacting cost or performance where performance has a long-standing record of good performance (e.g., dry climates such as the southwestern region of the U.S.).

Cost Impact: The code change proposal will increase the cost of construction. The proposal will not increase cost for substrates other than wood-based sheathing. Also, it will not impact cost or change requirements in dry climates where stucco has a long record of successful performance. This also will not impact cost in moist or marine climates where similar actions are already being taken (e.g., a drainage space) to reduce risk of moisture damage.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM E2925-17, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 5484

RB242-19

RB243-19

IRC@: R703.7.3, ASTM Chapter 44 (New)

Proponent: Craig Conner, representing self (craig.conner@mac.com); Joseph Lstiburek, representing self (joe@buildingscience.com)

2018 International Residential Code

Revise as follows:

R703.7.3 Water-resistive barriers. Water-resistive barriers shall be installed as required in Section R703.2 and, where applied over wood-based sheathing, shall include a water-resistive, ~~vapor-permeable~~ barrier with a performance water resistance at least equivalent to two layers of Grade D paper or two layers of water-resistive barrier complying with ASTM E2556. The individual layers shall be installed independently such that each layer provides a separate continuous plane and any flashing, installed in accordance with Section R703.4 and intended to drain to the *water-resistive barrier*, is directed between the layers.

Exception: Where the water-resistive barrier that is applied over wood-based sheathing has a water resistance equal to or greater than that of ~~60-minute Grade D paper~~ a water-resistive barrier complying with ASTM E2556 Type I and is separated from the stucco by an intervening, ~~substantially nonwater-absorbing layer or designed drainage~~ foam plastic insulating sheathing layer or by a minimum 3/16 inch (5 mm) space.

Add new text as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
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West Conshohocken PA 19428

E2556/E2556M—10: Standard Specification for Vapor Permeable Flexible Sheet Water-resistive Barriers Intended for Mechanical Attachment

Reason: Objective:

1. Define water resistance as the primary functional requirement of the WRB and remove reference to vapor permeable.
2. Enable a single layer of WRB complying with ASTM E2556 Type I with a drainage space.
3. Define depths drainage space

The existing code language gives insufficient guidance for other approved materials. The added language addresses this issue and provides a specific performance requirement for water resistance and provides consistency with other sections of the code that relate specifically to water-resistive barriers.

The size of the drainage space needs to be specified. Type 1 is the appropriate water-resistive metric for the specified space. This logic is consistent with the body and intent of the text of Section R703.7.3. The specified space and one layer of Type 1 provides equivalent performance to the two layers of Type 1 specified in the body of R703.7.3.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This change gives better guidance for water-resistance.

Staff Analysis: The referenced standard, ASTM E2556/E2556M-10, is currently referenced in other 2018 I-codes.

RB244-19

IRC®: R703.7.3

Proponent: Craig Conner, representing self (craig.conner@mac.com); Joseph Lstiburek, representing self (joe@buildingscience.com)

2018 International Residential Code

R703.7.3 Water-resistive barriers. Water-resistive barriers shall be installed as required in Section R703.2 and, where applied over wood-based sheathing, shall include a water-resistive, vapor-permeable barrier with a performance at least equivalent to two layers of Grade D paper. The individual layers shall be installed independently such that each layer provides a separate continuous plane and any flashing, installed in accordance with Section R703.4 and intended to drain to the *water-resistive barrier*, is directed between the layers.

Exception-Exceptions:

1. Where the *water-resistive barrier* that is applied over wood-based sheathing has a water resistance equal to or greater than that of 60-minute Grade D paper and is separated from the stucco by an intervening, substantially nonwater-absorbing layer or designed drainage space.
2. Where the water-resistive barrier is applied over wood-based sheathing where the annual mean rainfall as determined by the National Oceanic and Atmospheric Administration (NOAA) exceeds 20 inches, a minimum 3/16 inch space shall be provided between the stucco and the water-resistive barrier.

Reason: There are serious stucco failures occurring with wood frame buildings sheathed with wood based sheathing. The reasons for these failures can be found in the following link:

<https://buildingscience.com/documents/building-science-insights/bsi-102-coming-stucco-pocalypse>

This code change addresses these issues. Annual mean rainfall is the appropriate metric for risk not humidity and temperature.

Cost Impact: The code change proposal will increase the cost of construction

The code change proposal reduces the cost of damage, repair and associated litigation. This change gives better guidance for water resistance.

Proposal # 5424

RB244-19

RB245-19

IRC®: R703.7.3, ASTM Chapter 44 (New)

Proponent: Gary Ehrlich, National Association of Home Builders, representing National Association of Home Builders (gehrlich@nahb.org)

2018 International Residential Code

Revise as follows:

R703.7.3 Water-resistive barriers. Water-resistive barriers shall be installed as required in Section R703.2 and, where applied over wood-based sheathing, shall ~~include a water-resistive, vapor-permeable barrier with a performance~~ have a water resistance at least equivalent to 60-minute Grade D paper or other material complying with ASTM E2556, Type II and be separated from the stucco by an intervening, substantially nonwater-absorbing layer or by a designed drainage space not less than 3/16 inch in depth.

Exception: In *climate zones* designated as Dry (B) in accordance with Section 1101.7, the *water-resistive barrier* shall have a water resistance at least equivalent to ~~that of~~ two layers of 10-minute Grade D paper or other material complying with ASTM E2556, Type I. The individual layers shall be installed independently such that each layer provides a separate continuous plane and any flashing, installed in accordance with Section R703.4 and intended to drain to the *water-resistive barrier*, is directed between the layers. The designed drainage space or additional substantially non water-absorbing layer shall not be required.

Exception: ~~Where the *water-resistive barrier* that is applied over wood-based sheathing has a water resistance equal to or greater than that of 60-minute Grade D paper and is separated from the stucco by an intervening, substantially nonwater-absorbing layer or designed drainage space.~~

Add new text as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
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West Conshohocken PA 19428

E2556-10: Standard Specification for Vapor Permeable Flexible Sheet Water-resistive Barriers Intended for Mechanical Attachment

Reason: The purpose of this code change is to revise the requirements for water resistive barriers and drainage behind exterior lath and plaster (stucco)

Significant water damage has occurred in stucco walls due to improper provisions for drainage and drying behind the lath and plaster. If sufficient amounts of moisture accumulate, especially around penetrations and rough openings, it may be able to wick through the traditional 10-minute layers of Grade D paper or equivalent material. The current exception for one layer of minimum 60-minute Grade D paper or equivalent with an additional layer of non-water-absorbing material or drainage space is a good recommended practice and is elevated to the base requirement. The traditional requirement for two 10-minute layers of Grade D paper or equivalent material is limited to dry climate zones where bulk moisture is not expected to be present for extended periods of time.

Materials considered as “substantially non-water-absorbing material” include an additional layer of 10-minute Grade D paper, an additional layer of housewrap, or foam plastic insulating sheathing.

Cost Impact: The code change proposal will increase the cost of construction

Depending on the products selected to meet the water-resistant barrier requirements, the cost to provide a

single 60-minute layer may be greater than the cost to provide two separate 10-minute layers. In warm-humid climates, the requirement for an additional 10-minute layer over the 60-minute layer would be an increase in cost if not already being provided as the "substantially non-water absorbing layer".

Staff Analysis: The referenced standard, ASTM E2556-10, is currently referenced in other 2018 I-codes.

Proposal # 5076

RB245-19

RB246-19

IRC: 202 (New), R703.7.3, TABLE R703.7.3 (New), ASTM Chapter 44 (New)

Proponent: Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council (jcrandell@aresconsulting.biz)

2018 International Residential Code

Revise as follows:

R703.7.3 Water-resistive barriers. Water-resistive barriers shall be installed as required in Section R703.2 and, where applied over wood-based sheathing, ~~shall include a water-resistive, vapor-permeable barrier with a performance at least equivalent to two layers of Grade D paper. The individual~~ shall be installed as required in Table R703.7.3. The individual water-resistive barrier and bond break material layers shall be installed independently such that each layer provides a separate continuous plane and any flashing, installed in accordance with Section R703.4 and intended to drain to the *water-resistive barrier*, is directed between the layers.

Exception: ~~Where the water-resistive barrier that is applied over wood-based sheathing has a water resistance equal to or greater than that of 60-minute Grade D paper and is separated from the stucco by an intervening, substantially nonwater-absorbing layer or designed drainage space.~~

Add new text as follows:

TABLE R703.7.3
WATER-RESISTIVE BARRIER, BOND BREAK, DRAINAGE, AND VENTILATION REQUIREMENTS FOR EXTERIOR PLASTER (STUCCO)

<u>CLIMATE ZONE</u>	<u>WATER-RESISTIVE BARRIER</u>	<u>BOND BREAK MATERIAL LAYER</u>	<u>DRAINAGE SPACE</u>	<u>VENTILATED DRAINAGE SPACE</u>
APPLICATION: Stucco over any substrate other than wood-based sheathing				
All Climate Zones	Required	Not Required	Not Required	Not Required
APPLICATION: Stucco over wood-based sheathing				
Dry (B)	Required ^a	Required	Not Required	Not Required
Moist (A) and Marine (C), Except Warm-Humid	Required ^b	Required	Required ^c	Not Required
Warm-Humid	Required ^b	Required	Required ^{d,e}	

a. Water-resistive barrier complying with Section R703.2 shall be 10-minute Grade D paper or have a water-resistance equal to or greater than one layer of water-resistive barrier complying with ADTM E2556, Type I.

b. Water-resistive barrier complying with Section R703.2 shall be 60-min Grade D paper or have a water-resistance equal to or greater than one layer of water-resistive barrier complying with ADTM E2556, Type II.

c. A minimum 1/8-inch (3.2 mm) draining space or have a minimum drainage efficiency of 90% as measured in accordance with ASTM E2273 or Annex A2 of ASTM E2925.

d. A minimum 3/16-inch (4.8 mm) ventilated drainage space and, where not a clear airspace, have a minimum drainage efficiency of 90% as measured in accordance with ASTM E2273 or Annex A2 of ASTM E2925.

e. Where foam plastic insulating sheathing complying with ASTM C578 or ASTM C1289 is located between the stucco and wood-based sheathing with a drainage space in accordance with footnote 'c', a ventilated drainage space is not required.

Add new definition as follows:

BOND BREAK. A substantially nonwater-absorbing layer placed directly behind stucco to prevent adhesion of the stucco to the surface of the water-resistive barrier, to serve as a protective layer over the water-resistive barrier, to provide a capillary break, and to promote drainage.

DRAINAGE SPACE. A separation between cladding and the surface of a water-resistive barrier created by a furred gap, channels, a porous material or matrix, or by other means to provide drainage of water downward to an outlet.

VENTILATED DRAINAGE SPACE. A drainage space that further incorporates the capability to allow outdoor air flow into and back out of the space behind cladding, usually by way of high and low vent inlets and outlets or by way of an air permeable, vented, cladding.

Add new text as follows:

ASTM

ASTM International
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ASTM E2925-17: Standard Specification for Manufactured Polymeric Drainage and Ventilation Materials Used to Provide a Rainscreen Function

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428

E2556/E2556M—10: Standard Specification for Vapor Permeable Flexible Sheet Water-resistive Barriers Intended for Mechanical Attachment

Reason: The current minimum requirements for stucco installation over wood-based sheathing are confusing and also problematic in that they are predominantly aimed at practices that have been successful mainly in drying climates. In more moist climates, these minimum stucco installation requirements, particularly in regard to the WRB layer and lack of sufficient drainage or ventilation, has resulted in or contributed to numerous moisture-related problems.

Given the above concerns, this proposal achieves the following:

1) First, it **re-formats** the provisions into an easy-to-use tabulated ("look up table) format as shown in proposed Table R703.7.3. This will make it much easier to identify the various installation practices (including those also currently permitted in the code).

2) Second, it **clarifies** much of the confusion or ambiguity in this section of code. This is done through definitions and terminology that reflect the primary purpose of various features or materials that are important to an overall

stucco installation and proper functioning of the WRB layer. This has also allowed the exception to be deleted since it is now incorporated more appropriately within the requirements of Table R703.7.3 (and footnote 'b') and the added definition of a "bond break" (replacing currently use of "nonwater absorbing layer" is consistent with the intent of the exception as explained in the reason statement to proposal S93-03/04 which brought the exception into the 2006 code).

3) Third, it provides **enhanced moisture control practices only where needed** for the moist (rainy) and hot/humid climates where rainwater management (drainage) and also ventilation (drying) or hygric redistribution become more important, particularly when used over wood-based sheathing. Thus, these provisions add the enhancements only where needed and only where stucco is used over wood sheathing which is susceptible to moisture (following the current approach to single-out special requirements for application over wood-based sheathing). It does not change requirements where stucco has been performing successfully for decades.

4) Finally, this proposal provides for **flexibility** in meeting the requirements, including both prescriptive and performance requirements for drainage and ventilation in the footnotes. And, these requirements are consistent with a wide selection of suitable materials currently being used and relies on available (and widely used) consensus standards for measuring performance of those materials or alternatives.

Cost Impact: The code change proposal will increase the cost of construction

This proposal will not increase cost for stucco installation over substrates other than wood-based sheathing. Also, it will not impact cost or change requirements in dry climates where the minimum stucco installation over wood-based sheathing has a very successful performance record. Even where enhanced practices (drainage or ventilation) are required, this will impact cost only where they are not already being used to control risk of moisture damage. For those installations not already using these enhanced provisions in moist/rainy/humid climates, this proposal will likely reduce long term costs to builders and home owners because it will reduce risk of moisture problems and improve durability.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM E2925-17, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

The referenced standard, ASTM E2556-10, is currently referenced in other 2018 I-codes.

Proposal # 4526

RB246-19

RB247-19

IRC@: R703.8.4

Proponent: Ralph Leyva, APA- The Engineered Wood Assoc, representing APA- The Engineered Wood Assoc (ralph.leyva@apawood.org); Borjen Yeh, representing APA - The Engineered Wood Association (borjen.yeh@apawood.org)

2018 International Residential Code

Revise as follows:

R703.8.4 Anchorage. Masonry veneer shall be anchored directly to the supporting wall studs with corrosion-resistant metal ties embedded in mortar or grout and extending into the veneer a minimum of 1¹/₂ inches (38 mm), with not less than ⁵/₈-inch (15.9 mm) mortar or grout cover to outside face. Masonry veneer shall conform to Table R703.8.4(1). ~~For~~ Where the masonry veneer tie attachment is fastened directly to wood structural panel not less than 7/16 performance category through insulating sheathing not greater than 2 inches (51 mm) in thickness to not less than 7/16 performance category wood structural panel, see Table R703.8.4(2). Where Table R703.8.4(2) is used, attachment to the wood studs behind the sheathing is not required.

Reason: This is a non-technical change. It clarifies the code making it easier to use and enforce, and making it more clearly conveys the two separate anchorage requirements -- one directly to the studs and one directly to wood structural panel sheathing.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal clarifies the code and will not increase the cost of construction.

Proposal # 4695

RB247-19

RB248-19

IRC@: TABLE R703.8.4(1)

Proponent: Charles Clark Jr, Brick Industry Association, representing Brick Industry Association
(cclark@bia.org)

2018 International Residential Code

Revise as follows:

TABLE R703.8.4(1)
TIE ATTACHMENT AND AIRSPACE REQUIREMENTS

BACKING AND TIE	MINIMUM TIE	MINIMUM TIE FASTENER ^a	AIRSPACE ^{e, b}	
Wood stud backing with corrugated sheet metal	22 U.S. gage(0.0299 in.) x 7/8 in. wide	8d common nail ^{b, c} (2 1/2 in. x 0.131 in.)	Nominal 1 in. between sheathing and veneer	
Wood stud backing with <u>adjustable</u> metal strand wire	W1.7 (No. 9 U.S. gage; 0.148 in. <u>dia</u>) with hook embedded in mortar joint ^d	8d common nail ^{b, c} (2 1/2 in. x 0.131 in.)	Minimum nominal 1 in. between backing and veneer	Maximum 4 1/2 ^{4 5/8} in. between backing and veneer
<u>Wood stud backing with adjustable metal strand wire</u>	<u>W2.8 (0.187 in. dia.) with hook embedded in mortar joint^{e, f}</u>	<u>8d common nail ^c</u> <u>(2 1/2 in. x 0.131 in.)</u>	<u>Greater than 4 5/8 in. between backing and veneer</u>	<u>Maximum 6 5/8 in. between backing and veneer</u>
Cold-formed steel stud backing with adjustable metal strand wire	W1.7 (No. 9 U.S. gage; 0.148 in.) with hook embedded in mortar joint ^d	No. 10 screw extending through the steel framing a minimum of three exposed threads	Minimum nominal 1 in. between sheathing and veneer	Maximum 4 1/2 ^{4 5/8} in. between backing and veneer
<u>Cold-formed steel stud backing with adjustable metal strand wire</u>	<u>W2.8 (0.187 in. dia.) with hook embedded in mortar joint^{e, f}</u>	<u>No. 10 screw extending through the steel framing a minimum of three exposed threads</u>	<u>Greater than 4 5/8 in. between backing and veneer</u>	<u>Maximum 6 5/8 in. between backing and veneer</u>

~~b. a.~~ All fasteners shall have rust-inhibitive coating suitable for the installation in which they are being used, or be manufactured from material not susceptible to corrosion.

~~e. b.~~ All fasteners shall have rust-inhibitive coating suitable for the installation in which they are being used, or be manufactured from material not susceptible to corrosion.

~~a. c.~~ In Seismic Design Category D0, D1 or D2, the minimum tie fastener shall be an 8d ring-shank nail (2 1/2 in. x 0.131 in.) ~~or a No. 10 screw extending through the steel framing a minimum of three exposed threads.~~

d. Adjustable tie pintle shall include a minimum of 1 pintle leg of wire size W2.8 (MW18) with a maximum offset of 1-1/4 in.

e. Adjustable tie pintle shall include a minimum of 2 pintle legs with a maximum offset of 1-1/4 in. Distance between inside face of brick and end of pintle shall be a maximum of 2 in.

f. Adjustable tie backing attachment components shall consist of one of the following: eyes with minimum wire W2.8 (MW18), barrel with minimum 1/4 in. outside dia., or plate with minimum thickness of 0.074 in. and minimum width of 1-1/4 in.

Reason: This code change proposal allows larger airspaces to be constructed between masonry veneer and backing. Larger airspaces are necessary in order to accommodate thicker continuous insulation which may be needed in colder climate zones.

If adopted, the tie and airspace provisions of the IRC would match those required by the IBC through reference to the anchored masonry veneer provisions of TMS 402 Building Code Requirements for Masonry Structures. As such, they would allow masonry veneer with airspaces up to a maximum of 4-5/8 in. to be constructed using the traditional tie configurations already in the existing IRC table. They would also allow masonry veneer with airspaces greater than 4-5/8 in. up to a maximum of 6-5/8 in. to be constructed using stiffer tie configurations.

This code change proposal also adjusts the existing footnotes in the table (Footnotes a, b and c). For the footnote addressing Seismic Design Category D0, D1 or D2, there is no need to include No. 10 screws as they are already required for all cold-formed steel framing. Footnotes addressing rust-inhibitive coating and construction mortar are moved to more appropriate locations.

Cost Impact: The code change proposal will increase the cost of construction

This code change proposal WILL NOT increase the cost of constructing masonry veneer with an airspace of 4-1/2 in. or smaller as currently allowed by the existing code provision. Rather, it allows the construction of masonry veneer with an airspace larger than 4-1/2 in. to a maximum of 6-5/8 in. However, masonry veneer with an airspace greater than 4-5/8 in. will be more expensive than veneer with an airspace of 4-5/8 in. or less because stiffer ties are required to span the larger airspace.

Proposal # 5503

RB248-19

RB249-19

IRC@: R703.11.2, TABLE R703.11.2

Proponent: Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council

2018 International Residential Code

Revise as follows:

R703.11.2 Installation over foam plastic sheathing. Where vinyl siding or insulated vinyl siding is installed over foam plastic sheathing, the vinyl siding shall comply with Section R703.11 and shall have a wind load design wind pressure resistance rating in accordance with Table R703.11.2.

Exceptions:

1. Where the foam plastic sheathing is applied directly over wood structural panels, fiberboard, gypsum sheathing or other *approved* backing capable of independently resisting the design wind pressure, the vinyl siding shall be installed in accordance with Sections R703.3.3 and R703.11.1.
2. Where the vinyl siding manufacturer's product specifications provide an approved wind load design wind pressure rating for installation over foam plastic sheathing, use of this wind load design wind pressure rating shall be permitted and the siding shall be installed in accordance with the *manufacturer's installation instructions*.
3. Where the foam plastic sheathing and its attachment have a design wind pressure resistance complying with Sections R316.8 and R301.2.1, the vinyl siding shall be installed in accordance with Sections R703.3.3 and R703.11.1.

TABLE R703.11.2

ADJUSTED REQUIRED MINIMUM WIND LOAD DESIGN WIND PRESSURE REQUIREMENT RATING FOR VINYL SIDING INSTALLED OVER FOAM PLASTIC SHEATHING ALONE

ULTIMATE DESIGN WIND SPEED (MPH)	ADJUSTED MINIMUM DESIGN WIND PRESSURE (ASD) (PSF) ^{a, b}					
	Case 1: With interior gypsum wallboard ^c			Case 2: Without interior gypsum wallboard ^c		
	Exposure			Exposure		
	B	C	D	B	C	D
≤95	-30.0	-33.2	-39.4	-33.9	-47.4	-56.2
100	-30.0	-36.8	-43.6	-37.2	-52.5	-62.2
105	-30.0	-40.5	-48.1	-41.4	-57.9	-68.6
110	-44.0	-61.6	-73.1	-62.9	-88.1	-104.4
	<u>-31.8</u>	<u>-44.5</u>	<u>-52.8</u>	<u>-45.4</u>	<u>-63.5</u>	<u>-75.3</u>
115	-49.2	-68.9	-81.7	-70.3	-98.4	-116.7
	<u>-35.5</u>	<u>-49.7</u>	<u>-59.0</u>	<u>-50.7</u>	<u>-71.0</u>	<u>-84.2</u>

120	-51.8	-72.5	-86.0	-74.0	-103.6	-122.8
	<u>-37.4</u>	<u>-52.4</u>	<u>-62.1</u>	<u>-53.4</u>	<u>-74.8</u>	<u>-88.6</u>
130	-62.2	-87.0	-103.2	-88.8	-124.3	<u>-147.4</u>
	<u>-44.9</u>	<u>-62.8</u>	<u>-74.5</u>	<u>-64.1</u>	<u>-89.7</u>	<u>-106</u>
> 130	Not Allowed ^d					

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 square foot = 0.0929 m², 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa.

a. Linear interpolation is permitted.

b. The table values are based on a maximum 30-foot mean roof height, and effective wind area of 10 square feet Wall Zone 5 (corner), and the ASD design component and cladding wind pressure from Table R301.2(2), adjusted for exposure in accordance with Table R301.2(3), multiplied by the following adjustment factors: ~~2.6~~ 1.87 (Case 1) and ~~3.7~~ 2.67 (Case 2) ~~for wind speeds less than 130 mph and 3.7 (Case 2) for wind speeds greater than 130 mph.~~

c. Gypsum wallboard, gypsum panel product or equivalent.

d. For the indicated wind speed condition, vinyl siding over foam sheathing, ~~only on the exterior of frame walls with vinyl siding is not allowed unless the vinyl siding complies with an adjusted minimum design wind pressure requirement as determined in accordance with Note b and the wall assembly shall be capable of resisting an impact without puncture at least equivalent to that of a wood frame wall with minimum 7/16-inch OSB sheathing as tested in accordance with ASTM E1886. The vinyl siding shall comply with an adjusted design wind pressure requirement in accordance with Note b, using an adjustment factor of 2.67.~~

Reason: The main purpose of this proposal is to update Table R70311.2 to ensure that the adjusted vinyl siding design wind pressure ratings are based on updated standard for vinyl siding (ASTM D3679) which has changed the pressure equalization factor from 0.36 to 0.5 for design wind pressure rating of vinyl siding. Because the pressure equalization factor in ASTM D3679 is now more conservative (changed to 0.5 from 0.36), the adjustment for applications over foam sheathing are adjusted downward accordingly by multiplying existing table values by $0.36/0.5 = 0.72$. This will ensure that the intended level of performance is maintained with use of newer vinyl siding products complying with ASTM D3679 as required by the code. Also, the design components and cladding wind pressures for walls (which the adjusted values in Table R703.11.2 are based) remain consistent with the newer ASCE 7-16 standard. The proposal also coordinates “wind load design pressure rating” with terminology as used in ASTM D3679.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal only updates to correlate with the newer ASTM D3679 standard. Because the adjustments are relative to that standard, there is no difference in cost of vinyl siding specified for use over foam sheathing.

Proposal # 4527

RB249-19

RB250-19

IRC@: R703.14, R703.14.2, R703.14.3

Proponent: Matthew Dobson, Vinyl Siding Institute, representing Vinyl Siding Institute
(mdobson@vinylsiding.org)

2018 International Residential Code

Revise as follows:

R703.14 Polypropylene siding. Polypropylene siding shall be certified and labeled as conforming to the requirements of ASTM D7254, and those of Section R703.14.2 or Section R703.14.3, by an approved quality control agency.

Delete without substitution:

~~**R703.14.2 Fire separation.** Polypropylene siding shall not be installed on walls with a fire separation distance of less than 5 feet (1524 mm) and walls closer than 10 feet (3048 mm) to a building on another lot.~~

~~**Exception:** Walls perpendicular to the line used to determine the fire separation distance.~~

~~**R703.14.3 Flame spread index.** The certification of the *flame spread index* shall be accompanied by a test report stating that all portions of the test specimen ahead of the flame front remained in position during the test in accordance with ASTM E84 or UL 723.~~

Reason: The requirements in sections R703.14.2 & 3, are unnecessary and unfair. Section R302 of the code deals with fire separation, specifically for high density settings. We feel these sections are erroneous for the following reasons:

1. 703.14.2 bans the use of polypropylene siding high density settings, yet the product can pass an ASTM E119 test which is the requirement in high density settings. The requirement also applies a 10 foot fire separation to buildings on another lot which may or may not be enforceable as there may be two property owners involved.
2. 703.14.3 provides that if you change how you conduct the flame spread test prescribed in the ASTM standard for polypropylene siding, it can be used in high density settings. Having changes to standard testing methods in the code is inappropriate. This issue has been ongoing in the ASTM realm for years, it not the place of the code to get in the middle of this issue. Further, there has been no shown direct correlation of how this specific change to the flame spread test impacts allowing the product's use in high density settings, especially when the long standing requirement has been the rated assembly test.

We have included as evidence a report which approves polypropylene siding use with an ASTM E119 rated assembly as required by the code and therefore could and should be allowed in high density settings.

The code should be fair in its approach and not single out one particular product without clear substantiated evidence. We ask these erroneous restrictions be removed and let the code regulate safely as it has done through section R302.

Cost Impact: The code change proposal will decrease the cost of construction
This change could potentially reduce the cost by removing an additional unnecessary testing requirement.

Proposal # 5461

RB250-19

RB251-19

IRC@: TABLE R703.15.1

Proponent: Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council

2018 International Residential Code

Revise as follows:

TABLE R703.15.1

CLADDING MINIMUM FASTENING REQUIREMENTS FOR DIRECT ATTACHMENT OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING WEIGHT^a

Portions of table not shown remain unchanged.

CLADDING FASTENER THROUGH FOAM SHEATHING ^b	CLADDING FASTENER TYPE AND MINIMUM SIZE	CLADDING FASTENER VERTICAL SPACING (inches)	MAXIMUM CLADDING WEIGHT	
			Horizontal Spacing	Vertical Spacing
			3 psf	1 psf

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

DR = Design Required.

o.c. = On Center.

a. Wood framing shall be Spruce-pine-fir or any wood species with a specific gravity of 0.42 or greater in accordance with AWC NDS.

b. Where wood structural panels complying with the specific gravity requirement of Note 'a' are used, the fastener penetration depth into framing plus the thickness of the such panel shall be considered as satisfying the minimum penetration into framing. For cladding connections to wood structural panels, see Table R703.3.3.

~~b.c.~~ Nail fasteners shall comply with ASTM F1667, except nail length shall be permitted to exceed ASTM F1667 standard lengths.

~~e.d.~~ Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with ASTM C578 or ASTM C1289.

Reason: This footnote added to Table R703.15.1 is needed to coordinate with provisions in other parts of the code related to fastening through wood structural panels which addresses a very common “oversheathing” application of foam plastic insulating sheathing (continuous insulation).

Cost Impact: The code change proposal will decrease the cost of construction

The proposal will allow for slightly reduced fastener lengths while still satisfying minimum fastener penetration. It will also help reduce cost by referring to Table R703.3.3 which permits fastening directly to wood-structural panels of minimum required thickness to serve as a nail base. This will also simplify installation which can reduce cost.

Proposal # 4528

RB251-19

RB252-19

IRC: TABLE R703.15.1, TABLE R703.15.2, TABLE R703.16.1, TABLE R703.16.2

Proponent: Charles Clark Jr, representing Brick Industry Association (cclark@bia.org)

2018 International Residential Code

R703.15.1 Direct attachment. Where cladding is installed directly over foam sheathing without the use of furring, cladding minimum fastening requirements to support the cladding weight shall be as specified in Table R703.15.1.

Revise as follows:

TABLE R703.15.1

CLADDING MINIMUM FASTENING REQUIREMENTS FOR DIRECT ATTACHMENT OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING WEIGHT^a

CLADDING FASTENER THROUGH FOAM SHEATHING	CLADDING FASTENER TYPE AND MINIMUM SIZE ^b	CLADDING FASTENER VERTICAL SPACING (inches)	MAXIMUM THICKNESS OF FOAM SHEATHING ^c (inches)									
			16" o.c. Fastener Horizontal Spacing					24" o.c. Fastener Horizontal Spacing				
			Cladding Weight:					Cladding Weight:				
			3 psf	11 psf	15 psf	18 psf	25 psf	3 psf	11 psf	15 psf	18 psf	25 psf
Wood framing (minimum 1 ¹ / ₄ -inch penetration)	0.113" diameternail	6	2.00	1.45	<u>1.00</u>	0.75	DR	2.00	0.85	<u>0.55</u>	DR	DR
		8	2.00	1.00	<u>0.65</u>	DR	DR	2.00	0.55	<u>DR</u>	DR	DR
		12	2.00	0.55	<u>DR</u>	DR	DR	1.85	DR	<u>DR</u>	DR	DR
	0.120" diameternail	6	3.00	1.70	<u>1.15</u>	0.90	0.55	3.00	1.05	<u>0.65</u>	0.50	DR
		8	3.00	1.20	<u>0.80</u>	0.60	DR	3.00	0.70	<u>DR</u>	DR	DR
		12	3.00	0.70	<u>DR</u>	DR	DR	2.15	DR	<u>DR</u>	DR	DR
	0.131" diameternail	6	4.00	2.15	<u>1.50</u>	1.20	0.75	4.00	1.35	<u>0.90</u>	0.70	DR
		8	4.00	1.55	<u>1.05</u>	0.80	DR	4.00	0.90	<u>0.55</u>	DR	DR
		12	4.00	0.90	<u>0.55</u>	DR	DR	2.70	0.50	<u>DR</u>	DR	DR
	0.162" diameternail	6	4.00	3.55	<u>2.50</u>	2.05	1.40	4.00	2.25	<u>1.55</u>	1.25	0.80
		8	4.00	2.55	<u>1.80</u>	1.45	0.95	4.00	1.60	<u>1.10</u>	0.85	0.50
		12	4.00	1.60	<u>1.10</u>	0.85	0.50	4.00	0.95	<u>0.60</u>	DR	DR

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

DR = Design Required.

o.c. = On Center.

- a. Wood framing shall be Spruce-pine-fir or any wood species with a specific gravity of 0.42 or greater in accordance with AWC NDS.
- b. Nail fasteners shall comply with ASTM F1667, except nail length shall be permitted to exceed

ASTM F1667 standard lengths.

- c. Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with ASTM C578 or ASTM C1289.

R703.15.2 Furred cladding attachment. Where wood furring is used to attach cladding over foam sheathing, furring minimum fastening requirements to support the cladding weight shall be as specified in Table R703.15.2. Where placed horizontally, wood furring shall be preservative-treated wood in accordance with Section R317.1 or naturally durable wood and fasteners shall be corrosion resistant in accordance Section R317.3.

Revise as follows:

**TABLE R703.15.2
FURRING MINIMUM FASTENING REQUIREMENTS FOR APPLICATION OVER FOAM PLASTIC SHEATHING
TO SUPPORT CLADDING WEIGHT^{a, b}**

FURRING MATERIAL	FRAMING MEMBER	FASTENER TYPE AND MINIMUM SIZE	MINIMUM PENETRATION INTO WALL FRAMING (inches)	FASTENER SPACING IN FURRING (inches)	MAXIMUM THICKNESS OF FOAM SHEATHING ^d (inches)									
					16" o.c. Furring ^e				24" o.c. Furring ^e					
					Siding Weight:				Siding Weight:					
					3 psf	11 psf	15 psf	18 psf	25 psf	3 psf	11 psf	15 psf	18 psf	
Minimum 1x wood furring ^c	Minimum 2x woodstud	0.131" diameternail	1 1/4	8	4.00	2.45	<u>1.75</u>	1.45	0.95	4.00	1.60	<u>1.10</u>	0.85	
				12	4.00	1.60	<u>1.10</u>	0.85	DR	4.00	0.95	<u>0.55</u>	DR	
				16	4.00	1.10	<u>0.70</u>	DR	DR	3.05	0.60	<u>DR</u>	DR	
		0.162" diameternail	1 1/4	8	4.00	4.00	<u>3.05</u>	2.45	1.60	4.00	2.75	<u>1.85</u>	1.45	0
				12	4.00	2.75	<u>1.85</u>	1.45	0.85	4.00	1.65	<u>1.05</u>	0.75	I
				16	4.00	1.90	<u>1.25</u>	0.95	DR	4.00	1.05	<u>0.60</u>	DR	I
	No.10 woodscrew	1	12	4.00	2.30	<u>1.60</u>	1.20	0.70	4.00	1.40	<u>0.85</u>	0.60	I	
			16	4.00	1.65	<u>1.05</u>	0.75	DR	4.00	0.90	<u>DR</u>	DR	I	
			24	4.00	0.90	<u>DR</u>	DR	DR	2.85	DR	<u>DR</u>	DR	I	
	1/4" lag screw	1 1/2	12	4.00	2.65	<u>1.90</u>	1.50	0.90	4.00	1.65	<u>1.05</u>	0.80	I	
			16	4.00	1.95	<u>1.25</u>	0.95	0.50	4.00	1.10	<u>0.65</u>	DR	I	
			24	4.00	1.10	<u>0.65</u>	DR	DR	3.25	0.50	<u>DR</u>	DR	I	

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

DR = Design Required.

o.c. = On Center.

- Wood framing and furring shall be Spruce-pine-fir or any wood species with a specific gravity of 0.42 or greater in accordance with AWC NDS.
- Nail fasteners shall comply with ASTM F1667, except nail length shall be permitted to exceed ASTM F1667 standard lengths.
- Where the required cladding fastener penetration into wood material exceeds 3/4 inch and is not more than 1 1/2 inches, a minimum 2x wood furring or an approved design shall be used.
- Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with ASTM

C578 or ASTM C1289.

- e. Furring shall be spaced not more than 24 inches on center, in a vertical or horizontal orientation. In a vertical orientation, furring shall be located over wall studs and attached with the required fastener spacing. In a horizontal orientation, the indicated 8-inch and 12-inch fastener spacing in furring shall be achieved by use of two fasteners into studs at 16 inches and 24 inches on center, respectively.

R703.16.1 Direct attachment. Where cladding is installed directly over foam sheathing without the use of furring, cladding minimum fastening requirements to support the cladding weight shall be as specified in Table R703.16.1.

Revise as follows:

**TABLE R703.16.1
CLADDING MINIMUM FASTENING REQUIREMENTS FOR DIRECT ATTACHMENT OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING WEIGHT^a**

CLADDING FASTENER THROUGH FOAM SHEATHING INTO:	CLADDING FASTENER TYPE AND MINIMUM SIZE ^b	CLADDING FASTENER VERTICAL SPACING (inches)	MAXIMUM THICKNESS OF FOAM SHEATHING ^c (inches)									
			16" o.c. Fastener Horizontal Spacing					24" o.c. Fastener Horizontal Spacing				
			Cladding Weight:					Cladding Weight:				
			3 psf	11 psf	15 psf	18 psf	25 psf	3 psf	11 psf	15 psf	18 psf	25 psf
Steel framing (minimum penetration of steel thickness + 3 threads)	No. 8 screw into 33-mil steel or thicker	6	3.00	2.95	<u>2.50</u>	2.20	1.45	3.00	2.35	<u>1.75</u>	1.25	DR
		8	3.00	2.55	<u>2.00</u>	1.60	0.60	3.00	1.80	<u>0.90</u>	DR	DR
		12	3.00	1.80	<u>0.95</u>	DR	DR	3.00	0.65	<u>DR</u>	DR	DR
	No. 10 screw into 33 mil steel	6	4.00	3.50	<u>3.05</u>	2.70	1.95	4.00	2.90	<u>2.20</u>	1.70	0.55
		8	4.00	3.10	<u>2.50</u>	2.05	1.00	4.00	2.25	<u>1.35</u>	0.70	DR
		12	4.00	2.25	<u>1.35</u>	0.70	DR	3.70	1.05	<u>DR</u>	DR	DR
	No. 10 screw into 43-mil steel or thicker	6	4.00	4.00	<u>4.00</u>	4.00	3.60	4.00	4.00	<u>3.80</u>	3.45	2.70
		8	4.00	4.00	<u>4.00</u>	3.70	3.00	4.00	3.85	<u>3.25</u>	2.80	1.80
		12	4.00	3.85	<u>3.25</u>	2.80	1.80	4.00	3.05	<u>2.15</u>	1.50	DR

For SI: 1 inch = 25.4 mm, 1 mil = 0.0254 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

DR = Design Required.

o.c. = On Center.

- a. Steel framing shall be minimum 33 ksi steel for 33 mil and 43 mil steel, and 50 ksi steel for 54 mil steel or thicker.
- b. Screws shall comply with the requirements of ASTM C1513.
- c. Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with ASTM C578 or ASTM C1289.

R703.16.2 Furred cladding attachment. Where steel or wood furring is used to attach cladding over foam sheathing, furring minimum fastening requirements to support the cladding weight shall be as specified in Table R703.16.2. Where placed horizontally, wood furring shall be preservative-treated wood in accordance with Section R317.1 or naturally durable wood and fasteners shall be corrosion resistant in accordance with Section R317.3. Steel furring shall have a minimum G60 galvanized coating.

Revise as follows:

**TABLE R703.16.2
FURRING MINIMUM FASTENING REQUIREMENTS FOR APPLICATION OVER FOAM PLASTIC SHEATHING
TO SUPPORT CLADDING WEIGHT^a**

FURRING MATERIAL	FRAMING MEMBER	FASTENER TYPE AND MINIMUM SIZE ^b	MINIMUM PENETRATION INTO WALL FRAMING (inches)	FASTENER SPACING IN FURRING (inches)	MAXIMUM THICKNESS OF FOAM SHEATHING ^d (inches)								
					16" o.c. Furring ^e					24" o.c. Furring ^e			
					Cladding Weight:					Cladding Weight:			
					3 psf	11 psf	15 psf	18 psf	25 psf	3 psf	11 psf	15 psf	18 psf
Minimum 33-mil steel furring or minimum 1x wood furring ^c	33-mil steel stud	No. 8 screw	Steel thickness + 3threads	12	3.00	1.80	<u>0.95</u>	DR	DR	3.00	0.65	<u>DR</u>	DR
				16	3.00	1.00	<u>DR</u>	DR	DR	2.85	DR	<u>DR</u>	DR
				24	2.85	DR	<u>DR</u>	DR	DR	2.20	DR	<u>DR</u>	DR
		No. 10 screw	Steel thickness + 3threads	12	4.00	2.25	<u>1.35</u>	0.70	DR	3.70	1.05	<u>DR</u>	DR
				16	3.85	1.45	<u>DR</u>	DR	DR	3.40	DR	<u>DR</u>	DR
				24	3.40	DR	<u>DR</u>	DR	DR	2.70	DR	<u>DR</u>	DR
	43-mil or thicker steel stud	No. 8 Screw	Steel thickness + 3threads	12	3.00	1.80	<u>2.00</u>	DR	DR	3.00	0.65	<u>DR</u>	DR
				16	3.00	1.00	<u>1.30</u>	DR	DR	2.85	DR	<u>DR</u>	DR
				24	2.85	DR	<u>DR</u>	DR	DR	2.20	DR	<u>DR</u>	DR
		No. 10 screw	Steel thickness + 3threads	12	4.00	3.85	<u>3.25</u>	2.80	1.80	4.00	3.05	<u>2.15</u>	1.50
				16	4.00	3.30	<u>2.55</u>	1.95	0.60	4.00	2.25	<u>1.05</u>	DR
				24	4.00	2.25	<u>1.05</u>	DR	DR	4.00	0.65	<u>DR</u>	DR

For SI: 1 inch = 25.4 mm, 1 mil = 0.0254 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

DR = Design Required.

o.c. = On Center.

- Wood furring shall be Spruce-pine-fir or any softwood species with a specific gravity of 0.42 or greater. Steel furring shall be minimum 33-ksi steel. Steel studs shall be minimum 33-ksi steel for 33-mil and 43-mil thickness, and 50-ksi steel for 54-mil steel or thicker.
- Screws shall comply with the requirements of ASTM C1513.
- Where the required cladding fastener penetration into wood material exceeds 3/4 inch and is not more than 1 1/2 inches, a minimum 2-inch nominal wood furring or an approved design shall be used.
- Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with ASTM C578 or ASTM C1289.

- e. Furring shall be spaced not more than 24 inches (610 mm) on center, in a vertical or horizontal orientation. In a vertical orientation, furring shall be located over wall studs and attached with the required fastener spacing. In a horizontal orientation, the indicated 8-inch and 12-inch fastener spacing in furring shall be achieved by use of two fasteners into studs at 16 inches and 24 inches on center, respectively.

Reason: This code change proposal adds a 15 psf column option to the cladding over foam plastic sheathing tables. This is the weight usually associated with adhered masonry veneer applied using a traditional lath and scratch coat. The thicknesses in the proposed 15 psf columns were developed using the same analysis that was used for developing the original tables.

Cost Impact: The code change proposal will decrease the cost of construction. This code change proposal decreases the cost of hiring an engineer to determine the size and spacing of fasteners for a 15 psf cladding directly attached over foam sheathing.

Proposal # 5609

RB252-19

RB253-19

IRC®: TABLE R703.15.2

Proponent: Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council

2018 International Residential Code

Revise as follows:

TABLE R703.15.2
FURRING MINIMUM FASTENING REQUIREMENTS FOR APPLICATION OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING WEIGHT^{a, b}

FURRING MATERIAL	FRAMING MEMBER	FASTENER TYPE AND MINIMUM SIZE	MINIMUM PENETRATION INTO WALL FRAMING (inches) ^c	FASTENER SPACING IN FURRING (inches)	MAXIMUM THICKNESS OF SHEATHING			
					16" o.c. Furring			
					e _f			
					Siding Weight:			
					3 psf	11 psf	18 psf	25 psf
Minimum 1x wood furring ^{c,d}	Minimum 2x wood stud	0.131" diameter nail	1 1/4	8	4.00	2.45	1.45	0.95
				12	4.00	1.60	0.85	DR
				16	4.00	1.10	DR	DR
		0.162" diameter nail	1 1/4	8	4.00	4.00	2.45	1.60
				12	4.00	2.75	1.45	0.85
				16	4.00	1.90	0.95	DR
	No. 10 woodscrew	1	12	4.00	2.30	1.20	0.70	
			16	4.00	1.65	0.75	DR	
			24	4.00	0.90	DR	DR	
	1/4" lag screw	1 1/2	12	4.00	2.65	1.50	0.90	
			16	4.00	1.95	0.95	0.50	
			24	4.00	1.10	DR	DR	

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

DR = Design Required.

o.c. = On Center.

- a. Wood framing and furring shall be Spruce-pine-fir or any wood species with a specific gravity of 0.42 or greater in accordance with AWC NDS.
- b. Nail fasteners shall comply with ASTM F1667, except nail length shall be permitted to exceed ASTM F1667 standard lengths.
- c. Where wood structural panels complying with the specific gravity requirement of Note 'a' are

used, the fastener penetration depth into framing plus the thickness of the such panel shall be considered as satisfying the minimum penetration into framing.

- d. Where the required cladding fastener penetration into wood material exceeds $\frac{3}{4}$ inch and is not more than $1\frac{1}{2}$ inches, a minimum 2× wood furring or an approved design shall be used.
- e. Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with ASTM C578 or ASTM C1289.
- f. Furring shall be spaced not more than 24 inches on center, in a vertical or horizontal orientation. In a vertical orientation, furring shall be located over wall studs and attached with the required fastener spacing. In a horizontal orientation, the indicated 8-inch and 12-inch fastener spacing in furring shall be achieved by use of two fasteners into studs at 16 inches and 24 inches on center, respectively.

Reason: This footnote added to Table R703.15.2 is needed to allow for thickness of wood structural panels to count toward the required fastener penetration into framing.

Cost Impact: The code change proposal will decrease the cost of construction
The proposal will allow for slightly reduced fastener lengths while still satisfying minimum fastener penetration.

Proposal # 4529

RB253-19

RB254-19

IRC@: TABLE R703.16.1

Proponent: Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council

2018 International Residential Code

Revise as follows:

TABLE R703.16.1

CLADDING MINIMUM FASTENING REQUIREMENTS FOR DIRECT ATTACHMENT OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING WEIGHT^{a,b}

CLADDING FASTENER THROUGH FOAM SHEATHING INTO:	CLADDING FASTENER TYPE AND MINIMUM SIZE ^{b-c}	CLADDING FASTENER VERTICAL SPACING (inches)	MAXIMUM THICKNESS OF FOAM SHEATHING ^{e-d} (inches)							
			16" o.c. Fastener Horizontal Spacing				24" o.c. Fastener Horizontal Spacing			
			Cladding Weight:				Cladding Weight:			
			3 psf	11 psf	18 psf	25 psf	3 psf	11 psf	18 psf	25 psf
Steel framing (minimum penetration of steel thickness + 3 threads)	No. 8 screw into 33-mil steel or thicker	6	3.00	2.95	2.20	1.45	3.00	2.35	1.25	DR
		8	3.00	2.55	1.60	0.60	3.00	1.80	DR	DR
		12	3.00	1.80	DR	DR	3.00	0.65	DR	DR
	No. 10 screw into 33-mil steel	6	4.00	3.50	2.70	1.95	4.00	2.90	1.70	0.55
		8	4.00	3.10	2.05	1.00	4.00	2.25	0.70	DR
		12	4.00	2.25	0.70	DR	3.70	1.05	DR	DR
	No. 10 screw into 43-mil steel or thicker	6	4.00	4.00	4.00	3.60	4.00	4.00	3.45	2.70
		8	4.00	4.00	3.70	3.00	4.00	3.85	2.80	1.80
		12	4.00	3.85	2.80	1.80	4.00	3.05	1.50	DR

For SI: 1 inch = 25.4 mm, 1 mil = 0.0254 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

DR = Design Required.

o.c. = On Center.

a. Steel framing shall be minimum 33 ksi steel for 33 mil and 43 mil steel, and 50 ksi steel for 54 mil steel or thicker.

b. Where cladding is attached to wood structural panel sheathing only, fastening requirements shall be in accordance with Table R703.3.3.

~~b-~~ c. Screws shall comply with the requirements of ASTM C1513.

e. d. Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with ASTM C578 or ASTM C1289.

Reason: This footnote added to Table R703.16.1 is needed to coordinate with provisions in other parts of the code related to fastening through wood structural panels which addresses a very common “oversheathing” application of foam plastic insulating sheathing (continuous insulation).

Cost Impact: The code change proposal will decrease the cost of construction. The proposal will help reduce cost by referring to Table R703.3.3 which permits fastening directly to wood-structural panels of minimum required thickness to serve as a nail base. This will also simplify installation which can reduce cost.

Proposal # 4530

RB254-19

RB255-19

IRC@: R802.1.5

Proponent: Marcelo Hirschler, GBH International, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Revise as follows:

R802.1.5 Fire-retardant-treated wood. Fire-retardant-treated wood (FRTW) is any wood product that, when impregnated with chemicals by a pressure process or other means during manufacture, shall have, when tested in accordance with ASTM E84 or UL 723, a listed flame spread index of 25 or less ~~and does not show evidence of significant progressive combustion where the test is~~ .In addition, the ASTM E84 or UL 723 test shall be continued for an additional 20-minutes ~~.In addition,~~ and the flame front shall not progress more than 10.5 feet (3200 mm) beyond the center line of the burners at any time during the extended 30-minute test.

Reason: This proposal addresses the incorrect double requirement for testing to both flame front progress and no significant progressive combustion in the extended ASTM E84 test.

This issue has been under discussion for many years at the ICC codes, as well as at ASTM and at NFPA, but can now be resolved in the IRC code. The ASTM E5 committee, responsible for ASTM E84, has now, for the first time, accepted incorporating requirements for conducting a 30 minute test. Until this change ASTM E84 did not contain any information other than that it is a 10 minute test. Consequently, until this change ASTM E84 did not provide any details on how to assess either "no evidence of significant progressive combustion" or "the flame front shall not progress more than 10 1/2 feet (3200 mm) beyond the centerline of the burners". The information for how to determine both of those characteristics is contained in ASTM E2768. The committee agreed that the next edition of ASTM E84 will state that a 30 minute test is to be conducted per ASTM E2768. In turn, ASTM E2768 explains that "no significant progressive combustion" is evidenced by lack of flame front progress beyond 10 1/2 feet. In fact ASTM E2768 states: "The flame front shall not progress more than 10.5 ft (3.2 m) beyond the centerline of the burners at any time during the 30 min test period. This is considered evidence of no significant progressive combustion in this test method." This IBC proposal incorporates the requirements from the ASTM E84 test into the IBC and ensures that the code does not require a duplicate (and confusing) measurement.

It is likely that information will be presented stating that "no significant progressive combustion" has been in the code since the legacy codes and that the flame front progress requirement was added later. That is exactly the reason that ASTM E2768 was developed to ensure that everyone understands what is to be measured, and that is what the testing laboratories have been doing for many years now.

This change appears to alter requirements but in fact simply recognizes what the ASTM E84 standard states and what the labs are doing (and have been doing for years) and, therefore, is really clarification.

The ASTM E05 committee agreed on actions at the December 2018 meeting so that the language in ASTM E84 reads:

1. Scope

1.1 This fire-test-response standard for the comparative surface burning behavior of building materials is applicable to exposed surfaces such as walls and ceilings. The test is conducted with the specimen in the ceiling position with the surface to be evaluated exposed face down to the ignition source. The material, product, or assembly shall be capable of being mounted in the test position during the test. Thus, the specimen shall either be self-supporting by its own structural quality, held in place by added supports along the test surface, or

secured from the back side.

1.2 Test Method E84 is a 10-minute fire-test response method. The following standards address testing of materials in accordance with test methods that are applications or variations of the test method or apparatus used for Test Method E84:

1.2.1 Materials required by the user to meet an extended 30-min duration tunnel test shall be tested per Test Method E2768.

1.2.2 Wires and cables for use in air-handling spaces shall be tested per NFPA 262.

1.2.3 Pneumatic tubing for control systems shall be tested per UL 1820.

1.2.4 Combustible sprinkler piping shall be tested per UL 1887.

1.2.5 Optical fiber and communications raceways for use in air handling spaces shall be tested per UL 2024.

1.3 The purpose of this test method is to determine the relative burning behavior of the material by observing the flame spread along the specimen. Flame spread and smoke developed index are reported. However, there is not necessarily a relationship between these two measurements.

1.4 The use of supporting materials on the underside of the test specimen has the ability to lower the flame spread index from those which might be obtained if the specimen could be tested without such support. These test results do not necessarily relate to indices obtained by testing materials without such support.

1.5 Testing of materials that melt, drip, or delaminate to such a degree that the continuity of the flame front is destroyed, results in low flame spread indices that do not relate directly to indices obtained by testing materials that remain in place.

1.6 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.7 The text of this standard references notes and footnotes that provide explanatory information. These notes and footnotes, excluding those in tables and figures, shall not be considered as requirements of the standard.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This simply recognizes what the fire test labs have been doing for many years. When they conduct the "extended ASTM E84 test" they assess two criteria: a flame spread index of 25 and a flame front that does not progress more than 10.5 ft (3.2 m) beyond the centerline of the burners.

Proposal # 5094

RB255-19

RB256-19

IRC@: R802.1.5.2

Proponent: Marcelo Hirschler, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Revise as follows:

R802.1.5.2 Other means during manufacture. For wood products ~~produced~~ impregnated with chemicals by other means during manufacture, the treatment shall be an integral part of the manufacturing process of the wood product. The treatment shall provide permanent protection to all surfaces of the wood product. The use of paints, coatings, stains or other surface treatments is not an approved method of protection as required in this section.

Reason: This proposal corrects the language of the section by making it identical to the language of the corresponding section of the IBC. The proposal makes two changes:

1. It incorporates the words "impregnated with chemicals" into the first sentence, which makes it consistent with the code section above that says that the pressure treatment process must provide impregnation with chemicals.
2. It adds a sentence pointing out that coatings are not permitted as a way of generating fire retardant treated wood.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is clarification, consistent with the IBC and with the section above.

Proposal # 5096

RB256-19

RB257-19

IRC@: R802.1.5.2

Proponent: Manny Muniz, representing Representing self (Mannymuniz.mm@gmail.com)

2018 International Residential Code

Revise as follows:

R802.1.5.2 Other means during manufacture. For wood products ~~produced~~ impregnated with chemicals by other means during manufacture, the treatment shall be an integral part of the manufacturing process of the wood product. The treatment shall provide permanent protection to all surfaces of the wood product. The use of paints, coating, stains or other surface treatments is not an approved method of protection as required by this section.

Reason: The proposed code language has already been approved in the IBC and appears in the 2018 International Building Code, Section 2303.2.2. Clarification is made that regardless of the other means used during manufacture, fire-retardant-treated wood must be impregnated with chemicals per the definition of fire-retardant-treated wood in Chapter 2. During the IBC committee hearings, the State Fire Marshal of California, a committee member, identified this code change as being a necessary clarification as California had experienced numerous problems with coated wood products pretending to be fire-retardant-treated wood. The language in the last sentence was derived from the California codes.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code change proposal will not increase or decrease the cost of construction.

Proposal # 5590

RB257-19

RB258-19

IRC: R802.1.5.3, 802.1.5.3.1 (New)

Proponent: Marcelo Hirschler, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Revise as follows:

R802.1.5.3 Testing. ~~For wood products produced by other means during manufacture, other than a pressure process, all sides fire retardant treated wood products the front and back faces of the wood product shall be tested in accordance with and produce the results required in Section R802.1.5. Testing of only the front and back faces of wood structural panels shall be permitted.~~

Add new text as follows:

R802.1.5.3.1 Fire testing of wood structural panels. Wood structural panels shall be tested with a ripped or cut longitudinal gap of 1/8 inch (3.2 mm).

Reason: Note that the sections above require that fire retardant treated wood be "impregnated with chemicals" and provide permanent protection. That requirement applies to all FRTW products, whether produced by a pressure process or produced by other means during manufacture. IBC Section 2303.2.2 (and the proposed revision to R802.1.5.2, for consistency) is also explicit in stating that the use of paints or coatings is not an approved method to comply with this section. This proposal thus eliminates the requirement to test a particular type of fire retardant treated wood on "all sides", since the testing is never actually conducted on all sides (as pointed out often by multiple testifiers in previous code cycles) because all sides really means front and back (you literally cannot test the edges in the ASTM E84 other than by putting multiple edge pieces into the tunnel to make up the 24 feet by 2 feet specimen). In order to test "all sides" of a lumber product it would be necessary to fasten 864 small pieces together to make one specimen, which is not realistic.

The proposed new subsection will add fire safety because it recognizes an issue that was highlighted in the previous code cycle, and was also brought up in committee ASTM E05 and at the IWUIC: wood structural panels are typically installed in the field following industry practice. Industry recommendations for wood structural panels require a gap to accommodate dimensional changes caused by swelling due to changing moisture conditions. Therefore, installation in the field requires cutting and ripping of the panels and this results in the creation of "non-factory edges". Therefore, it is important to test wood structural panels with a rip or gap to ensure that the required fire test results from the charging paragraph are achieved when the interior of the panel is exposed.

Note that the IWUIC requires such a rip or gap for ignition resistant structural panels, and it sends FRTW products to IBC section 2303.2, which is equivalent to section R802.1.5.

Cost Impact: The code change proposal will increase the cost of construction

This proposal will add fire safety and will require more testing for wood structural panels. The proposal will also require more testing for other FRTW products manufactured by a pressure process but apparently less testing for FRTW products that are manufactured by other means, except that typically just the front and back faces are tested anyway.

Proposal # 4823

RB258-19

RB259-19

IRC®: R801.2, ASSE Chapter 44 (New)

Proponent: nella davis-ray, Michigan Department of Licensing and Regulatory Affairs, MIOASHA, representing MIOASHA (davis-rayn@michigan.gov)

2018 International Residential Code

Revise as follows:

R801.2 Requirements. Roof and ceiling construction shall be capable of accommodating all loads imposed in accordance with Section R301 and of transmitting the resulting loads to the supporting structural elements. Permanent anchorage connectors shall be installed to fixed structural members to provide a secure connecting point for personal fall arrest systems. The anchorage connecting devices shall comply with ANSI/ASSE Z359.1.

Add new text as follows:

ASSE

ASSE International
18927 Hickory Creek Drive, Suite
220
Mokena IL 60448

ANSI/ASSE Z359.1—2016: Requirements for the ANSI/ASSE Z359 Fall Protection Code

Reason: Falls are the leading cause of death in the construction industry. Falls from roofs account for a third of the fall deaths. Contractors are required to use fall protection by OSHA. 1926.502 - Fall Protection, addresses minimum requirements and criteria for fall protection at construction workplaces. Personal fall arrest systems (PFAs) require a secure point of attachment, anchorage and components for coupling PFAs to anchorage, anchorage connectors. A significant challenge contractors report is finding or creating suitable anchoring for PFAs. A logical time to install anchorage connectors is during the construction process. OSHA cannot mandate permanent anchorage connectors for PFAs fabricated or designed into fixed structural members although we know the protective and functional anchoring role they play.

A variety of permanent anchorage connectors are commercially available. ANSI/ASSE Z359 establishes safety requirements for personal fall arrest systems, subsystems and components. Verification that permanent anchorage connectors are installed in accordance with applicable requirements of ANSI/ASSE Z359.1 will be an additional element of a building plan review.

Requiring permanent anchorage connectors has many advantages:

a. Level playing field: Currently, installing and removing temporary anchor points costs the “safe” contractors time and money. If the building code required the installation permanent anchorage connectors it would help ensure compliance with fall protection requirements.

b. Benefits to the building owner. The building owners becomes the beneficiary of a safer building which is a primary goal of construction codes. Permanent anchorage connections can be used for building maintenance such as cleaning windows, cleaning gutters, minor repairs, hanging holiday lights, etc. These anchor points would be available for maintenance/repair contractors eliminating the need for these contractors to make new penetrations in the roof.

c. Reduced labor costs: The labor cost of installing and removing temporary anchors is eliminated, helping offset the cost of the permanent anchors.

d. Efficiencies in construction: For other contractors working at the site, the work and costs of installing temporary anchor points is removed. This added efficiency would likely help offset the cost of the permanent anchorage connectors.

e. Workers Comp Reductions: Workers compensation costs for the building industry is very high. Availability of anchor points, and their use, may lead to lower premium costs for many businesses.

f. General Liability: Reduced likelihood of accidents by contractors, and due diligence for providing safety, reduces property and personal injury risk thus reducing the contractor and building owner liability.

g. Aligning requirements: Aligning building code requirements with national safety requirements helps contractors more clearly understand what is required and how it all fits together.

h. Increased use of fall protection: If the anchorage connectors are there, people are more likely to use them. Creating buildings and job sites with less risk, less citations, and more cost savings.

Cost Impact: The code change proposal will increase the cost of construction. The increased advantage of having anchorage will encourage use of fall protection which will lower fall accidents and fatalities. In turn, increased safety may lower worker compensation costs.

Staff Analysis: The referenced standard, ANSI/ASSE Z359.1—2016, is currently referenced in other 2018 I-codes.

Proposal # 4867

RB259-19

RB260-19

IRC: R802.4.2, R802.4.6, TABLE R602.3(1)

Proponent: Robert Rice C.B.O., Northwest Code Professionals, representing Southern Oregon Chapter-ICC (RobertR@nwcodepros.com)

2018 International Residential Code

Revise as follows:

R802.4.2 Framing details. Rafters shall be framed ~~opposite from each other to a ridge board, shall not be offset~~ more than 1 1/2 inches (38 mm) ~~offset from each other to a ridge board or directly opposite from each other and shall be connected with a collar tie, gusset plate or ridge strap in accordance with Section R802.4.6 or a gusset plate~~ in accordance with Table R602.3(1). Rafters shall be nailed to the top wall plates in accordance with Table R602.3(1) unless the roof assembly is required to comply with the uplift requirements of Section R802.11.

R802.4.6 Collar ties. Where collar ties are used to connect opposing rafters, they shall be located in the upper third of the *attic* space and fastened in accordance with Table R602.3(1). Collar ties shall be not less than 1 inch by 4 inches (25 mm x 102 mm) nominal, spaced not more than 4 feet (1220 mm) on center. Ridge straps ~~in accordance with Table R602.3(1)~~ shall be permitted to replace collar ties. Ridge straps shall be not less than 1 1/4 inch (32 mm) x 20 gage and shall extend a minimum of 12 inches (305 mm) onto rafters and shall be nailed in accordance with manufacturers installation instructions.

**TABLE R602.3(1)
FASTENING SCHEDULE**

Portions of table not shown remain unchanged.

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a, b, c}	SPACING AND LOCATION
Roof			
5	Collar tie to rafter, face nail or 1 1/4" x 20-ga. ridge strap to rafter	4-10d box (3" x 0.128"); or 3-10d common (3" x 0.148"); or 4-3" x 0.131" nails	Face nail each rafter

Reason: Prior to the 2012 code, this section (R802.3.1 in the previous code) simply called out a "ridge strap" with no further information. It was not known to most code users that Table R602.3(1) showed a "1 1/4" x 20 ga ridge strap". A proposal was submitted and approved to modify this section to include "...in accordance with Table R602.3(1)." and Figure R802.4.5 was also revised to call out the ridge strap which tied those sections together.

However, upon further examination, I realized that the ridge strap noted in the Table only defines the width and gauge of the strap. It does not specify the length that the strap has to extend onto the rafter or the nailing requirements for the strap. It also does not specify the spacing requirements for the straps. Without this information, the strap reference is incomplete and, effectively, impossible to accomplish.

This proposal is to address the missing information. Rather than adding the information to the strap noted in the table, it would be much more clear to add the information to the text of Sections R802.4.2 and R802.4.6 as shown in this proposal.

The requirement for a minimum of 12 inches onto each rafter is based on typical manufactured straps.

The spacing requirement is consistent with the collar tie requirement of 48 inches on center.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal clarifies an existing provision for ridge straps to replace collar ties and does not add or remove any code requirements. The use of ridge straps is and remains an option. Therefore, there is no cost impact.

Proposal # 4090

RB260-19

RB261-19

IRC: R802.5.2, TABLE R802.5.2, R802.5.2.1, R802.5.2.2, R802.5.2.3

Proponent: Randy Shackelford, P.E., Simpson Strong-Tie Co., representing Simpson Strong-Tie Co. (rshackelford@strongtie.com)

2018 International Residential Code

Add new text as follows:

R802.5.2 Ceiling joist and rafter connections. Ceiling joists, rafter ties and ridge beams shall be in accordance with Sections R802.5.2.1 and R802.5.2.2.

Revise as follows:

R802.5.2 R802.5.2.1 Ceiling joist and rafter connections: joists parallel to rafters. Where ceiling joists run parallel to rafters and are located at the top wall plate, they shall be connected to rafters at and the top wall plate in accordance with Table ~~R802.5.2~~ R802.5.2.1. Where ceiling joists are not connected to the rafters at the top wall plate, they shall be installed in the bottom third of the rafter height in accordance with Figure R802.4.5 and Table ~~R802.5.2~~ R802.5.2.1. Where the ceiling joists are installed above the bottom third of the rafter height, the ridge shall be supported by a wall or ridge beam designed in accordance with accepted engineering practice as a beam. ~~Where ceiling joists do not run parallel to rafters, the ceiling joists shall be connected to top plates in accordance with Table R602.3(1). Each rafter shall be tied across the structure with a rafter tie or a 2-inch by 4-inch (51 mm × 102 mm) kicker connected to the ceiling diaphragm with nails equivalent in capacity to Table R802.5.2.~~

**TABLE R802.5.2 R802.5.2.1
RAFTER/CEILING JOIST HEEL JOINT CONNECTIONS^{a, b, c, d, e, g}**

Portions of table not shown remain unchanged.

RAFTER SLOPE	RAFTER SPACING (inches)	GROUND SNOW LOAD (psf)															
		20 ^f				30				50				70			
		Roof span (feet)															
		12	20	28	36	12	20	28	36	12	20	28	36	12	20	28	36
Required number of 16d common nails ^{a, b} per heel joint splices ^{c, d, e}																	

Add new text as follows:

R802.5.2.2 Ceiling joists not parallel to rafters or not provided. Where ceiling joists do not run parallel to rafters, the ceiling joists shall be connected to top plates in accordance with Table R602.3(1). Each rafter shall be tied across the structure with a rafter tie not less than 2 inches by 4 inches (51 mm × 102 mm) fastened to rafters in accordance with Table R802.2.5.1 and with joints in accordance with Section R802.5.3. Where ceiling joists or rafter ties are not provided, the ridge shall be supported by a wall or ridge beam designed in accordance with accepted engineering practice.

Revise as follows:

R802.5.2.1 R802.5.3 Ceiling joists lapped. Ends of ceiling joists shall be lapped not less than 3 inches (76 mm) or butted over bearing partitions or beams and toenailed to the bearing member. Where ceiling joists are used to provide resistance to rafter thrust, lapped joists shall be nailed together in accordance with Table

R802.5.2 and butted joists shall be tied together ~~with a connection of equivalent capacity~~ in a manner to resist such thrust. Joists that do not resist thrust shall be permitted to be nailed in accordance with Table R602.3(1). ~~Wood structural panel roof sheathing, in accordance with Table R503.2.1.1(1), shall not cantilever more than 9 inches (229 mm) beyond the gable endwall unless supported by gable overhang framing.~~

Delete without substitution:

~~**R802.5.2.2 Rafter ties.** Wood rafter ties shall be not less than 2 inches by 4 inches (51 mm × 102 mm) installed in accordance with Table R802.5.2 at each rafter. Other approved rafter tie methods shall be permitted.~~

Revise as follows:

~~**R802.5.2.3 R802.5.4 Blocking-Lumber.** Blocking-Lumber used to transfer loads shall be not less than utility grade lumber.~~

Reason: The purpose of this code change is to clarify the requirements for connections of rafters and ceiling joists. This section is the most important section in establishing the concept of the continuous tie across the lower portion of the rafters, using either ceiling joists or rafter ties, which will prevent the rafters from sliding off the walls or pushing the walls out when the rafters are loaded, which is referred to as rafter thrust. The concept is that the ceiling joists have to be installed in the lower portion of the attic, and fastened in a specific manner as required in Table R802.5.2. However, sometimes the ceiling joists are installed higher in the attic where they are ineffective as a tie, sometimes the ceiling joists are installed perpendicular to the rafters, and sometimes there may not be any ceiling joists at all, such as in a cathedral ceiling.

So the first revision is to break out these possibilities into two separate sections to clarify what needs to happen in each case to ensure the rafters do not slide off the walls or push them outward.

In each case, either a tie can be provided, or a "wall or ridge beam designed in accordance with accepted engineering practice" can be provided. This language is close to what was required in this section prior to the 2018 edition.

In new R802.5.2.2, the requirements for rafter ties are moved back into this section, and the description of the rafter tie is provided. Since it is in this section now, the subsequent section on Rafter Ties can be deleted. The language about the kicker connected to the ceiling diaphragm is deleted because I don't know what a kicker really is in regard to ceiling joists, and because a prescriptive requirement is not provided. Any alternate method could be accepted if proven equivalent.

In new R802.5.3, Ceiling Joists Lapped, the last sentence talking about wood structural panel roof sheathing is deleted because this is out of place. The exact same wording is repeated in Section R803.2.3, which is the appropriate location.

In the last section, the term "blocking" was replaced by "lumber". It does not appear that the term "blocking" is used anywhere in this section, but it is possible that scraps of wood could be used to transfer tension loads across butt joints in ceiling joists or rafter ties, so it is proposed to be left in this way.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. There is no intent to cause any change in requirements, just a clarification.

Proposal # 5688

RB261-19

RB262-19

IRC®: TABLE R802.5.2

Proponent: Dennis Richardson, American Wood Council, representing American Wood Council (drichardson@awc.org)

2018 International Residential Code

Delete and substitute as follows:

TABLE R802.5.2
RAFTER/CEILING JOIST HEEL JOINT CONNECTIONS^{a, b, c, d, e, g}

RAFTER SLOPE	RAFTER SPACING (inches)	GROUND SNOW LOAD (psf)															
		20 ^f				30				50				70			
		Roof span (feet)															
		12	20	28	36	12	20	28	36	12	20	28	36	12	20	28	36
Required number of 16d common nails ^{a, b} per heel joint splices ^{c, d, e}																	
3:12	12	4	6	8	10	4	6	8	11	5	8	12	15	6	11	15	20
	16	5	8	10	13	5	8	11	14	6	11	15	20	8	14	20	26
	24	7	11	15	19	7	11	16	21	9	16	23	30	12	21	30	39
4:12	12	3	5	6	8	3	5	6	8	4	6	9	11	5	8	12	15
	16	4	6	8	10	4	6	8	11	5	8	12	15	6	11	15	20
	24	5	8	12	15	5	9	12	16	7	12	17	22	9	16	23	29
5:12	12	3	4	5	6	3	4	5	7	3	5	7	9	4	7	9	12
	16	3	5	6	8	3	5	7	9	4	7	9	12	5	9	12	16
	24	4	7	9	12	4	7	10	13	6	10	14	18	7	13	18	23
7:12	12	3	4	4	5	3	3	4	5	3	4	5	7	3	5	7	9
	16	3	4	5	6	3	4	5	6	3	5	7	9	4	6	9	11
	24	3	5	7	9	3	5	7	9	4	7	10	13	5	9	13	17
9:12	12	3	3	4	4	3	3	3	4	3	3	4	5	3	4	5	7
	16	3	4	4	5	3	3	4	5	3	4	5	7	3	5	7	9
	24	3	4	6	7	3	4	6	7	3	6	8	10	4	7	10	13
12:12	12	3	3	3	3	3	3	3	3	3	3	3	4	3	3	4	5
	16	3	3	4	4	3	3	3	4	3	3	4	5	3	4	5	7
	24	3	4	4	5	3	3	4	6	3	4	6	8	3	6	8	10

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

- a. 40d box nails shall be permitted to be substituted for 16d common nails.
- b. Nailing requirements shall be permitted to be reduced 25 percent if nails are clinched.
- c. Heel joint connections are not required where the ridge is supported by a load-bearing wall, header or ridge beam.
- d. Where intermediate support of the rafter is provided by vertical struts or purlins to a load-bearing

wall, the tabulated heel joint connection requirements shall be permitted to be reduced proportionally to the reduction in span.

- e. Equivalent nailing patterns are required for ceiling joist to ceiling joist lap splices.
- f. Applies to roof live load of 20 psf or less.
- g. Tabulated heel joint connection requirements assume that ceiling joists or rafter ties are located at the bottom of the attic space. Where ceiling joists or rafter ties are located higher in the attic, heel joint connection requirements shall be increased by the following factors:

H_C/H_R	Heel Joint Connection Adjustment Factor
1/3	1.5
1/4	1.33
1/5	1.25
1/6	1.2
1/10 or less	1.11

where:

H_C = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls.

H_R = Height of roof ridge measured vertically above the top of the rafter support walls.

**TABLE R802.5.2
RAFTER/CEILING JOIST HEEL JOINT CONNECTIONS ^g**

SLOPE	RAFTER SPACING (inches)	GROUND SNOW LOAD (psf)											
		20 ^e			30			50			70		
		Roof span (feet)											
		12	24	36	12	24	36	12	24	36	12	24	36
Required number of 16d common nails per heel joint splice ^{a,b,c,d,f}													
3:12	12	3	5	8	3	6	9	5	9	13	6	12	17
	16	4	7	10	4	8	12	6	12	17	8	15	23
	19.2	4	8	12	5	10	14	7	14	21	9	18	27
	24	5	10	15	6	12	18	9	17	26	12	23	34
4:12	12	3	4	6	3	5	7	4	7	10	5	9	13
	16	3	5	8	3	6	9	5	9	13	6	12	17
	19.2	3	6	9	4	7	11	6	11	16	7	14	21
	24	4	8	11	5	9	13	7	13	19	9	17	26
5:12	12	3	3	5	3	4	6	3	6	8	4	7	11
	16	3	4	6	3	5	7	4	7	11	5	9	14
	19.2	3	5	7	3	6	9	5	9	13	6	11	17
	24	3	6	9	4	7	11	6	11	16	7	14	21
7:12	12	3	3	4	3	3	4	3	4	6	3	5	8
	16	3	3	5	3	4	5	3	5	8	4	7	10

	<u>19.2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>3</u>	<u>4</u>	<u>6</u>	<u>3</u>	<u>6</u>	<u>9</u>	<u>4</u>	<u>8</u>	<u>12</u>
	<u>24</u>	<u>3</u>	<u>5</u>	<u>7</u>	<u>3</u>	<u>5</u>	<u>8</u>	<u>4</u>	<u>8</u>	<u>11</u>	<u>5</u>	<u>10</u>	<u>15</u>
<u>9:12</u>	<u>12</u>	<u>3</u>	<u>5</u>	<u>3</u>	<u>4</u>	<u>6</u>							
	<u>16</u>	<u>3</u>	<u>3</u>	<u>4</u>	<u>3</u>	<u>3</u>	<u>4</u>	<u>3</u>	<u>4</u>	<u>6</u>	<u>3</u>	<u>5</u>	<u>8</u>
	<u>19.2</u>	<u>3</u>	<u>3</u>	<u>4</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>3</u>	<u>5</u>	<u>7</u>	<u>3</u>	<u>6</u>	<u>9</u>
	<u>24</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>3</u>	<u>4</u>	<u>6</u>	<u>3</u>	<u>6</u>	<u>9</u>	<u>4</u>	<u>8</u>	<u>12</u>
<u>12:12</u>	<u>12</u>	<u>3</u>	<u>4</u>	<u>3</u>	<u>3</u>	<u>5</u>							
	<u>16</u>	<u>3</u>	<u>5</u>	<u>3</u>	<u>4</u>	<u>6</u>							
	<u>19.2</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>4</u>	<u>3</u>	<u>4</u>	<u>6</u>	<u>3</u>	<u>5</u>	<u>7</u>
	<u>24</u>	<u>3</u>	<u>3</u>	<u>4</u>	<u>3</u>	<u>3</u>	<u>5</u>	<u>3</u>	<u>5</u>	<u>7</u>	<u>3</u>	<u>6</u>	<u>9</u>

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

a. 10d common (3" x 0.148") nails shall be permitted to be substituted for 16d common (3-1/2"x 0.162") nails where the required number of nails is taken as 1.2 times the required number of 16d common nails.

b. Heel joint connections are not required where the ridge is supported by a load-bearing wall, header or ridge beam.

c. Where intermediate support of the rafter is provided by vertical struts or purlins to a load-bearing wall, the tabulated heel joint connection requirements shall be permitted to be reduced proportionally to the reduction in span.

d. Equivalent nailing patterns are required for ceiling joist to ceiling joist lap splices.

e. Applies to roof live load of 20 psf or less.

f. Tabulated heel joint connection requirements assume that ceiling joists or rafter ties are located at the bottom of the attic space. Where ceiling joists or rafter ties are located higher in the attic, heel joint connection requirements shall be increased by the following factors:

H_C/H_R	Heel Joint Connection Adjustment Factor
1/3	1.5
1/4	1.33
1/5	1.25
1/6	1.2
1/10 or less	1.11

where:

H_C = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls.

H_R = Height of roof ridge measured vertically above the top of the rafter support walls.

g. Tabulated requirements are based on 10 psf roof dead load in combination with the specified roof snow load

and roof live load.

Reason: Replace Table R802.5.2 to be consistent with calculation basis of 2018 Wood Frame Construction Manual (WFCM) heel joint nailing requirements based on the 2018 National Design Specification for Wood Construction (NDS) provisions for nailed connections. The reduced number of 16d common nails required in rafter tie connections, by approximately 15%, are due to changes in penetration factor and load duration assumptions from those used to develop the existing table. The existing table used a 0.77 penetration factor (based on 1991 and 1997 NDS) for 16d common nails with less than 12d penetration in the main member and a load duration factor of 1.25 for all tabulated cells. The proposed revised nailing requirements are based on use of a 1.15 load duration factor for snow cases, 1.25 load duration factor for roof live load cases, and an effective penetration factor equal to 1.0 per 2001 NDS and later editions when nail lateral value calculations are based on the actual penetration in the wood member. The ratio of nail design values for snow cases originally used to develop nailing requirements to the current nail design values for snow cases is $(Z \times 0.77 \times 1.25) / (Z \times 1.0 \times 1.15) = 0.84$ and explains the reduced number of nails required by this proposal. Due to revised nail design provisions in the NDS, the benefit of a longer nail that is clinched is no longer recognized for this application and existing footnote b is removed. A 10d common nail option is added in new footnote "a." based on NDS lateral nail calculations. The table heading clarifies the 10psf dead load basis of the tabulated nailing requirements.

Bibliography: 1) 2018 Wood Frame Construction Manual (WFCM) for One- and Two-Family Dwellings. American Wood Council, Leesburg, VA. 2018. <https://awc.org/pdf/codes-standards/publications/wfcm/AWC-WFCM2018-ViewOnly-1711.pdf>
2) 2018 National Design Specification (NDS) for Wood Construction. American Wood Council, Leesburg, VA. 2018. <https://awc.org/pdf/codes-standards/publications/nds/AWC-NDS2018-ViewOnly-171117.pdf>

Cost Impact: The code change proposal will decrease the cost of construction
This code change utilizes fewer nails from the WFCM at less cost.

Proposal # 4258

RB262-19

RB263-19

IRC@: R802.5.2.1

Proponent: Randy Shackelford, Simpson Strong-Tie Co., representing Simpson Strong-Tie Co.
(rshackelford@strongtie.com)

2018 International Residential Code

Revise as follows:

R802.5.2.1 Ceiling joists lapped. Ends of ceiling joists shall be lapped not less than 3 inches (76 mm) or butted over bearing partitions or beams and toenailed to the bearing member. Where ceiling joists are used to provide resistance to rafter thrust, lapped joists shall be nailed together in accordance with Table R802.5.2 and butted joists shall be tied together in a manner to resist such thrust. Joists that do not resist thrust shall be permitted to be nailed in accordance with Table R602.3(1). ~~Wood structural panel roof sheathing, in accordance with Table R503.2.1.1(1), shall not cantilever more than 9 inches (229 mm) beyond the gable endwall unless supported by gable overhang framing.~~

Reason: This wording does not appear to belong here. This section deals with lapping of ceiling joists to provide a continuous tie across the building. The exact same text on roof sheathing cantilever over gable end walls is contained in Section R803.2.3.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is just deleting an unrelated and duplicate code requirement so no cost impact

Proposal # 5195

RB263-19

RB264-19

IRC@: R802.6

Proponent: Randy Shackelford, Simpson Strong-Tie Co., representing Simpson Strong-Tie Co.
(rshackelford@strongtie.com)

2018 International Residential Code

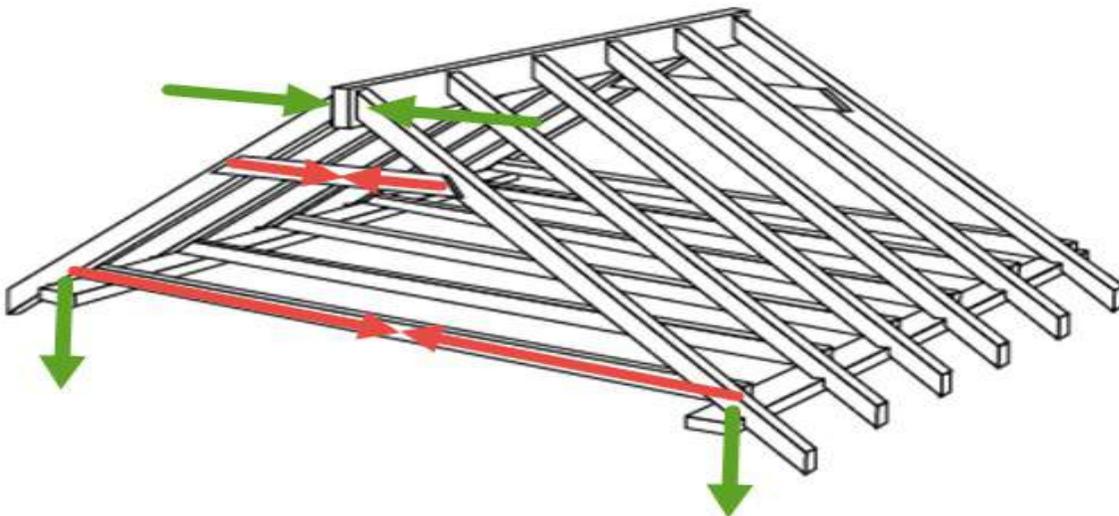
Revise as follows:

R802.6 Bearing. The ends of each rafter or ceiling joist shall have not less than 1½ inches (38 mm) of bearing on wood or metal and not less than 3 inches (76 mm) on masonry or concrete. The bearing on masonry or concrete shall be direct, or a sill plate of 2-inch (51 mm) minimum nominal thickness shall be provided under the rafter or ceiling joist. The sill plate shall provide a minimum nominal bearing area of 48 square inches (30 865 mm²). Where the roof pitch is greater than or equal to 3:12 (25% slope), and ceiling joists or rafter ties are connected to rafters to provide a continuous tension tie in accordance with Section R802.5.2, vertical bearing of the top of the rafter against the ridge board shall satisfy this bearing requirement.

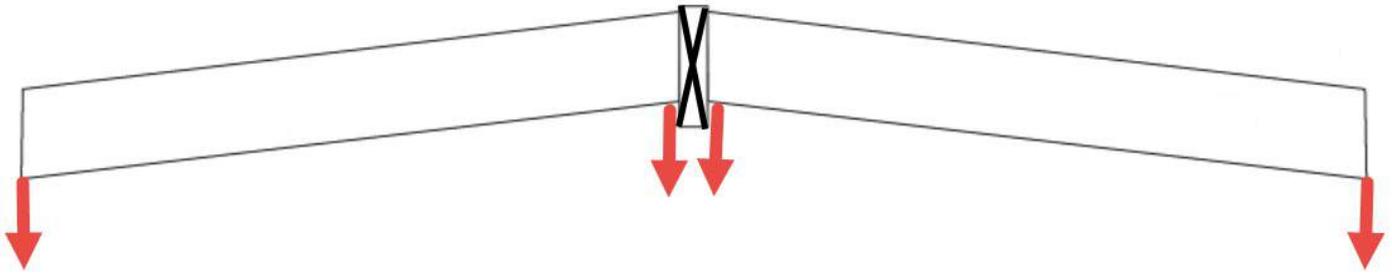
Reason: The reason for this code change is to clarify what types of bearing are acceptable for rafters, specifically at the top ends of rafters.

Section R802.6 requires that "The ends of each rafter or ceiling joist shall have not less than 1-1/2 inches of bearing on wood or metal.....".

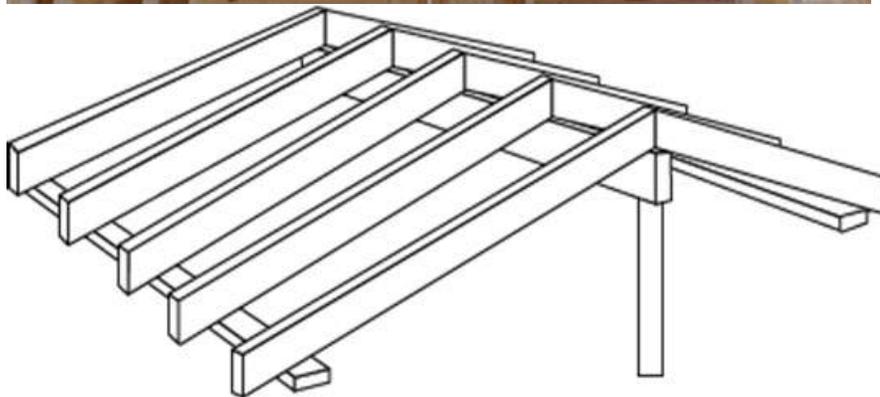
Bearing is typically thought of as bearing on a horizontal surface, such as a top plate, beam, or hanger for resisting vertical loads. However, for a rafter system that has the continuous tension tie at the bottom provided by ceiling joists or rafter ties, and collar ties at the top, it is considered that the downward force is all transferred to the lower ends of the rafters, and the force at the top is a horizontal force toward the ridge board, bearing on it. So horizontal bearing here is fine.



On the other hand, when the roof slope gets shallow, a structural ridge beam is required to be provided. (See Section R802.4.4). In that case, the ridge beam is providing vertical support for the "top" end of the rafters, and a connection with vertical capacity is required (horizontal bearing).



Another case is when the horizontal tie is not provided at the bottom of the rafters. In that case, a load-bearing ridge beam is required to be provided (See Section R802.5.2). Again, here the ridge beam is providing vertical support for the top end of the rafter, so a support against vertical forces is required (horizontal bearing).



Cost Impact: The code change proposal will not increase or decrease the cost of construction. This code change is meant as a clarification, and will not result in an increase in cost for a normal rafter/ceiling joist system.

RB265-19

IRC: R802.11.1

Proponent: Randy Shackelford, Simpson Strong-Tie Co., representing Simpson Strong-Tie Co.
(rshackelford@strongtie.com)

2018 International Residential Code

Revise as follows:

R802.11 Roof tie-down.

R802.11.1 Uplift resistance. Roof assemblies shall have uplift resistance in accordance with Sections R802.11.1.1 and R802.11.1.2.

Exception: ~~Where the uplift force does not exceed 200 pounds (90.8 kg), rafters and trusses spaced not more than 24 inches (610 mm) on center~~ Rafters or trusses shall be permitted to be attached to their supporting wall assemblies in accordance with Table R602.3(1) where either of the following occur:

1. Where the uplift force per rafter or truss does not exceed 200 pounds (90.8 kg) as determined by Table R802.11.
2. Where the basic wind speed does not exceed 115 mph, the wind exposure category is B, the roof pitch is 5:12 (42-percent slope) or greater, ~~and the roof span is 32 feet (9754 mm) or less,~~ and rafters and trusses are spaced not more than 24 inches (610 mm) on center ~~shall be permitted to be attached to their supporting wall assemblies in accordance with Table R602.3(1).~~

R802.11.1.1 Truss uplift resistance. Trusses shall be attached to supporting wall assemblies by connections capable of resisting uplift forces as specified on the truss design drawings for the ultimate design wind speed as determined by Figure R301.2(5)A and listed in Table R301.2(1) or as shown on the construction documents. Uplift forces shall be permitted to be determined as specified by Table R802.11, if applicable, or as determined by accepted engineering practice.

R802.11.1.2 Rafter uplift resistance. Individual rafters shall be attached to supporting wall assemblies by connections capable of resisting uplift forces as determined by Table R802.11 or as determined by accepted engineering practice. Connections for beams used in a roof system shall be designed in accordance with accepted engineering practice.

Reason: The purpose of this proposal is to clarify the roof tiedown requirements. Section R802.11.1 states that roof tiedown shall be in accordance with either the truss tiedown section (R802.11.1.1) or the rafter tiedown section (R802.11.1.2). Then it has some more text that are actually exceptions for when the standard roof to wall fastening can be used. This seems to be more appropriate as an exception, so this code change is written as such. There is no intent to make technical changes. Exception 1 does not need the language about limiting to 24" o.c. since the uplift is being read directly from Table R802.11 anyway, and that only goes up to 24" o.c.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal is just a clarification of this section.

Proposal # 5638

RB265-19

RB266-19

IRC®: TABLE R804.3, TABLE R804.3.2.1(2), R804.3.2.1.2, FIGURE R804.3.2.1.2, R804.3.2.5

Proponent: Jon-Paul Cardin, American Iron and Steel Institute, representing American Iron and Steel Institute (JCardin@steel.org)

2018 International Residential Code

Revise as follows:

**TABLE R804.3
ROOF FRAMING FASTENING SCHEDULE^{a, b}**

DESCRIPTION OF BUILDING ELEMENTS			NUMBER AND SIZE OF FASTENERS ^a				SPACING OF FASTENERS
Roof sheathing (oriented strand board or plywood) to rafter			No. 8 screws				6" o.c. on edges and 12" o.c. at interior supports. 6" o.c. at gable end truss
<u>Gypsum board to ceiling joists</u>			<u>No. 6 screws</u>				<u>12" o.c.</u>
Gable end truss to endwall top track			No. 10 screws				12" o.c.
Rafter to ceiling joist <u>and to ridge member</u>			Minimum No. 10 screws, in accordance with Table R804.3.1.1(3)				Evenly spaced, not less than 1/2" from all edges.
Ceiling joist or roof truss to top track of bearing wall ^b	Ceiling Joist or Truss Spacing (in.)	Roof Span (ft)	Ultimate Design Wind Speed (mph) and Exposure Category				Each ceiling joist or roof truss
			126 <u>130</u> B	<139 B	126 <u>130</u> C	<139 C	
			110 <u>115</u> C	115 <u>120</u> C			
	16	24	2 <u>3</u>	2 <u>3</u>	2 <u>4</u>	3 <u>5</u>	
		28	2 <u>3</u>	2 <u>3</u>	3 <u>4</u>	3 <u>5</u>	
		32	2 <u>3</u>	2 <u>4</u>	3 <u>5</u>	4 <u>6</u>	
		36	2 <u>4</u>	2 <u>4</u>	3 <u>5</u>	4 <u>6</u>	
		40	2 <u>4</u>	2 <u>4</u>	3 <u>6</u>	4 <u>7</u>	
	24	24	2 <u>4</u>	2 <u>5</u>	3 <u>6</u>	4 <u>7</u>	
		28	2 <u>4</u>	2 <u>5</u>	4 <u>6</u>	5 <u>8</u>	
		32	2 <u>4</u>	3 <u>6</u>	4 <u>7</u>	5 <u>8</u>	
		36	2 <u>4</u>	3 <u>6</u>	4 <u>8</u>	6 <u>9</u>	
		40	2 <u>6</u>	3 <u>6</u>	5 <u>8</u>	6 <u>10</u>	

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 mil = 0.0254 mm.

a. Screws are a minimum No. 10 unless noted otherwise.

b. Indicated number of screws shall be applied through the flanges of the truss or ceiling joist or

through each leg of a 54 mil clip angle. See Section R804.3.8 for additional requirements to resist uplift forces.

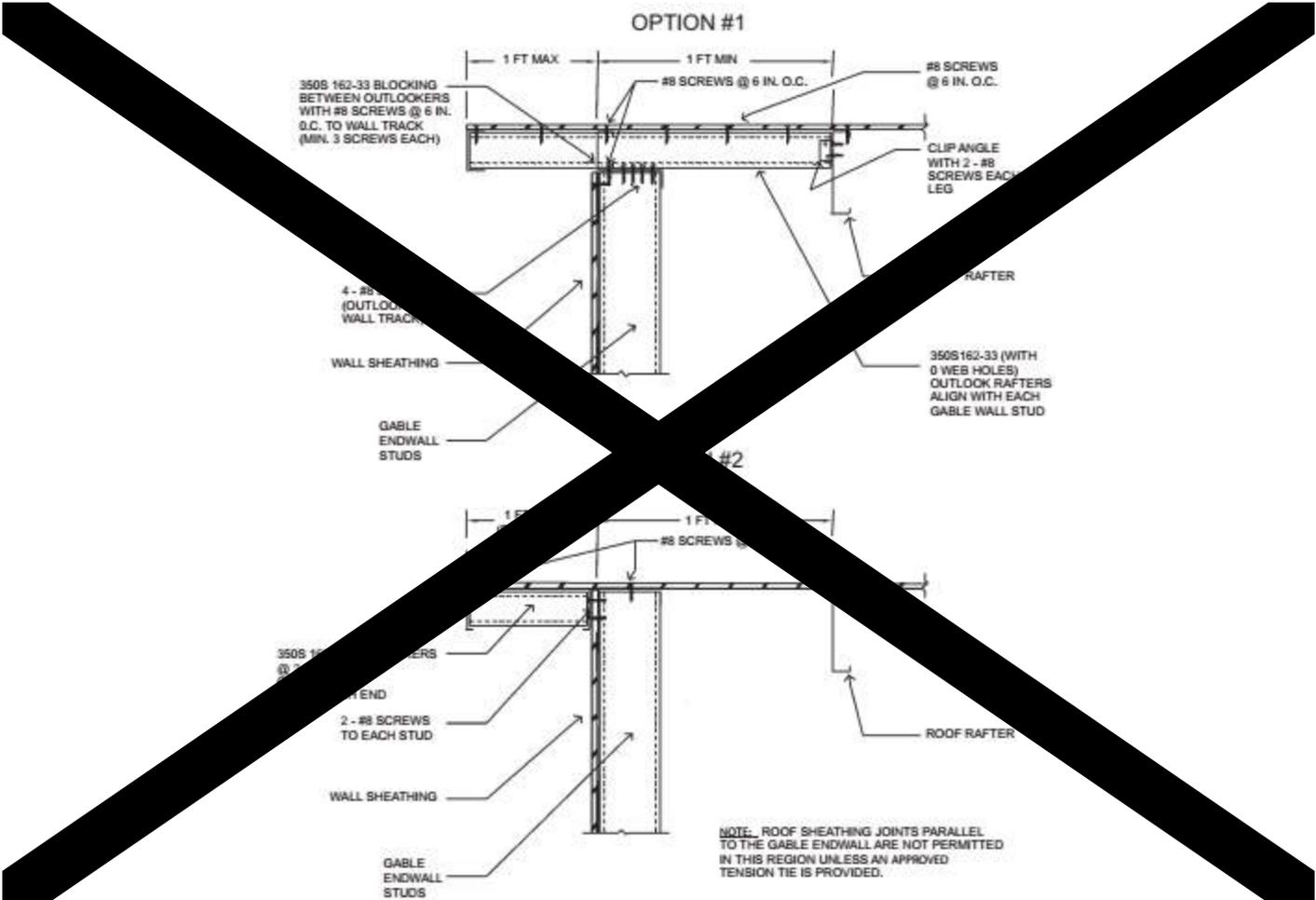
TABLE R804.3.2.1(2)
ULTIMATE DESIGN WIND SPEED TO EQUIVALENT SNOW LOAD CONVERSION

ULTIMATE WIND SPEED AND EXPOSURE		EQUIVALENT GROUND SNOW LOAD (psf)									
		Roof slope									
Exposure	Wind speed(mph)	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12
B	115	20	20	20	20	30 20	20	30 20	30 20	30 20	50 20
	120	20	20	20	20	30 20	30 20	30 20	30 20	30 20	50 20
	130	20	20	20	20	30 20	30 20	30 20	50 20	50 20	50 20
	<140	20	20	20	20	30 20	50 20	50 20	50 30	50 30	50 30
C	115	20	20	20	20	30 20	30 20	30 20	50 20	50 30	50 30
	120	20	20	20	20	30 20	30 20	50 20	50 30	50 30	50
	130	20	20	20 30	30	30	50 30	50 30	50 30	50	70 50
	<140	30	30	30 50	50	50 30	50 30	70 50	70 50	70 50	= 50

For SI: 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa.

R804.3.2.1.2 Rake overhangs. Rake overhangs shall not exceed 12 inches (305 mm) measured horizontally. ~~the limitations provided for Option #1 or Option #2 in Figure R804.3.2.1.2. Outlookers at gable endwalls shall be installed in accordance with Figure R804.3.2.1.2. The required strength for uplift connectors required for Option #1 shall be determined in accordance with AISI S230 Table F3-4.~~

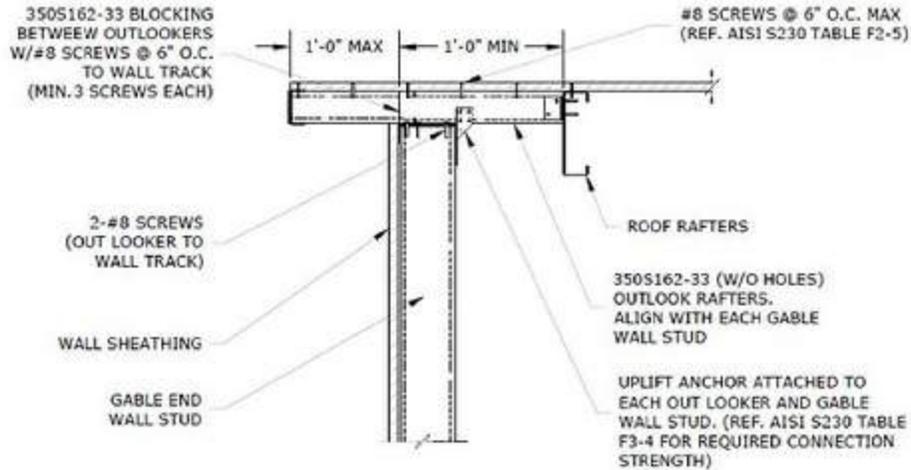
Delete and substitute as follows:



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

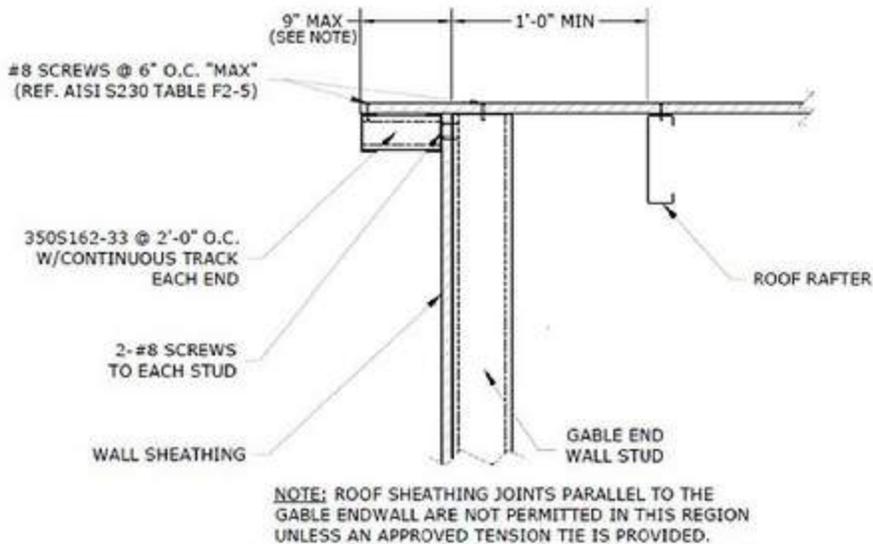
**FIGURE R804.3.2.1.2
GABLE ENDWALL OVERHANG DETAILS**

OPTION #1



OPTION #2

(NOT APPLICABLE FOR WIND SPEEDS > 130mph)



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

FIGURE R804.3.2.1.2
GABLE ENDWALL OVERHANG DETAILS

Revise as follows:

R804.3.2.5 Roof rafter bottom flange bracing. The bottom flanges of roof rafters shall be continuously braced, at a maximum spacing of ~~8~~ 4 feet (2440 mm) as measured parallel to the roof rafters, with one of the following members:

1. Minimum 33-mil (0.84 mm) C-shaped member.
2. Minimum 33-mil (0.84 mm) track section.
3. Minimum 1¹/₂-inch by 33-mil (38 mm by 0.84 mm) steel strap.

The bracing element shall be fastened to the bottom flange of each roof rafter with one No. 8 screw and shall be fastened to blocking with two No. 8 screws. Blocking shall be installed between roof rafters in-line with the continuous bracing at a maximum spacing of 12 feet (3658 mm) measured perpendicular to the roof rafters.

The ends of continuous bracing shall be fastened to blocking or anchored to a stable building component with two No. 8 screws.

Reason: The purpose of this code change proposal is to update the cold-formed steel framing provisions of the International Residential Code to correspond to the latest edition of AISI S230 - *Standard for Cold-Formed Steel Framing - Prescriptive Method for One- and Two-Family Dwellings (AISI S230-18)*. The 2018 edition of AISI S230 has updated the prescriptive provisions to conform to the loading criteria of the 2016 edition of ASCE 7- *Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7-16)*. The cold-formed steel provisions affected by the update to ASCE 7-16 are exclusively located in IRC Section 804 – *Roof Framing*. The affected provisions are isolated in Section 804 due to the increase in wind pressure coefficients on roof surfaces from the 2010 to 2016 editions of ASCE 7. AISI S230-18 reduced the required bottom flange bracing spacing from 8-feet to 4-feet in order to minimize changes in the allowable roof span tables due to the increased wind loading.

There is a concurrent code change proposal to update Chapter 44 to AISI S230-18. A draft version of AISI S230-18 is currently available for review at www.aisistandards.org. AISI anticipates the final published edition of AISI S230-18 will be available free of charge at the same website by March 1, 2019.

Bibliography: AISI (2018), *Standard for Cold-Formed Steel Framing - Prescriptive Method for One- and Two-Family Dwellings*, ANSI/AISI S230-18, American Iron and Steel Institute, Washington D.C.

Cost Impact: The code change proposal will increase the cost of construction. This proposal reduces the required bottom flange bracing of roof members to account for increase wind uplift forces. Also, in some conditions this code change proposal will require additional tie-downs at roof overhangs to resist wind uplift forces.

Proposal # 4002

RB266-19

RB267-19

IRC@: R805.1

Proponent: Robert DeVries, representing Self (rdevries@nuwool.com)

2018 International Residential Code

Revise as follows:

R805.1 Ceiling installation. Ceilings shall be installed in accordance with the requirements for interior wall finishes as provided in ~~Section R702~~; Sections R702.1 through R702.6

Reason: Removing section R702.7 from section R805 Ceiling Finishes clears up the confusion of vapor retarders being required in the ceiling assembly. Section R702.7 specifically requires vapor retarders for frame walls but since the ceiling finishes section refers to this section it may be interpreted to mean a vapor retarder is required in the ceiling assembly as well.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The code change proposal will not increase or decrease the cost of construction due to the fact the code is not changing but rather clarifying the scope as to how it is applied.

Proposal # 5000

RB267-19

RB268-19

IRC: R806.5

Proponent: Craig Conner, representing self (craig.conner@mac.com); Joseph Lstiburek, representing self (joe@buildingscience.com)

2018 International Residential Code

SECTION R806 ROOF VENTILATION

R806.1 Ventilation required. Enclosed attics and enclosed rafter spaces formed where ceilings are applied directly to the underside of roof rafters shall have cross ventilation for each separate space by ventilating openings protected against the entrance of rain or snow. Ventilation openings shall have a least dimension of $\frac{1}{16}$ inch (1.6 mm) minimum and $\frac{1}{4}$ inch (6.4 mm) maximum. Ventilation openings having a least dimension larger than $\frac{1}{4}$ inch (6.4 mm) shall be provided with corrosion-resistant wire cloth screening, hardware cloth, perforated vinyl or similar material with openings having a least dimension of $\frac{1}{16}$ inch (1.6 mm) minimum and $\frac{1}{4}$ inch (6.4 mm) maximum. Openings in roof framing members shall conform to the requirements of Section R802.7. Required ventilation openings shall open directly to the outside air and shall be protected to prevent the entry of birds, rodents, snakes and other similar creatures.

Revise as follows:

R806.5 Unvented attic and unvented enclosed rafter assemblies. Unvented *attics* and unvented enclosed roof framing assemblies created by ceilings that are applied directly to the underside of the roof framing members and structural roof sheathing applied directly to the top of the roof framing members/rafters, shall be permitted where all the following conditions are met:

1. The unvented *attic* space is completely within the *building thermal envelope*.
2. Interior Class I vapor retarders are not installed on the ceiling side (*attic* floor) of the unvented *attic* assembly or on the ceiling side of the unvented enclosed roof framing assembly.
3. Where wood shingles or shakes are used, a minimum $\frac{1}{4}$ -inch (6.4 mm) vented airspace separates the shingles or shakes and the roofing underlayment above the structural sheathing.
4. In Climate Zones 5, 6, 7 and 8, any *air-impermeable insulation* shall be a Class II vapor retarder, or shall have a Class II vapor retarder coating or covering in direct contact with the underside of the insulation.
5. Insulation shall comply with Item 5.3 and either Item 5.1 or 5.2:
 - 5.1. Item 5.1.1, 5.1.2, 5.1.3 or 5.1.4 shall be met, depending on the air permeability of the insulation directly under the structural roof sheathing.
 - 5.1.1. Where only *air-impermeable insulation* is provided, it shall be applied in direct contact with the underside of the structural roof sheathing.
 - 5.1.2. Where *air-permeable insulation* is installed directly below the structural sheathing, rigid board or sheet insulation shall be installed directly above the structural roof sheathing in accordance with the *R*-values in Table R806.5 for condensation control.
 - 5.1.3. Where both *air-impermeable* and *air-permeable insulation* are provided, the *air-impermeable insulation* shall be applied in direct contact with the underside of the structural roof sheathing in accordance with Item 5.1.1 and shall be in accordance with the *R*-values in Table R806.5 for condensation control. The *air-permeable insulation* shall be installed directly under the *air-impermeable insulation*.

- 5.1.4. Alternatively, sufficient rigid board or sheet insulation shall be installed directly above the structural roof sheathing to maintain the monthly average temperature of the underside of the structural roof sheathing above 45°F (7°C). For calculation purposes, an interior air temperature of 68°F (20°C) is assumed and the exterior air temperature is assumed to be the monthly average outside air temperature of the three coldest months.
- 5.2. In Climate Zones 1, 2 and 3, air-permeable insulation installed in unvented *attics* shall meet the following requirements:
- 5.2.1. An approved *vapor diffusion port* shall be installed not more than 12 inches (305 mm) from the highest point of the roof, measured vertically from the highest point of the roof to the lower edge of the port.
- 5.2.2. The port area shall be greater than or equal to 1:600 of the ceiling area. Where there are multiple ports in the attic, the sum of the port areas shall be greater than or equal to the area requirement.
- 5.2.3. The vapor-permeable membrane in the *vapor diffusion port* shall have a vapor permeance rating of greater than or equal to 20 perms when tested in accordance with Procedure A of ASTM E96.
- 5.2.4. The *vapor diffusion port* shall serve as an air barrier between the *attic* and the exterior of the building.
- 5.2.5. The *vapor diffusion port* shall protect the *attic* against the entrance of rain and snow.
- 5.2.6. Framing members and blocking shall not block the free flow of water vapor to the port. Not less than a 2-inch (51 mm) space shall be provided between any blocking and the roof sheathing. Air-permeable insulation shall be permitted within that space.
- 5.2.7. The roof slope shall be greater than or equal to 3:12 (vertical/horizontal).
- 5.2.8. Where only air-permeable insulation is used, it shall be installed directly below the structural roof sheathing, on top of the attic floor, or on top of the ceiling.
- 5.2.9. Air-impermeable insulation, if any where used in conjunction with air-permeable insulation, shall be directly above or below the structural roof sheathing and is not required to meet the *R*-value in Table 806.5. Where directly below the structural roof sheathing, there shall be no space between the *air-impermeable insulation* and air-permeable insulation.
- 5.2.10. The Where air-permeable insulation is used and is installed directly below the roof structural sheathing, air shall be supplied at a flow rate greater than or equal to 50 CFM (23.6 L/s) per 1,000 square feet (93 m²) of ceiling. The air shall be supplied from ductwork providing supply air to the occupiable space when the conditioning system is operating. Alternatively, the air shall be supplied by a supply fan when the conditioning system is operating.
- Exceptions:**
1. Where both air-impermeable and air-permeable insulation are used, and the R-value in Table 806.5 is met, air supply to the attic is not required.
 2. Where only air-permeable insulation is used and is installed on top of the attic floor, or on top of the ceiling, air supply to the attic is not required.
- 5.3. Where preformed insulation board is used as the air-impermeable insulation layer, it shall be sealed at the perimeter of each individual sheet interior surface to form a continuous layer.

Reason: Objective: Provide consistency with IBC and provide additional options

This code change provides consistency with the IBC and provides additional options. The building science related to this change can be found in the following link:

<https://buildingscience.com/documents/building-science-insights-newsletters/bsi-094-no-sweat>

Cost Impact: The code change proposal will decrease the cost of construction
For some types of insulation and construction this will be a lower cost option.

Proposal # 5433

RB268-19

RB269-19

IRC: R807.1.1(New)

Proponent: Vincent Anderson Jr, Self, representing Self (Vincent.Anderson@denvergov.org)

2018 International Residential Code

R807.1 Attic access. Buildings with combustible ceiling or roof construction shall have an *attic* access opening to *attic* areas that have a vertical height of 30 inches (762 mm) or greater over an area of not less than 30 square feet (2.8 m²). The vertical height shall be measured from the top of the ceiling framing members to the underside of the roof framing members.

The rough-framed opening shall be not less than 22 inches by 30 inches (559 mm by 762 mm) and shall be located in a hallway or other location with *ready access*. Where located in a wall, the opening shall be not less than 22 inches wide by 30 inches high (559 mm wide by 762 mm high). Where the access is located in a ceiling, minimum unobstructed headroom in the *attic* space shall be 30 inches (762 mm) at some point above the access measured vertically from the bottom of ceiling framing members. See Section M1305.1.3 for access requirements where mechanical *equipment* is located in *attics*.

Add new text as follows:

807.1.1 Attic access platform. A standing platform having an area not less than 32 square foot (2.98 m²) shall be constructed adjacent to the attic access opening. The platform shall be constructed of plywood or oriented stand board (OSB) sheathing of 5/8-inch (16 mm) minimum thickness and fastened to the ceiling joists or bottom truss chord with nails or screws, and elevated to create a nominal 10 inch (254 mm) deep cavity space for installing insulation beneath the sheathing. Framing materials shall be provided to support the platform sheathing.

Reason: The attic access opening is usually accessed by use of a ladder or similar device to gain entry into the attic space. Once inside the attic, there is little to no place to stand or maneuver once in the attic space. It is a life-safety issue everytime a person enters the attic regarding the location and placement of their feet once inside the attic. Some attics have limited insulation and the bottom chords of trusses or ceiling joists can be easily seen, however with the advent of blown-in insulation and added energy conservation measures the attic ceiling joists disappear below the insulation surface. This lack of a "platform" could lead to persons stepping onto the ceiling gypsum board and potentially falling between or through the attic joists/rafters, resulting in serious injury from a fall to the floor level below. A building occupant, owner, tenant, or repairman could sustain serious injury from a fall especially in an unlighted attic space. A second code change to add an electrical outlet receptacle has been proposed to IRC Sec. E3901.9 to provide a light source and power source during the performance of work or maintenance within an attic space.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The cost impact of adding this 32-sqft "platform" adjacent to the attic access opening is negligible to less than \$100.00 .

Proposal # 4818

RB269-19

RB270-19

IRC®: R902.2

Proponent: Marcelo Hirschler, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Revise as follows:

R902.2 Fire-retardant-treated shingles and shakes. Fire-retardant-treated wood shakes and shingles shall be treated by impregnation with chemicals by ~~the full-cell vacuum pressure process, in accordance with AWPA C1,~~ a pressure process or other means during manufacture. ~~The fire-retardant-treated wood shakes and shingles shall be tested in accordance with and produce the results required in Section R802.1.5.~~ Each bundle shall be marked to identify the manufactured unit and the manufacturer, and shall be *labeled* to identify the classification of the material in accordance with the testing required in Section R902.1, the treating company and the quality control agency.

Reason: Section 802.1.5 explains that fire retardant treated wood needs to be manufactured by impregnation "with chemicals by a pressure process or other means during manufacture" and this section should state the same and not address a specific manufacturing process. The same words are also in the IBC and in the IWUIC. The added sentence ensures that the fire retardant treated wood products meet the requirements for fire-retardant treated wood products, now in chapter 8.

The other change being introduced is the elimination of AWPA C1, which is a standard that has been withdrawn by AWPA (since being issued in 2003). Moreover, AWPA C1 (entitled "All Timber Products - Preservative Treatment by Pressure Processes") does not address impregnation with fire retardant chemicals for improved flame spread but addresses preservative treatment.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This is clarification since the requirements for fire retardant treated wood are already in the IRC code.

Proposal # 4824

RB270-19

RB271-19

IRC®: R902.4

Proponent: Jonathan Roberts, UL LLC, representing UL LLC (jonathan.roberts@ul.com)

2018 International Residential Code

Revise as follows:

R902.4 Rooftop-mounted photovoltaic panel systems. Rooftop-mounted *photovoltaic panel systems* installed on or above the roof covering shall be tested, listed and identified with a fire classification in accordance with ~~UL 1703~~ and UL 2703. Class A, B or C *photovoltaic panel systems* and modules shall be installed in jurisdictions designated by law as requiring their use or where the edge of the roof is less than 3 feet (914 mm) from a lot line.

Reason: This correlates with the action taken in Group A for Section 1505.9 of the IBC, Proposal FS152-18. Fire classification for rooftop rack-mounted photovoltaic panel systems are determined in accordance with UL 2703. UL 1703 includes partial fire testing of the photovoltaic panel, which is one of the components of the photovoltaic panel system. UL 2703 uses the results of that component testing, and includes further evaluation and testing of the photovoltaic panel system (i.e. the photovoltaic panel and the rack support system) to establish the Fire Classification for the system. UL 1703 is referenced within UL 2703.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Fire classification of these systems are determined in accordance with UL 2703 currently.

Proposal # 4266

RB271-19

RB272-19

IRC: R904 (New), R905.2.4.1, TABLE R905.2.4.1, R905.1, R905.16.6, R905.17.7, ASTM, FM, ICC, UL Chapter 44 (New)

Proponent: T. Eric Stafford, representing Insurance Institute for Business and Home Safety (testafford@charter.net)

2018 International Residential Code

Add new text as follows:

SECTION R904 WIND REQUIREMENTS FOR ROOF COVERINGS

R904.1 Wind resistance for roof coverings. Roof coverings shall comply with the wind provisions and limitations of this section.

Revise as follows:

~~R905.2.4.1~~ **R904.1.1 Wind resistance of asphalt shingles.** Asphalt shingles shall be tested in accordance with ASTM D7158. Asphalt shingles shall meet the classification requirements of Table ~~R905.2.4.1~~ R904.1.1 for the appropriate ultimate design wind speed. Asphalt shingle packaging shall bear a label to indicate compliance with ASTM D7158 and the required classification in Table ~~R905.2.4.1~~ R904.1.1.

Exception: Asphalt shingles not included in the scope of ASTM D7158 shall be tested and labeled in accordance with ASTM D3161. Asphalt shingle packaging shall bear a label to indicate compliance with ASTM D3161 and the required classification in Table ~~R905.2.4.1~~ R904.1.1.

TABLE ~~R905.2.4.1~~ R904.1.1
CLASSIFICATION OF ASPHALT ROOF SHINGLES

MAXIMUM ULTIMATE DESIGN WIND SPEED, V_{ult} FROM FIGURE R301.2(5)A (mph)	MAXIMUM BASIC WIND SPEED, V_{ASD} FROM TABLE R301.2.1.3(mph)	ASTM D7158^a SHINGLE CLASSIFICATION	ASTM D3161 SHINGLE CLASSIFICATION
110	85	D, G or H	A, D or F
116	90	D, G or H	A, D or F
129	100	G or H	A, D or F
142	110	G or H	F
155	120	G or H	F
168	130	H	F
181	140	H	F
194	150	H	F

For SI: 1 foot = 304.8 mm; 1 mile per hour = 0.447 m/s.

- a. The standard calculations contained in ASTM D7158 assume Exposure Category B or C and a building height of 60 feet or less. Additional calculations are required for conditions outside of these assumptions.

Add new text as follows:

R904.1.2 Concrete and clay tile. In regions where wind design is required in accordance with Figure R301.2(5)B, wind loads on concrete and clay tile shall be determined in accordance with Section 1609.5 of the *International Building Code*. Concrete and clay tile shall be tested to determine their resistance to overturning due to wind loads in accordance with SBCCI SSTD 11 or ASTM C1568. Where concrete and clay roof tiles do not satisfy the limitations in Chapter 16 of the *International Building Code* for rigid tile, a wind tunnel test shall be used to determine the wind characteristics of the concrete or clay tile roof covering in accordance with SBCCI SSTD 11.

In regions where wind design is not required in accordance with Figure R301.2(5)B, concrete and clay tiles shall be attached in accordance with this section or Section R905.3

R904.1.3 Metal roof shingles. Metal roof shingles shall be installed to resist the component and cladding loads specified in Table R301.2(2), adjusted for height and exposure in accordance with Table R301.2(3). Metal roof shingles shall be tested in accordance with FM 4474, UL 580 or UL 1897.

R904.1.4 Mineral-surfaced roll roofing. Mineral-surfaced roll roofing shall be installed to resist the component and cladding loads specified in Table R301.2(2), adjusted for height and exposure in accordance with Table R301.2(3).

R904.1.5 Slate shingles. Slate shingles shall be installed to resist the component and cladding loads specified in Table R301.2(2), adjusted for height and exposure in accordance with Table R301.2(3).

R904.1.6 Wood shingles. In regions where wind design is required in accordance with Figure R301.2(5)B, Wood shingles shall be installed to resist the component and cladding loads specified in Table R301.2(2), adjusted for height and exposure in accordance with Table R301.2(3). In regions where wind design is not required in accordance with Figure R301.2(5)B, wood shingles are permitted to be attached in accordance with Section R905.7.

R904.1.7 Wood shakes. In regions where wind design is required in accordance with Figure R301.2(5)B, Wood shakes shall be installed to resist the component and cladding loads specified in Table R301.2(2), adjusted for height and exposure in accordance with Table R301.2(3). In regions where wind design is not required in accordance with Figure R301.2(5)B, wood shakes are permitted to be attached in accordance with Section R905.8.

R904.1.8 Metal roof panels. Metal roof panels shall be installed to resist the component and cladding loads specified in Table R301.2(2), adjusted for height and exposure in accordance with Table R301.2(3). Metal roof panels shall be tested for wind resistance in accordance with FM 4474, UL 580, or UL 1897.

R904.1.9 Photovoltaic shingles. Photovoltaic shingles shall be tested in accordance with procedures and acceptance criteria in ASTM D 3161. Photovoltaic shingles shall comply with the classification requirements of Table R904.1.1 for the appropriate maximum basic wind speed. Photovoltaic shingle packaging shall bear a label to indicate compliance with the procedures in ASTM D 3161 and the required classification from Table R904.1.1.

R904.1.10 Building-integrated Photovoltaic roof panels. *BIPV roof panels* shall be tested in accordance with UL 1897. *BIPV roof panel* packaging shall bear a *label* to indicate compliance with UL 1897.

R904.1.11 Other roof systems. Built-up, modified bitumen, fully adhered or mechanically attached single ply systems, sprayed polyurethane foam, and liquid applied roof coverings shall be tested in accordance with FM 4474, UL1897 or UL 580 and installed to resist the component and cladding loads specified in Table R301.2(2), adjusted for height and exposure in accordance with Table R301.2(3).

Revise as follows:

R905.1 Roof covering application. Roof coverings shall be applied in accordance with the applicable provisions of this section and the manufacturer's installation instructions. ~~Unless otherwise specified in this section, roof~~ Roof coverings shall be installed to resist the component and cladding loads specified in Table R301.2(2), ~~adjusted for height and exposure in accordance with Table R301.2(3).~~ comply with the wind requirements specified in Section R904.

R905.16.6 Wind resistance. ~~Photovoltaic~~ Wind resistance of photovoltaic shingles shall be tested in accordance with ~~procedures and acceptance criteria in ASTM D3161. Photovoltaic shingles shall comply with the classification requirements of Table R905.2.4.1 for the appropriate maximum basic wind speed. Photovoltaic shingle packaging shall bear a label to indicate compliance with the procedures in ASTM D3161 and the required classification from Table R905.2.4.1.~~ Section R904.

R905.17.7 Wind resistance. Wind resistance of BIPV roof panels shall be tested in accordance with ~~UL 1897. BIPV roof panel packaging shall bear a label to indicate compliance with UL 1897.~~ Section R904.

Add new standard(s) as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428

C1568-08(2013): Standard Test Method for Wind Resistance of Concrete and Clay Roof Tiles (Mechanical Uplift Resistance Method) R904.1.2

FM

FM Approvals
Headquarters Office
Norwood MA 02062

4474-2011: American National Standard for Evaluating the Simulated Wind Uplift Resistance of Roof Assemblies Using Static Positive and/or Negative Differential Pressures R904.1.3, R904.1.8

ICC

International Code Council, Inc.
500 New Jersey Avenue NW
Washington DC 20001

SBCCI SSTD 11-97: Test Standard for Determining Wind Resistance of Concrete or Clay Roof Tiles R904.1.2

UL

UL LLC
333 Pfingsten Road
Northbrook IL 60062

580-2006: Test for Uplift Resistance of Roof Assemblies-with Revisions through October 2013 R904.1.3, R904.1.8

Reason: This proposal is one of two proposals intended to clarify the wind limitations in the IRC. Section R301.2.1.1 intends to limit the applicability of the IRC to areas where wind design is not required in accordance with Figure R301.2(5)B. However, Chapter 9 contains high wind requirements for asphalt shingles and for underlayment in wind design required regions, but for no other roof coverings. While Section R905.1 states that unless otherwise specified, roof coverings have to resist the component and cladding loads specified in Table

R302(2), that requirement is not necessarily correct for all roof coverings. Prescriptive attachment methods are provided for concrete and clay tile but the code does not specify any wind limitations on the use of this prescriptive method.

Therefore, a new section is proposed for Chapter 9 on roof coverings that specifically addresses the wind limitations in the IRC for roof covering attachment and specifies the performance requirements for roof coverings in wind design required regions. It is similar to and was patterned after Section 1504 in the IBC.

This proposal is not intended to change any technical requirements in the IRC related to wind design. It is intended to simply clarify the wind requirements for roof coverings in the IRC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This code change proposal will not increase the cost of construction as it is primarily a clarification.

Staff Analysis: The referenced standard, ASTM C1568-08(2013), FM 4474-2011, ICC SBCCI SSTD 11-97 and UL 580-2006 are currently referenced in other 2018 I-codes.

Proposal # 4660

RB272-19

RB273-19

IRC®: R905.1.1, ASTM Chapter 44 (New)

Proponent: Gregory Keeler, Owens Corning, representing Owens Corning (greg.keeler@owenscorning.com)

2018 International Residential Code

Revise as follows:

R905.1.1 Underlayment. *Underlayment* for asphalt shingles, clay and concrete tile, metal roof shingles, mineral-surfaced roll roofing, slate and slate-type shingles, wood shingles, wood shakes, metal roof panels and *photovoltaic shingles* shall conform to the applicable standards listed in this chapter. *Underlayment* materials required to comply with ASTM D226, D1970, D4869, ~~and D6757~~ and ASTM WK51913 shall bear a label indicating compliance to the standard designation and, if applicable, type classification indicated in Table R905.1.1(1). *Underlayment* shall be applied in accordance with Table R905.1.1(2). *Underlayment* shall be attached in accordance with Table R905.1.1(3).

Exceptions:

1. As an alternative, self-adhering polymer-modified bitumen *underlayment* complying with ASTM D1970 installed in accordance with both the *underlayment* manufacturer's and roof covering manufacturer's instructions for the deck material, roof ventilation configuration and climate exposure for the roof covering to be installed, shall be permitted.
2. As an alternative, a minimum 4-inch-wide (102 mm) strip of self-adhering polymer-modified bitumen membrane complying with ASTM D1970, installed in accordance with the *manufacturer's installation instructions* for the deck material, shall be applied over all joints in the roof decking. An *approved underlayment* for the applicable roof covering for maximum ultimate design wind speeds, V_{ult} , less than 140 miles per hour shall be applied over the entire roof over the 4-inch-wide (102 mm) membrane strips.
3. As an alternative, two layers of *underlayment* complying with ASTM D226 Type II; ~~or~~ ASTM D4869 Type III or Type IV; or ASTM WK51913 shall be permitted to be installed as follows in 3.1 through 3.4:
 - 3.1. Apply a 19-inch-wide (483 mm) strip of *underlayment* parallel with the eave. Starting at the eave, apply 36-inch-wide (914 mm) strips of *underlayment* felt, overlapping successive sheets 19 inches (483 mm). End laps shall be 4 inches (102 mm) and shall be offset by 6 feet (1829 mm).
 - 3.2. The *underlayment* shall be attached with corrosion-resistant fasteners in a grid pattern of 12 inches (305 mm) between side laps with a 6-inch (152 mm) spacing at side and end laps.
 - 3.3. *Underlayment* shall be attached using metal or plastic cap nails with a nominal cap diameter of not less than 1 inch (25 mm). Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a thickness of not less than 0.010 inch (0.25 mm). Minimum thickness of the outside edge of plastic caps shall be 0.035 inch (0.89 mm).
 - 3.4. The cap nail shank shall be not less than 0.083 inch (2.11 mm) for ring shank cap nails and 0.091 inch (2.31 mm) for smooth shank cap nails. Cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than $\frac{3}{4}$ inch (19 mm) into the roof sheathing.

Add new text as follows:

ASTM WK51913 - ?????: New Specification for Mechanically Attached Polymeric Roof Underlayment Used in Steep Slope Roofing

Reason: This is a placeholder for the ASTM Work Item to develop a standard related to synthetic underlayments. This will be the first ASTM Standard that applies specifically to synthetic underlayments and includes requirements that are related directly to synthetic underlayments. These requirements are much more appropriate for synthetic underlayment products than testing in accordance with the current standards which are specifically for asphalt impregnated products.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal simply adds requirements for products that are already in widespread use.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM WK51913, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 5310

RB273-19

RB274-19

IRC@: R905.1.1, TABLE R905.1.1(1)

Proponent: Mike Fischer, Kellen Company, representing The Asphalt Roofing Manufacturers Association (mfischer@kellencompany.com)

2018 International Residential Code

Revise as follows:

R905.1.1 Underlayment. *Underlayment* for asphalt shingles, clay and concrete tile, metal roof shingles, mineral-surfaced roll roofing, slate and slate-type shingles, wood shingles, wood shakes, metal roof panels and *photovoltaic shingles* shall conform to the applicable standards listed in this chapter. *Underlayment* materials required to comply with ASTM D226, D1970, D4869 and D6757 shall bear a label indicating compliance to the standard designation and, if applicable, type classification indicated in Table R905.1.1(1). *Underlayment* shall be applied in accordance with Table R905.1.1(2). *Underlayment* shall be attached in accordance with Table R905.1.1(3).

Exceptions:

1. ~~As an alternative, self-adhering polymer-modified bitumen *underlayment* complying with ASTM D1970 installed in accordance with both the *underlayment* manufacturer's and roof covering manufacturer's instructions for the deck material, roof ventilation configuration and climate exposure for the roof covering to be installed, shall be permitted.~~
2. As an alternative, a minimum 4-inch-wide (102 mm) strip of self-adhering polymer-modified bitumen membrane complying with ASTM D1970, installed in accordance with the *manufacturer's installation instructions* for the deck material, shall be applied over all joints in the roof decking. An *approved underlayment* for the applicable roof covering for maximum ultimate design wind speeds, V_{ult} , less than 140 miles per hour shall be applied over the entire roof over the 4-inch-wide (102 mm) membrane strips.
3. As an alternative, two layers of *underlayment* complying with ASTM D226 Type II or ASTM D4869 Type III or Type IV shall be permitted to be installed as follows in 3.1–3.4:
 - 3.1. Apply a 19-inch-wide (483 mm) strip of *underlayment* parallel with the eave. Starting at the eave, apply 36-inch-wide (914 mm) strips of *underlayment* felt, overlapping successive sheets 19 inches (483 mm). End laps shall be 4 inches (102 mm) and shall be offset by 6 feet (1829 mm).
 - 3.2. The *underlayment* shall be attached with corrosion-resistant fasteners in a grid pattern of 12 inches (305 mm) between side laps with a 6-inch (152 mm) spacing at side and end laps.
 - 3.3. *Underlayment* shall be attached using metal or plastic cap nails with a nominal cap diameter of not less than 1 inch (25 mm). Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a thickness of not less than 0.010 inch (0.25 mm). Minimum thickness of the outside edge of plastic caps shall be 0.035 inch (0.89 mm).
 - 3.4. The cap nail shank shall be not less than 0.083 inch (2.11 mm) for ring shank cap nails and 0.091 inch (2.31 mm) for smooth shank cap nails. Cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than $\frac{3}{4}$ inch (19 mm) into the roof sheathing.

TABLE R905.1.1(1)
UNDERLAYMENT TYPES

Portions of table not shown remain unchanged.

ROOF COVERING	SECTION	MAXIMUM ULTIMATE DESIGN WIND SPEED, $V_{ult} < 140$ MPH	MAXIMUM ULTIMATE DESIGN WIND SPEED, $V_{ult} \geq 140$ MPH
Asphalt shingles	R905.2	ASTM D226 Type I or Type II ASTM D4869 Type I, II, III or IV ASTM D6757	ASTM D226 Type II ASTM D4869 Type III or Type IV ASTM D6757

For SI: 1 mile per hour = 0.447 m/s.

Reason: The proposal makes two editorial changes. The alternate for ASTM D 1970 is redundant as that standard is listed in Section R905.1.1. Table R905.1.1 (1) includes ASTM D226 Type II for high wind areas; that material is also appropriate for lower wind zone areas.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal is editorial.

Proposal # 5672

RB274-19

RB275-19

IRC@: R905.1.1, TABLE R905.1.1(1), TABLE R905.1.1(2), TABLE R905.1.1(3)

Proponent: T. Eric Stafford, representing Insurance Institute for Business and Home Safety
(testafford@charter.net)

2018 International Residential Code

Revise as follows:

R905.1.1 Underlayment. *Underlayment* for asphalt shingles, clay and concrete tile, metal roof shingles, mineral-surfaced roll roofing, slate and slate-type shingles, wood shingles, wood shakes, metal roof panels and *photovoltaic shingles* shall conform to the applicable standards listed in this chapter. *Underlayment* materials required to comply with ASTM D226, D1970, D4869 and D6757 shall bear a label indicating compliance to the standard designation and, if applicable, type classification indicated in Table R905.1.1(1). *Underlayment* shall be applied in accordance with Table R905.1.1(2). *Underlayment* shall be attached in accordance with Table R905.1.1(3).

Exceptions:

1. As an alternative, self-adhering polymer-modified bitumen *underlayment* complying with ASTM D1970 installed in accordance with both the *underlayment* manufacturer's and roof covering manufacturer's instructions for the deck material, roof ventilation configuration and climate exposure for the roof covering to be installed, shall be permitted.
2. As an alternative, a minimum 4-inch-wide (102 mm) strip of self-adhering polymer-modified bitumen membrane complying with ASTM D1970, installed in accordance with the *manufacturer's installation instructions* for the deck material, shall be applied over all joints in the roof decking. An *approved underlayment* for the applicable roof covering for ~~maximum~~ ultimate design wind speeds, V_{ult} , less than 140 miles per hour areas where wind design is not required in accordance with Figure R301.2(4)B shall be applied over the entire roof over the 4-inch-wide (102 mm) membrane strips.
3. ~~As an alternative, two layers of *underlayment* complying with ASTM D226 Type II or ASTM D4869 Type III or Type IV shall be permitted to be installed as follows in 3.1–3.4:~~
 - 3.1. ~~Apply a 19-inch-wide (483 mm) strip of *underlayment* parallel with the eave. Starting at the eave, apply 36-inch-wide (914 mm) strips of *underlayment* felt, overlapping successive sheets 19 inches (483 mm). End laps shall be 4 inches (102 mm) and shall be offset by 6 feet (1829 mm).~~
 - 3.2. ~~The *underlayment* shall be attached with corrosion-resistant fasteners in a grid pattern of 12 inches (305 mm) between side laps with a 6-inch (152 mm) spacing at side and end laps.~~
 - 3.3. ~~*Underlayment* shall be attached using metal or plastic cap nails with a nominal cap diameter of not less than 1 inch (25 mm). Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a thickness of not less than 0.010 inch (0.25 mm). Minimum thickness of the outside edge of plastic caps shall be 0.035 inch (0.89 mm).~~
 - 3.4. ~~The cap nail shank shall be not less than 0.083 inch (2.11 mm) for ring shank cap nails and 0.091 inch (2.31 mm) for smooth shank cap nails. Cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than $\frac{3}{4}$ inch (19 mm) into the roof sheathing.~~

**TABLE R905.1.1(1)
UNDERLAYMENT TYPES**

ROOF COVERING	SECTION	<u>AREAS WHERE WIND DESIGN IS NOT REQUIRED IN ACCORDANCE WITH FIGURE R301.2(4)B MAXIMUM ULTIMATE DESIGN WIND SPEED, $V_{ult} < 140$ MPH</u>	<u>AREAS WHERE WIND DESIGN IS REQUIRED IN ACCORDANCE WITH FIGURE R301.2(4)B MAXIMUM ULTIMATE DESIGN WIND SPEED, $V_{ult} \geq 140$ MPH</u>
Asphalt shingles	R905.2	ASTM D226 Type I ASTM D4869 Type I, II, III or IV ASTM D6757	ASTM D226 Type II ASTM D4869 Type III or Type IV ASTM D6757
Clay and concrete tile	R905.3	ASTM D226 Type II ASTM D2626 Type I ASTM D6380 Class M mineral- surfaced roll roofing	ASTM D226 Type II ASTM D2626 Type I ASTM D6380 Class M mineral- surfaced roll roofing
Metal roof shingles	R905.4	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV	ASTM D226 Type II ASTM D4869 Type III or Type IV
Mineral-surfaced roll roofing	R905.5	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV	ASTM D226 Type II ASTM D4869 Type III or Type IV
Slate and slate-type shingles	R905.6	ASTM D226 Type I ASTM D4869 Type I, II, III or IV	ASTM D226 Type II ASTM D4869 Type III or Type IV
Wood shingles	R905.7	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV	ASTM D226 Type II ASTM D4869 Type III or Type IV
Wood shakes	R905.8	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV	ASTM D226 Type II ASTM D4869 Type III or Type IV
Metal panels	R905.10	Manufacturer's instructions	ASTM D226 Type II ASTM D4869 Type III or Type IV
Photovoltaic shingles	R905.16	ASTM D4869 Type I, II, III or IV ASTM D6757	ASTM D4869 Type III or Type IV ASTM D6757

For SI: 1 mile per hour = 0.447 m/s.

**TABLE R905.1.1(2)
UNDERLAYMENT APPLICATION**

ROOF COVERING	SECTION	<u>AREAS WHERE WIND DESIGN IS NOT REQUIRED IN ACCORDANCE WITH FIGURE R301.2(4)B MAXIMUM ULTIMATE DESIGN WIND SPEED, $V_{ult} < 140$ MPH</u>	<u>AREAS WHERE WIND DESIGN IS REQUIRED IN ACCORDANCE WITH FIGURE R301.2(4)B MAXIMUM ULTIMATE DESIGN WIND SPEED, $V_{ult} \geq 140$ MPH</u>
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Asphalt shingles	R905.2	<p>For roof slopes from two units vertical in 12 units horizontal (2:12), up to four units vertical in 12 units horizontal (4:12), underlayment shall be two layers applied in the following manner: apply a 19-inch strip of underlayment felt parallel to and starting at the eaves. Starting at the eave, apply 36-inch-wide sheets of underlayment, overlapping successive sheets 19 inches. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. End laps shall be 4 inches and shall be offset by 6 feet. For roof slopes of four units vertical in 12 units horizontal (4:12) or greater, underlayment shall be one layer applied in the following manner: underlayment shall be applied shingle fashion, parallel to and starting from the eave and lapped 2 inches. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. End laps shall be 4 inches and shall be offset by 6 feet.</p>	<p>Same as Maximum Ultimate Design Wind Speed, $V_{ult} < 140$ mph except all laps shall be not less than 4 inches. <u>Underlayment shall be two layers applied in the following manner: apply a 19-inch strip of underlayment felt parallel to and starting at the eaves. Starting at the eave, apply 36-inch-wide sheets of underlayment, overlapping successive sheets 19 inches. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. End laps shall be 4 inches and shall be offset by 6 feet.</u></p>
Clay and concrete tile	R905.3	<p>For roof slopes from two and one-half units vertical in 12 units horizontal ($2\frac{1}{2}$:12), up to four units vertical in 12 units horizontal (4:12), underlayment shall be not fewer than two layers applied as follows: starting at the eave, apply a 19-inch strip of underlayment parallel with the eave. Starting at the eave, apply 36-inch-wide strips of underlayment felt, overlapping successive sheets 19 inches. End laps shall be 4 inches and shall be offset by 6 feet. For roof slopes of four units vertical in 12 units horizontal (4:12) or greater, underlayment shall be not fewer than one layer of underlayment felt applied shingle fashion, parallel to and starting from the eaves and lapped 2 inches. End laps shall be 4 inches and shall be offset by 6 feet.</p>	<p>Same as Maximum Ultimate Design Wind Speed, $V_{ult} < 140$ mph, except all laps shall be not less than 4 inches. <u>Underlayment shall be two layers applied in the following manner: apply a 19-inch strip of underlayment felt parallel to and starting at the eaves. Starting at the eave, apply 36-inch-wide sheets of underlayment, overlapping successive sheets 19 inches. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. End laps shall be 4 inches and shall be offset by 6 feet.</u></p>

Metal roof shingles	R905.4	Apply in accordance with the manufacturer's installation instructions.	For roof slopes from two units vertical in 12 units horizontal (2:12), up to four units vertical in 12 units horizontal (4:12), u Underlayment shall be two layers applied in the following manner: apply a 19-inch strip of underlayment felt parallel to and starting at the eaves. Starting at the eave, apply 36-inch-wide sheets of underlayment, overlapping successive sheets 19 inches. End laps shall be 4 inches and shall be offset by 6 feet. For roof slopes of four units vertical in 12 units horizontal (4:12) or greater, underlayment shall be one layer applied in the following manner: underlayment shall be applied shingle fashion, parallel to and starting from the eave and lapped 4 inches. End laps shall be 4 inches and shall be offset by 6 feet.
Mineral-surfaced roll roofing	R905.5		
Slate and slate-type shingles	R905.6		
Wood shingles	R905.7		
Wood shakes	R905.8		
Metal panels	R905.10		
Photovoltaic shingles	R905.16	For roof slopes from two units vertical in 12 units horizontal (2:12), up to four units vertical in 12 units horizontal (4:12), underlayment shall be two layers applied in the following manner: apply a 19-inch strip of underlayment felt parallel to and starting at the eaves. Starting at the eave, apply 36-inch-wide sheets of underlayment, overlapping successive sheets 19 inches. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. End laps shall be 4 inches and shall be offset by 6 feet. For roof slopes of four units vertical in 12 units horizontal (4:12) or greater, underlayment shall be one layer applied in the following manner: underlayment shall be applied shingle fashion, parallel to and starting from the eave and lapped 2 inches. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. End laps shall be 4 inches and shall be offset by 6 feet.	Same as Maximum Ultimate Design Wind Speed, $V_{ult} < 140$ mph, except all laps shall be not less than 4 inches. Underlayment shall be two layers applied in the following manner: apply a 19-inch strip of underlayment felt parallel to and starting at the eaves. Starting at the eave, apply 36-inch-wide sheets of underlayment, overlapping successive sheets 19 inches. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. End laps shall be 4 inches and shall be offset by 6 feet.

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s.

**TABLE R905.1.1(3)
UNDERLAYMENT APPLICATION**

ROOF COVERING	SECTION	AREAS WHERE WIND DESIGN IS NOT REQUIRED IN ACCORDANCE WITH FIGURE R301.2(4)B MAXIMUM ULTIMATE DESIGN WIND SPEED, $V_{ult} < 140$ MPH	AREAS WHERE WIND DESIGN IS REQUIRED IN ACCORDANCE WITH FIGURE R301.2(4)B MAXIMUM ULTIMATE DESIGN WIND SPEED, $V_{ult} \geq 140$ MPH
Asphalt shingles	R905.2	Fastened sufficiently to hold in place	The underlayment shall be attached with corrosion-resistant fasteners in a grid pattern of 12 inches between side laps with a 6-inch spacing at side and end laps. Underlayment shall be attached using <u>annular ring or deformed shank nails with 1 inch diameter metal or plastic cap s nails or cap staples with a nominal cap diameter of not less than 1 inch</u> . Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a minimum thickness of 0.010 inch. Minimum thickness of the outside edge of plastic caps shall be 0.035 inch. The cap nail shank shall be not less than 0.083 inch for ring shank cap nails and 0.091 inch for smooth shank cap nails . Staples shall be not less than 21 gage. The G cap nail shank and cap staple legs shall have a length sufficient to penetrate through the roof sheathing or not less than $\frac{3}{4}$ inch into the roof sheathing.
Clay and concrete tile	R905.3		
Photovoltaic	R905.16		
Metal roof shingles	R905.4	Manufacturer's installation instructions.	The underlayment shall be attached with corrosion-resistant fasteners in a grid pattern of 12 inches between side laps with a 6-inch spacing at side and end laps. Underlayment shall be attached using <u>annular ring or deformed shank nails with 1 inch diameter metal or plastic cap s nails or cap staples with a nominal cap diameter of not less than 1 inch</u> . Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a minimum thickness of 0.010 inch. Minimum thickness of the outside edge of plastic caps shall be 0.035 inch. The cap nail shank shall be not less than 0.083 inch for ring shank cap nails and 0.091 inch for smooth shank cap nails . Staples shall be not less than 21 gage. The G cap nail shank and cap staple legs shall have a length sufficient to penetrate through the roof sheathing or not less than $\frac{3}{4}$ inch into the roof sheathing.
Mineral-surfaced roll roofing	R905.5		
Slate and slate-type shingles	R905.6		
Wood shingles	R905.7		
Wood shakes	R905.8		
Metal panels	R905.10		

For SI: 1 inch = 25.4 mm, 1 mile per hour = 0.447 m/s.

Reason: This code change simply requires an extra layer of 30# roofing felt (ASTM D 226 Type II, or ASTM D 4869 Types III or IV) for areas vulnerable to roof covering loss and subsequent water intrusion in the hurricane-prone regions. The fastening of the underlayment remains the same as required in the 2018 IRC except the use of staples as a fastening method has been removed. The effectiveness of staples in keeping the underlayment in place when subjected to hurricane-level wind loads has not been tested. Additionally, the trigger for the enhanced underlayment has been changed to where wind design is required in accordance with Figure

R301.2(4)B. The wind design required trigger is consistent with other limitations in the IRC and would also capture areas impacted by Hurricane Michael where design wind speeds currently range from 130 mph to 140 mph. However, for the northeastern U.S. and Alaska, where the wind design required region is based on the 140 mph wind speed contour, the trigger remains the same. This proposal would also remove the enhanced underlayment requirements from the Special Wind Regions.

Water infiltration due to wind driven rain has been well documented from post-hurricane damage assessments where hurricane winds were strong enough to blow off the primary roof covering, but not strong enough to blow off roof sheathing. In such instances, significant property damage and extended occupant displacement routinely occur due to water intrusion. In many cases, the building will appear relatively undamaged from the exterior except for roof covering loss. However, a closer inspection would reveal significant interior and contents damage.

Water entry can occur where it is able to infiltrate through the roof, walls, vents, windows, and/or doors, or at interfaces between these items. Water intrusion can cause extensive damage to interior finishes, furnishings, and other contents, and can lead to ceiling collapse when attic insulation is saturated. When power is lost and/or a building cannot otherwise be dried out within 24–48 hours, additional issues such as mold can develop, potentially extending the period during which the property may not be available for use. An insurance closed claims study for residential properties conducted following Hurricane Charley in 2004 indicated interior losses and additional living expenses were 27% of the total loss costs.

Recent hurricanes have not been an exception. The following photographs show buildings damaged due to Hurricane Michael which impacted Mexico Beach and the Panama City area of Florida (other areas as well). While structurally, the buildings performed well, each had extensive interior damage likely due to wind driven rain and roof covering loss. Also, parts of North Carolina that were hit by Hurricane Florence in 2018 are in areas where the design wind speed is around 145 mph. However, these areas suffered substantial residential roof damage at winds which measured only at around 100 mph.

Tests performed by IBHS at the Research Center have consistently shown that the secondary roof underlayment strategies recommended by the IBHS Fortified Home™ - Hurricane program consistently show significantly reduced water intrusion rates when one of these strategies was employed. Two of these strategies are already recognized by the code in Exceptions 1 and 2 to Section R905.1.1. A 2011 hurricane demonstration clearly showed the benefit of sealing the seams of the roof deck sheathing which is one of the strategies recognized in Exception 2 to Section R905.1.1.

A summary of the results of the demonstration can be viewed at the following link:

<http://ibhstest.wpengine.com/ibhs-news-releases/ibhs-hurricane-demonstration-illustrates-importance-of-sealed-roof-deck-3/>.

The wind driven rain demonstration can be viewed at the following link:

<https://disastersafety.org/thunderstorms/wind-driven-rain-demo/>.

A more recent study included an assessment of a new approach where the roof is covered with two layers of high-quality underlayment attached with cap nails. Based on the performance achieved with this system, it has now been added to the FORTIFIED Home–Hurricane program as a fifth option for achieving a sealed roof deck. This report is identified in the bibliography and has been included as an attachment to this code change. All of the mitigation strategies, including the two layers of felt underlayment reduced water entry into the attic space by 70% or more.





Bibliography: Brown, T.M., Quarles, S.L., Giammanco, I.M., Brown, R., Insurance Institute for Business and Home Safety, "Building Vulnerability to Wind-Driven Rain Entry and Effectiveness of Mitigation Techniques." 14th International Conference on Wind Engineering (ICWE).

Cost Impact: The code change proposal will increase the cost of construction
If one of the methods in Exceptions 1 or 2 of Section R905.1.1 are used, this proposal will not increase the cost of construction.

If the double layer of underlayment option is used, for areas where wind design is required, the cost of the additional layer of underlayment will vary by region. However, for a 2000 square foot roof, the cost increase for the additional layer of underlayment will be between \$100 to \$200. For areas where the design wind speed is less than 140 mph but equal to or greater than 130 mph in the wind design required region, additional fasteners will be required in addition to the additional layer of underlayment.

Proposal # 4669

RB275-19

RB276-19

IRC®: TABLE R905.1.1(1), ASTM Chapter 44 (New)

Proponent: Gregory Keeler, representing Owens Corning (greg.keeler@owenscorning.com)

2018 International Residential Code

Revise as follows:

**TABLE R905.1.1(1)
UNDERLAYMENT TYPES**

ROOF COVERING	SECTION	MAXIMUM ULTIMATE DESIGN WIND SPEED, $V_{ult} < 140$ MPH	MAXIMUM ULTIMATE DESIGN WIND SPEED, $V_{ult} \geq 140$ MPH
Asphalt shingles	R905.2	ASTM D226 Type I ASTM D4869 Type I, II, III or IV ASTM D6757 <u>ASTM WK51913</u>	ASTM D226 Type II ASTM D4869 Type III or Type IV ASTM D6757 <u>ASTM WK51913</u>
Clay and concrete tile	R905.3	ASTM D226 Type II <u>ASTM WK51913</u> ASTM D2626 Type I ASTM D6380 Class M mineral-surfaced roll roofing	ASTM D226 Type II <u>ASTM WK51913</u> ASTM D2626 Type I ASTM D6380 Class M mineral-surfaced roll roofing
Metal roof shingles	R905.4	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV <u>ASTM WK51913</u>	ASTM D226 Type II ASTM D4869 Type III or Type IV <u>ASTM WK51913</u>
Mineral-surfaced roll roofing	R905.5	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV <u>ASTM WK51913</u>	ASTM D226 Type II ASTM D4869 Type III or Type IV <u>ASTM WK51913</u>
Slate and slate-type shingles	R905.6	ASTM D226 Type I ASTM D4869 Type I, II, III or IV <u>ASTM WK51913</u>	ASTM D226 Type II ASTM D4869 Type III or Type IV <u>ASTM WK51913</u>

Wood shingles	R905.7	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV <u>ASTM WK51913</u>	ASTM D226 Type II ASTM D4869 Type III or Type IV <u>ASTM WK51913</u>
Wood shakes	R905.8	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV <u>ASTM WK51913</u>	ASTM D226 Type II ASTM D4869 Type III or Type IV <u>ASTM WK51913</u>
Metal panels	R905.10	Manufacturer's instructions	ASTM D226 Type II ASTM D4869 Type III or Type IV <u>ASTM WK51913</u>
Photovoltaic shingles	R905.16	ASTM D4869 Type I, II, III or IV ASTM D6757 <u>ASTM WK51913</u>	ASTM D4869 Type III or Type IV ASTM D6757 <u>ASTM WK51913</u>

For SI: 1 mile per hour = 0.447 m/s.

Add new text as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428

ASTM WK51913 - ???? : New Specification for Mechanically Attached Polymeric Roof Underlayment Used in Steep Slope Roofing

Reason: This proposal references an ASTM Work Item for a new ASTM Standard that will apply exclusively to synthetic underlayments. The proposal simply stipulates new performance requirements for products that are already in widespread use.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal references a proposed ASTM Standard that will, for the first time, apply specific performance requirements to synthetic underlayment products that are already in widespread use and will therefore not affect the cost of construction.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM WK51913-????, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 5319

RB276-19

RB277-19

IRC@: R905.3.1

Proponent: Shahen Akelyan (shahen.akelyan@lacity.org)

2018 International Residential Code

Revise as follows:

R905.3.1 Deck requirements. Concrete and clay tile shall be installed only over solid ~~sheathing or spaced~~ structural sheathing boards.

Reason: This section is amended to require concrete and clay tiles to be installed **only** over solid structural sheathing boards. The change is necessary because there were numerous observations of tile roofs pulling away from wood framed buildings following the 1994 Northridge Earthquake. The SEAOSC/LA City Post Northridge Earthquake committee findings indicated significant problems with tile roofs was due to inadequate design and/or construction. Therefore, the amendment is needed to minimize such occurrences in the event of future significant earthquakes. This amendment will reduce the failure of concrete and clay tile roofs during a significant earthquake and is in accordance with the scope and objectives of the International Building Code.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal limits the "spaces sheathing", therefore it does not increase any cost.

Proposal # 4876

RB277-19

RB278-19

IRC@: R905.3.6 (New)

Proponent: Rick Allen, International Staple, Nail and Tool Association, representing International Staple, Nail and Tool Association (rallen@isanta.org)

2018 International Residential Code

Revise as follows:

R905.3.6 Fasteners. Nails shall be corrosion resistant and not less than 11-gage, [0.120 inch (3 mm)] ⁵/₁₆-inch (11 mm) head, and of sufficient length to penetrate the deck not less than ³/₄ inch (19 mm) or through the thickness of the deck, whichever is less. Attaching wire for clay or concrete tile shall not be smaller than 0.083 inch (2 mm). Perimeter fastening areas include three tile courses but not less than 36 inches (914 mm) from either side of hips or ridges and edges of eaves and gable rakes.

Reason: ASTM F1667-18 requires that when gage is used as a diameter for nails, a decimal equivalent must also be shown. This requirement was put in place because of the multiple and conflicting wire gage tables that are used in the manufacturing of nails.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal will not change the cost of production. It only provides clarification required by ASTM F01667-18

Proposal # 4085

RB278-19

RB279-19

IRC: R301.2.1, R905.4.4.1(New), TABLE R905.4.4.1 (New), FM Chapter 44 (New), UL Chapter 44 (New)

Proponent: Andy Williams, Metal Construction Association, representing Metal Construction Association (afwilliams@Connect2amc.com)

2018 International Residential Code

Add new text as follows:

R905.4.4.1 Wind Resistance of metal roof shingles. Metal roof shingles applied to a solid or closely fitted deck shall be tested in accordance with ASTM D3161, FM 4474, UL 580, or UL 1897. Metal roof shingles tested in accordance with ASTM D3161 shall meet the classification requirements of Table R905.4.4.1 for the appropriate maximum basic wind speed and the metal shingle packaging shall bear a label to indicate compliance with ASTM D3161 and the required classification in Table R905.2.4.1

TABLE R905.4.4.1

CLASSIFICATION OF STEEP SLOPE ROOF SHINGLES TESTED IN ACCORDANCE WITH ASTM D3161 OR D7158

<u>MAXIMUM ULTIMATE DESIGN WIND SPEED, V_{ult} FROM FIGURE R301.2(5)A (mph)</u>	<u>MAXIMUM BASIC WIND SPEED, V_{ASD} FROM TABLE R301.2.1.3 (mph)</u>	<u>ASTM D7158^a SHINGLE CLASSIFICATION</u>	<u>ASTM D3161 SHINGLE CLASSIFICATION</u>
110	85	D, G or H	A, D or E
116	90	D, G or H	A, D or E
129	100	G or H	A, D or F
142	110	G or H	E
155	120	G or H	E
168	130	H	E
181	140	H	F
194	150	H	E

For SI: 1 foot = 304.8 mm; 1 mile per hour = 0.447 m/s.

- a. The standard calculations contained in ASTM D7158 assume Exposure Category B or C and a building height of 60 feet or less. Additional calculations are required for conditions outside of these assumptions.

Revise as follows:

R301.2.1 Wind design criteria. Buildings and portions thereof shall be constructed in accordance with the wind provisions of this code using the ultimate design wind speed in Table R301.2(1) as determined from Figure R301.2(5)A. ~~A.~~ The structural provisions of this code for wind loads are not permitted where wind design is required as specified in Section R301.2.1.1. Where different construction methods and structural materials are used for various portions of a building, the applicable requirements of this section for each portion shall apply. Where not otherwise specified, the wind loads listed in Table R301.2(2) adjusted for height and exposure using Table R301.2(3) shall be used to determine design load performance requirements for wall coverings, curtain walls, roof coverings, exterior windows, skylights, garage doors and exterior doors. Asphalt shingles shall be designed for wind speeds in accordance with Section R905.2.4. Metal roof shingles shall be designed for wind

speeds in accordance with Section R905.4.4. A continuous load path shall be provided to transmit the applicable uplift forces in Section R802.11.1 from the roof assembly to the foundation.

Add new text as follows:

FM

FM Approvals
Headquarters Office
Norwood MA 02062

4474—2011: American National Standard for Evaluating the Simulated Wind Uplift Resistance of Roof Assemblies Using Static Positive and/or Negative Differential Pressures

UL

UL LLC
333 Pfingsten Road
Northbrook IL 60062

580—2006: Test for Uplift Resistance of Roof Assemblies—with Revisions through October 2013

Reason: This proposal recognizes wind resistance of "metal roof shingles" as a separate item in Section R905.4.4.1. This product is not the same in all respects as asphalt shingles (Section R905.2.4.1) which is the reason for addition of this section.

Table R905.2.4.1 is appropriate to metal roof shingles. The title is changed to reflect modifications that were made to ASTM D3161 dating back to 2013.

The major issue is that the wind uplift testing is currently addressed by multiple standards that determine compliance through uplift ratings. Metal shingle performance is not correctly represented by these current tests due to the air permeability inherent in the design of the shingle units, so a fan-induced method was developed through ASTM, with UL as a major proponent, as an alternative to the required uplift resistance testing. Manufacturers use one or more of the standards listed to determine this performance and feel they should choose the correct and most representative method to show compliance.

ASTM D3161 (Fan Induced) was originally created for asphalt shingles however the standard was expanded in 2013 to evaluate wind resistance of discontinuous, air permeable, steep slope roofing products with or without contribution from adhesives or mechanical interlocking to hold down the leading tab edge and is not limited to asphalt shingles. This clearly includes metal shingles (specifically identified in Scope Section 1.3).

ASTM D3161 removes difficulties for metal shingle manufacturers currently required to run UL 1897 or UL 580 in a non-air-permeable manner that does not fairly represent the product. UL has provided metal shingle wind classifications for many years and currently has D3161-related listings in the Online Classification Directory. UL was also a proponent of the D3161 scope change showing acceptance of D3161 as a means to demonstrate metal shingle wind resistance. The scope is clear. "This test method was formerly titled "Wind Resistance of Asphalt Shingles (Fan-Induced Method)" but was revised to acknowledge that the method is applicable to many other steep slope roofing products and has been used to evaluate the wind resistance of those products for many years by several testing and certification laboratories."

The modification to Section R301.2.1 is placed to point the reader to Section R905.4.4.1.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal introduces alternate wind resistance testing that is more appropriate to metal shingles.

Staff Analysis: The referenced standard, FM 4474-2011 and UL 580-2006/13, is currently referenced in other 2018 I-codes.

RB280-19

IRC@: R905.7.1

Proponent: David Roodvoets (davelee@ix.netcom.com)

2018 International Residential Code

Revise as follows:

R905.7.1 Deck requirements. Wood shingles shall be installed on solid or spaced sheathing. Where spaced sheathing is used, sheathing boards shall be not less than 1-inch by 4-inch (25 mm by 102 mm) nominal dimensions and shall be spaced on centers equal to the weather exposure to coincide with the placement of fasteners. Spaced sheathing shall be open to the building interior and shall not be backed with spray foam or other moisture impermeable material.

Reason: Moisture is driven into the shingles by the heating of the sun. When the back or interior side of the shingles are open to air the moisture and heat has two ways to escape the shingle, toward the inside and toward the outdoors. When foam insulation is added to the back side of the shingles, there is only one escape path. The foam also stops heat transfer and builds up the temperature of the shingle, resulting in more rapid deterioration from both moisture and heat.

Bibliography: Fiset, P. Housewraps, Felt Paper and Weather Penetration Barriers: Building Materials and Wood Technology, University of Massachusetts Amherst, 2001

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This change is primarily to stop a practice that often occurs as a retrofit. It is not a normal part of any construction process or system, but can sometimes be added to a building interior during modifications. No costs are involved when following standard construction practices.

Proposal # 4728

RB280-19

RB281-19

IRC@: R905.8.1

Proponent: David Roodvoets (davelee@ix.netcom.com)

2018 International Residential Code

Revise as follows:

R905.8.1 Deck requirements. Wood shakes shall be used only on solid or spaced sheathing. Where spaced sheathing is used, sheathing boards shall be not less than 1-inch by 4-inch (25 mm by 102 mm) nominal dimensions and shall be spaced on centers equal to the weather exposure to coincide with the placement of fasteners. Where 1-inch by 4-inch (25 mm by 102 mm) spaced sheathing is installed at 10 inches (254 mm) on center, additional 1-inch by 4-inch (25 mm by 102 mm) boards shall be installed between the sheathing boards. Spaced sheathing shall not be backed with spray foam or other moisture impermeable material.

Reason: Moisture is driven into the shakes by the heating of the sun. When the back or interior side of the shakes are open to air the moisture has two ways to escape the shake, toward the inside and toward the outdoors. When foam insulation is added to the back side of the shakes there is only one escape path. The foam also stops heat transfer and builds up the temperature in the shake resulting in more rapid deterioration from both moisture and heat.

Bibliography: Fissette P.; Housewarps, Felt Paper and Weather Penetration Barriers: Building Materials and Wood Technology. University of Massachusetts, Amherst 2001

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This change is primarily to stop a practice that often occurs as a retrofit. It is not a normal part of any construction process or system, but can sometimes be added to a building interior during modifications. No costs are involved when following standard construction practices.

Proposal # 4730

RB281-19

RB282-19

IRC®: TABLE R905.9.2, ASTM Chapter 44 (New)

Proponent: Chadwick Collins, Kellen Company, representing Asphalt Roofing Manufacturers Association (Ccollins@kellencompany.com)

2018 International Residential Code

Revise as follows:

TABLE R905.9.2
BUILT-UP ROOFING MATERIAL STANDARDS

MATERIAL STANDARD	STANDARD
Acrylic coatings used in roofing	ASTM D6083
Aggregate surfacing	ASTM D1863; D7655
Asphalt adhesive used in roofing	ASTM D3747
Asphalt cements used in roofing	ASTM D2822; D3019; D4586
Asphalt-coated glass fiber base sheet	ASTM D4601
Asphalt coatings used in roofing	ASTM D1227; D2823; D2824; D4479
Asphalt glass felt	ASTM D2178
Asphalt primer used in roofing	ASTM D41
Asphalt-saturated and asphalt-coated organic felt base sheet	ASTM D2626
Asphalt-saturated organic felt (perforated)	ASTM D226
Asphalt used in roofing	ASTM D312
Coal-tar cements used in roofing	ASTM D4022; D5643
Coal-tar primer used in roofing, dampproofing and waterproofing	ASTM D43
Coal-tar saturated organic felt	ASTM D227
Coal-tar used in roofing	ASTM D450, Type I or II
Glass mat, coal tar	ASTM D4990
Glass mat, venting type	ASTM D4897
Mineral-surfaced inorganic cap sheet	ASTM D3909
Thermoplastic fabrics used in roofing	ASTM D5665; D5726

Add new text as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428

D7655/D7655M—12: Standard Classification for Size of Aggregate Used as Ballast for Roof Membrane Systems

Reason: This proposal adds an accepted ASTM standard for specification of aggregate for built-up roofs. It also coordinates with a separate proposal providing improved provisions for parapet height and aggregate size

to control aggregate blow-off in extreme wind events.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal adds an already listed aggregate standard from the referenced standard list to the table.

Staff Analysis: The referenced standard, ASTM D7655/D7655M-12, is currently referenced in other 2018 I-codes.

Proposal # 5457

RB282-19

RB283-19

IRC®: R906.1, NFPA Chapter 44 (New)

Proponent: Mike Fischer, Kellen Company, representing The Center for the Polyurethanes Industry of the American Chemistry Council (mfischer@kellencompany.com)

2018 International Residential Code

Revise as follows:

R906.1 General. ~~The use of~~ Where above-deck thermal insulation is installed, such insulation shall be permitted provided that such insulation is covered with an *approved* roof covering and ~~complies with FM 4450 shall~~ comply with NFPA 276 or UL 1256.

Add new standard(s) as follows:

NFPA

National Fire Protection
Association
1 Batterymarch Park
Quincy MA 02169-7471

276-15: Standard Method of Fire Tests for Determining the Heat Release Rate of Roofing Assemblies with Combustible Above-deck Roofing Components

Reason: During the development of the 2012 IBC, FM 4450 was removed from the IBC requirements for roof insulation and replaced with NFPA 276. This proposal will make the code consistent with IBC Section 1508.1. FM 4450 is no longer applicable for this use. NFPA 276 is referenced in the IBC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal is editorial in nature to align with IBC requirements.

Staff Analysis: The referenced standard, NFPA 276-15, is currently referenced in other 2018 I-codes.

Proposal # 5615

RB283-19

RB284-19

IRC: R1001.13(New), UL Chapter 44 (New)

Proponent: Jonathan Roberts, representing UL LLC (jonathan.roberts@ul.com)

2018 International Residential Code

Add new text as follows:

R1001.13 Fireplace accessories. *Listed and labeled* fireplace accessories shall be installed in accordance with the conditions of the listing and the manufacturer's instructions. Fireplace accessories shall comply with UL 907.

Add new standard(s) as follows:

UL

UL LLC
333 Pfingsten Road
Northbrook IL 60062

UL 907-94: Fireplace Accessories - with revisions through November 2014

Reason: This proposal aligns the masonry fireplace requirements in the IRC with the masonry fireplace requirements in the IMC, Section 902.2.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This proposal only requires that if listed and labeled fireplace accessories are used, they shall be installed in accordance with the manufacturer's installation instructions and be listed in accordance with UL 907.

Staff Analysis: The referenced standard, UL 907-94, is currently referenced in other 2018 I-codes.

Proposal # 4843

RB284-19

RB285-19

IRC: R101.2.1 (New), Chapter 44 HUD (New), Appendix E, AJ101.4.1 (New), AJ701

Proponent: Brian Tollisen, representing Division of Building Standards and Codes, New York State Department of State (Brian.Tollisen@dos.ny.gov)

2018 International Residential Code

Add new text as follows:

R101.2.1 Manufactured Home Installation. The installation of a new manufactured home shall be in accordance with HUD 24 CFR 3285 and the manufacturer's installation instructions.

Add new standard(s) as follows:

HUD

United States Department of
Housing and Urban Development
451 7th Street S.W.,
Washington D.C. 20410
US

HUD

United States Department of
Housing and Urban Development
451 7th Street S.W.,
Washington D.C. 20410
US

24 CFR 3285: Model Manufactured Home Installation Standards

Delete without substitution:

~~E~~

~~MANUFACTURED HOUSING USED AS DWELLINGS~~

SECTION AJ101 PURPOSE AND INTENT

Add new text as follows:

AJ101.4 Relocated Manufactured Home A manufactured home that is being relocated to a new foundation system shall comply with one of the following standards:

1. The manufacturer's installation instructions for that specific model.
2. The latest installation instructions provided by the manufacturer of the manufactured home.
3. NFPA 225

AJ101.4.1 Repair, renovation, alteration and reconstruction of a manufactured home The repair, renovation, alteration and reconstruction of a manufactured home shall comply with Appendix J.

Revise as follows:

SECTION AJ701 REFERENCED STANDARDS ASTM

F2090-17 Specification for Window Fall Prevention Devices with Emergency Escape (Egress) Release Mechanisms ...AJ102.4.3, AJ102.4.4

ICC

IEBC-18 International Existing Building Code® ...AJ102.6

NFPA

225-2017: Model Manufactured Home Installation Standard, 2017 Edition....AJ101.4

Reason: This proposal will delete all of Appendix E.

All manufactured home installations are required to conform to 24 CFR 3285 - Model Manufactured Home Installation Standards. In accordance with 24 CFR 3285.2, a manufacturer of manufactured homes must provide installation instructions. Federal standards regulate the installation of a manufactured home. This proposal directly references 24 CFR 3285 within the scope of the IRC for new installations and addresses the repair, renovation, relocation, renovation and addition of manufactured homes in Appendix J.

Cost Impact: The code change proposal will increase the cost of construction

The proposal will increase the cost of construction in places that Appendix E is less restrictive than 24 CFR 3285.

Staff Analysis: A review of the standard proposed for inclusion in the code, HUD 24 CFR CFR 3285 and NFPA 225-17, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

This proposal will delete the entirety of Appendix E.

Proposal # 1367

RB285-19

RB286-19

IRC@: AF103.7 (New), AF103.7.1 (New), AF103.7.2 (New), AF103.7.3 (New), AF103.7.4 (New)

Proponent: Dan Buuck, National Association of Home Builders, representing National Association of Home Builders (dbuuck@nahb.org)

2018 International Residential Code

Add new text as follows:

AF103.7 Sidewall Vent Termination. The vent pipe shall be permitted to be routed out the side of the building and terminated at the sidewall provided the requirements of this section are met.

AF103.7.1 Vent Location. The vent termination shall be located:

1. Not less than 3 feet (914 mm) above any forced-air inlet located within 10 feet (3048 mm).
2. Not less than 4 feet (1219 mm) below, 4 feet (1219 mm) horizontally from or 1 foot (305 mm) above any door, operable window or gravity air inlet into any building. The bottom of the vent terminal shall be located not less than 12 inches (305 mm) above finished ground level.
3. Not over public walkways or over an area where condensate or vapor could create a nuisance or hazard or could be detrimental to the operation of regulators, relief valves or other equipment.
4. Not less than 12 inches (305 mm) above finished ground level.

AF103.7.2 Vent Pipe. Vent pipe joints shall be solvent welded.

AF103.7.3 Fan. A radon fan shall be installed to activate the system and shall meet the following conditions:

1. The fan shall be a listed in-line fan designed for radon mitigation and be installed in accordance with NFPA 70 and the manufacturer's installation instructions.
2. The fan shall be airtight and installed within 4 feet (1219 mm) from the point the vent passes through the wall.
3. The fan shall have ready access for repair or replacement.
4. The fan shall be connected to a system failure alarm.

AF103.7.4 Testing. The radon system shall be tested as follows:

1. Testing shall be performed after the dwelling passes its air tightness test and after the radon control system and HVAC installations are complete.
2. The radon fan and HVAC system shall be operating during the test.
3. Testing shall be performed with the windows closed.
4. Testing shall be performed with the exterior doors closed, except when being used for entrance or exit.
5. If the test result is 4 pCi/L or greater, then the system shall be modified and retested until the test result is less than 4 pCi/L.
6. The final test results shall be included with the construction documents.

Reason: The intent of this proposal is to allow sidewall venting of radon reduction systems without changing the other provisions of Appendix F. An active system is required if the sidewall venting option is chosen, but builders and owners still have the option of constructing a passive through-the-roof system. The sidewall termination option can provide advantages for those who have already decided to install a radon fan and want the benefits of simple vent routing or want to have better access to the fan for monitoring and maintenance. The side-vent option reduces ice formation on the roof vent. In cold climates ice forms on the roof vent as warm moist air meets cold outdoor air.



Research used to substantiate the U.S. requirement for roof

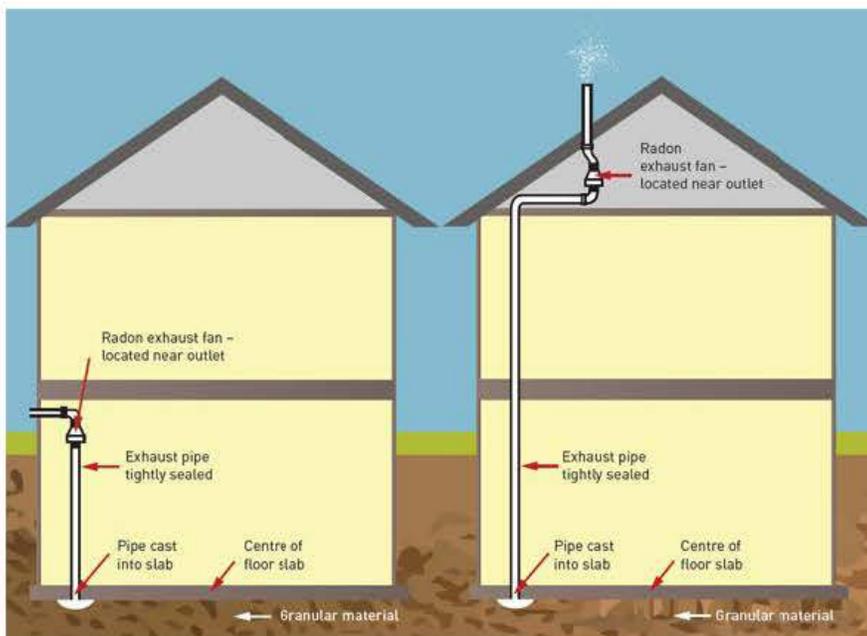


venting (Henschel, 1995) showed a negligible re-entrainment level of 0.07 pCi/L when a concentration of 25 times the EPA action level was being exhausted at grade level. At the action level of 4 pCi/L the calculated re-entrainment level would be a negligible 0.003 pCi/L. This same research has been used as substantiation to allow sidewall radon vent termination in Canada (see Health Canada, *Reducing Radon Levels in Existing Homes: A Canadian Guide for Professional Contractors*). Recent additional testing summarized below supports this view.

The following is from *Summary Report on Active Soil Depressurization (ASD) Field Study* (Health Canada, 2016), emphasis added. The 200 Bq/m³ in the quoted text below is the Canadian action level for radon.

"The second part of the study investigated how quickly radon levels dissipate with distance away from the side-wall discharge point. To do this, real-time radon dispersion measurements were conducted at 5 homes. At each home, arrays of approximately 10-15 continuous radon monitors were set up at fixed heights and distances away from where the exhaust is expelled, and measurements were conducted for a continuous period of roughly 6 hours. Generally speaking, radon levels fell from thousands of Bq/m³ to less than the 200 Bq/m³ guideline value within 1-2 metres, indicating a rapid decrease with distance.

"The long-term indoor post-mitigation results indicate that radon levels can be successfully lowered, and maintained, to levels well below the Canadian guideline value using an ASD mitigation system with an indoor mounted fan and side-wall discharge. This further implies that indoor leakage of radon from the system, and re-entry of radon into the home from the exhaust stream, were not issues of concern for the systems tested. As predicted, extreme cold climatic conditions did not cause freeze-up issues or impact the function of the ASD fan or system, as system components were not directly exposed to harsh conditions in the way they may be with the traditional geometry. The alternative, and conveniently less expensive, ASD geometry has been shown to be quite viable."

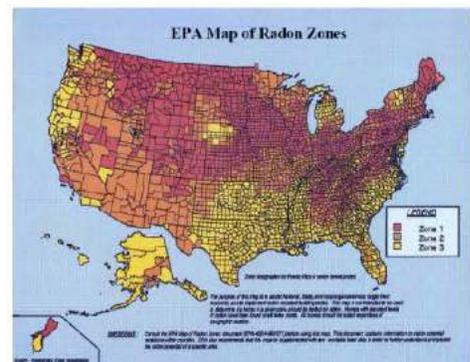
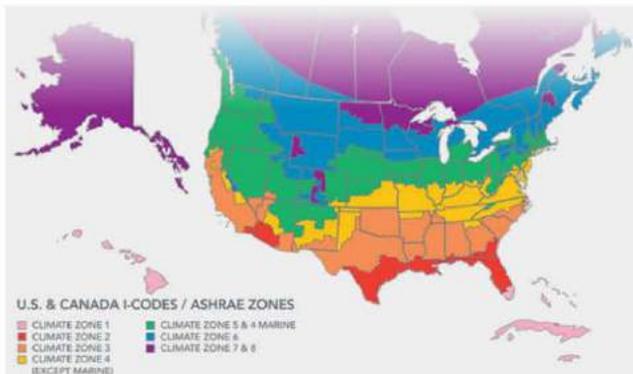




A sidewall termination can also be beneficial in cold climates where water vapor can freeze at the termination of tall, uninsulated systems, closing off the vent.

“Condensation problems can be reduced if the exhaust is discharged from a short pipe near ground level at right angles to the wall; similar to the exhausts from fan powered combustion appliances. ... A major advantage in cold weather areas is that the exposed discharge pipe is short and horizontal, reducing condensation and frost problems.”
 (Health Canada, *Reducing Radon Levels in Existing Homes: A Canadian Guide for Professional Contractors*).

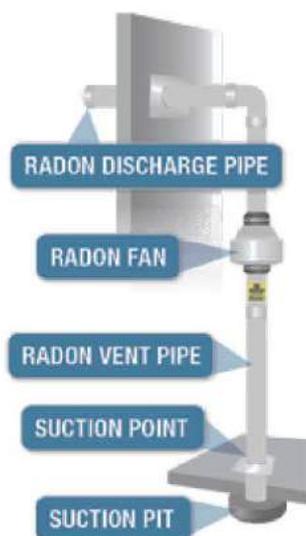
When considering how big of an issue freezing can be, it's important to note that most of the Canadian population lives near the U.S. border in climate zone 6, which is the same climate zone that covers a significant portion of the northern U.S. This is demonstrated in the figure to the left which shows IECC climate zones extended into Canada. Coincidentally, the same region covers much of radon zone 1.



(Map credit: www.greenbuildingadvisor.com/article/climate-zone-map-including-canada)

The proposed language for the vent termination clearances was taken from IRC Section G2427.8 where it applies to a mechanical draft venting system. The power source for a future fan is adequately addressed in AF103.12.

The Canadian – National Radon Proficiency Program (C-NRPP) also recognizes sidewall terminations for radon reduction systems and shows the following image on its website (<https://c-nrpp.ca/radonreduction/>). The C-NRPP was established in 2014 as an agreement between the Canadian Association of Radon Scientists and Technologists and Health Canada.



Bibliography: Henschel, D. (1995). Re-Entrainment and Dispersion of Exhausts from Indoor Radon Reductions Systems: Analysis of Tracer Gas Data. *Indoor Air* 5(4):270-284.

https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NRMRL&dirEntryId=128594.

Health Canada. (2010). Reducing Radon Levels in Existing Homes: A Canadian Guide for Professional Contractors. www.hc-sc.gc.ca/ewh-semt/pubs/radiation/radon_contractors-entrepreneurs/index-eng.php.

Health Canada. (2014). Radon Reduction Guide for Canadians.

www.canada.ca/en/healthcanada/services/environmental-workplace-health/reports-publications/radiation/radonreduction-guide-canadianshealth-canada-2013.html.

Health Canada. (2016). Summary Report on Active Soil Depressurization (ASD) Field Study.

www.canada.ca/en/healthcanada/services/environmental-workplace-health/radiation/radon/summary-report-activesoil-depressurization-fieldstudy.html.

"Understanding a Radon Mitigation System." Canadian – National Radon Proficiency Program, <https://cnrpp.ca/radonreduction/>.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. Installing an active radon system with a sidewall termination is an option, and the passive, through-the-roof option is still available.

Proposal # 4478

RB286-19

RB287-19

IRC@: AF103.13 (New), AF103.14 (New)

Proponent: David Kapturowski, American Association of Radon Scientists and Technicians and Spruce Environmental Technologies, Inc., representing AARST & Spruce Environmental Technologies, Inc.; Jane Malone (janemalonedc@gmail.com)

2018 International Residential Code

Add new text as follows:

AF103.13 Testing. The building or dwelling unit shall be tested and verified as having an indoor radon level less than the USEPA Action level of 4 picocuries per liter (pCi/L). Testing shall be conducted in accordance with ANSI/AARST MAH. Where required by the *code official* testing shall be provided by an approved third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*. Testing shall be conducted at any time after the completion of the building thermal envelope, with all doors and windows in place, and after the building heating and cooling systems are installed.

AF103.14 Mitigation. Where testing results indicate the radon level is 4 pCi/L or greater steps shall be taken to mitigate radon levels, including the installation of a radon fan in the anticipated location prescribed in Section AF103.12. Where required by the *code official* mitigation shall be provided by an approved third party. Testing as prescribed in Section AF103.13 shall be repeated until results are below 4 pCi/L.

Reason: This proposal updates Appendix F Radon Control Methods by adding new requirements for Radon Testing and Mitigation. Radon is an odorless, colorless radioactive that can only be detected through a radon test. Various inexpensive test methods are available. If the test results exceed the USEPA Action Level of 4 picocuries per liter (pCi/L) then the excess gas can be removed by adding a radon fan to the preliminary system properly installed per Appendix F. An active radon mitigation system can be up to 99% effective in removing radon gas from a home.

Bibliography: Add Referenced Standards:

AARST/ANSI MAH - Protocol For Conducting Measurements Of Radon And Radon Decay Products In Homes

Cost Impact: The code change proposal will increase the cost of construction. Radon testing can cost between \$20 and \$125 depending on the type of test and who performs the test. Only if excess levels of radon are detected will a radon fan will need to be added which will increase the cost between \$100 and \$300.

Staff Analysis: A review of the standard proposed for inclusion in the code, ANSI/AARST MAH, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 5515

RB287-19

RB288-19

IRC®: SECTION AF101, AF101.1, SECTION AF102, AF102.1, , (New), SECTION AF103, AF103.1, AF103.2, FIGURE AF103, AF103.6, AF103.3.1 (New), AF103.3.2 (New), AF103.3, AF103.5, AF103.5.3, AF103.5.2, AF103.6.1, AF103.5.1, AF103.7, AF103.9, AF103.10, AF103.6.2, AF103.5.6 (New), AF103.8, AF103.5.6.2 (New), AF103.12, AF103.4, AF103.4.1, AF103.4.2, AF103.4.4, AF103.4.5, AF103.4.10, AF103.4.3, AF103.4.6, AF103.4.7, AF103.4.8, AF103.4.9, AF103.11, FIGURE AF101, TABLE AF101(1), ASTM Chapter 44 (New)

Proponent: Jane Malone, American Association of Radon Scientists and Technologists, representing American Association of Radon Scientists and Technologists (jmalone@aarst.org); David Kapturowski, representing AARST & Spruce Environmental Technologies, Inc. (dave@spruce.com)

2018 International Residential Code

SECTION AF101 SCOPE

Revise as follows:

AF101.1 General. This appendix contains requirements for radon control methods in new construction .new construction in ~~jurisdictions~~ where radon-resistant construction is required. Inclusion of this appendix by jurisdictions shall be determined through the use of locally available data or determination of Zone 1 designation in Figure AF101 and Table AF101(1)

Add new definition as follows:

SECTION AF102 DEFINITIONS

AF102.1 General. For the purpose of these requirements, the terms used shall be defined as follows:

Delete without substitution:

~~**DRAIN TILE LOOP.** A continuous length of drain tile or perforated pipe extending around all or part of the internal or external perimeter of a *basement* or crawl space footing.~~

Revise as follows:

~~**RADON GAS.** A naturally occurring, chemically inert, radioactive gas that is not detectable by human senses. As a gas, it can move readily through particles of soil and rock, and can accumulate under the slabs and foundations of homes where it can easily enter into the living space through construction cracks and openings. The element Rn, which is a radioactive colorless, odorless, tasteless, cancer-causing gas that occurs naturally as a decay product of radium.~~

Add new definition as follows:

RADON ROUGH-IN. The installation of all parts and materials of sub-membrane or sub-slab depressurization system including gas permeable layers, soil gas retarders, membranes, piping, connectors, terminations, and power sources.

SOIL-GAS-RETARDER. A continuous membrane of 6-mil (0.15 mm) polyethylene or other equivalent material used to retard the flow of soil gases into a building.

Revise as follows:

SUBMEMBRANE DEPRESSURIZATION SYSTEM. A system designed to achieve lower submembrane air pressure relative to crawl space air pressure by use of a fan-powered vent drawing air from beneath the soil-gas-retarder membrane.

SUBSLAB DEPRESSURIZATION SYSTEM (Active) . A system designed to achieve lower ~~subslab~~ air pressure relative to indoor sub-slab air pressure by use of a fan-powered vent drawing air from beneath the slab.

Delete without substitution:

~~**SUBSLAB DEPRESSURIZATION SYSTEM (Passive).** A system designed to achieve lower subslab air pressure relative to indoor air pressure by use of a vent pipe routed through the *conditioned space* of a building and connecting the subslab area with outdoor air, thereby relying on the convective flow of air upward in the vent to draw air from beneath the slab.~~

SECTION AF103 REQUIREMENTS

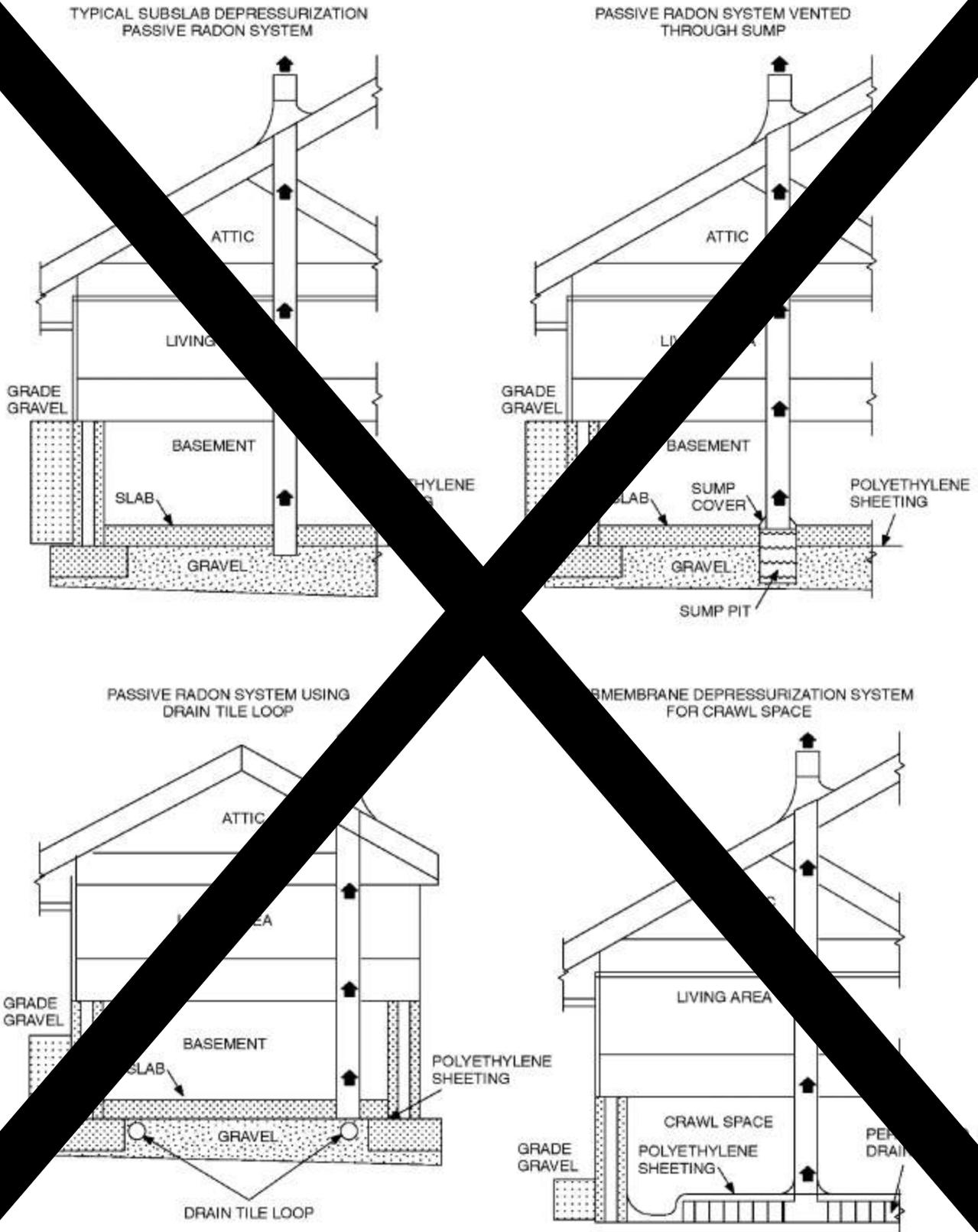
Revise as follows:

AF103.1 General. The following construction techniques are intended to resist radon entry and prepare the building for post-construction radon mitigation, if necessary (~~see Figure AF103~~). ~~These techniques are required in areas where designated by the *jurisdiction* .~~

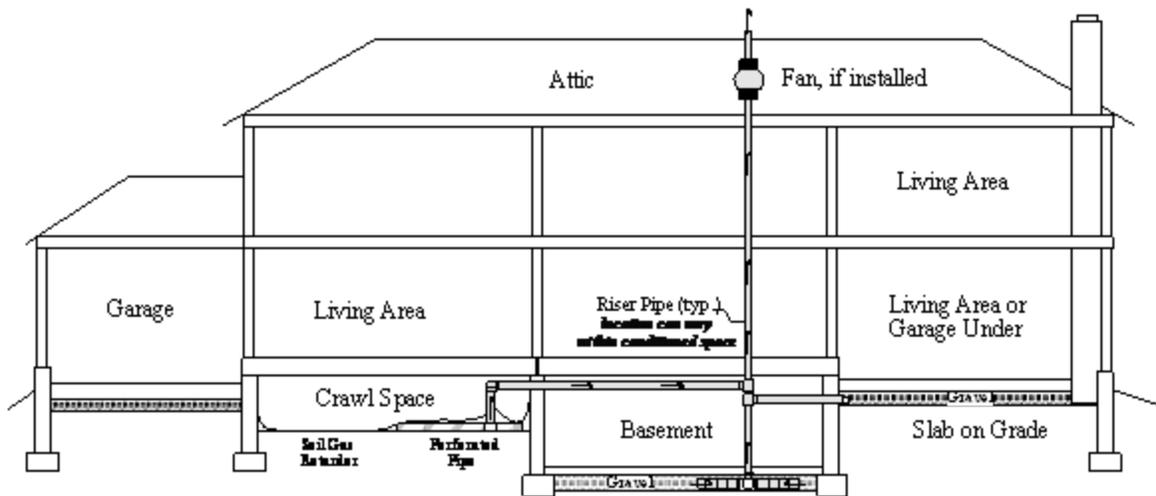
AF103.2 ~~Subfloor preparation.~~ Radon Rough-In A radon rough-in is required for all foundation types, including crawlspace, basement, slab on grade, and slab on grade garage located below a living area as shown in Figure AF103.2. The rough-in shall be installed prior to pouring of concrete slabs, closure of building cavities, and installation of finish materials. ~~layer of gas permeable material shall be placed under all concrete slabs and other floor systems that directly contact the ground and are within the walls of the living spaces of the building, to facilitate future installation of a subslab depressurization system, if needed. The gas permeable layer shall consist of one of the following:~~

- ~~1. A uniform layer of clean aggregate, not less than 4 inches (102 mm) thick. The aggregate shall consist of material that will pass through a 2-inch (51 mm) sieve and be retained by a $\frac{1}{4}$ -inch (6.4 mm) sieve.~~
- ~~2. A uniform layer of sand (native or fill), not less than 4 inches (102 mm) thick, overlain by a layer or strips of geotextile drainage matting designed to allow the lateral flow of soil gases.~~
- ~~3. Other materials, systems or floor designs with demonstrated capability to permit depressurization across the entire subfloor area.~~

Delete and substitute as follows:



**FIGURE AF103
RADON-RESISTANT CONSTRUCTION DETAILS FOR FOUR FOUNDATION TYPES**



**FIGURE AF103.2
FOUNDATION TYPES**

Revise as follows:

AF103.6 ~~AF103.3~~ **Passive subslab** ~~Sub-slab depressurization system; system rough-in.~~ In basement or slab-on-grade buildings, the following components of a ~~passive subslab~~ **sub-slab depressurization system** shall be installed during ~~construction~~ **construction** in accordance with Sections AF103.3.1 through AF103.3 and AF103.5 through AF103.6.5.

Add new text as follows:

AF103.3.1 Gas Permeable Layer A gas-permeable layer shall be constructed under all concrete slabs and other floor systems that directly contact the ground and are within the walls of the living spaces of the building. The gas-permeable layer shall consist of one of the following:

1. A uniform layer of clean aggregate, not less than 4 inches [102 mm] in depth, shall be placed over the soil. The aggregate shall have a void ratio of not less than 35 percent or a Size Number 4, 5, 56, or 6 as classified by ASTM C33.
2. A uniform layer of native or fill sand, a minimum of 4 inches [102 mm] in depth, overlain by a layer or strips of geotextile drainage matting. The geotextile drainage matting shall have a cross-sectional area of at least 12 square inches [774 sq mm]. The closest edge of the geotextile matting shall be placed no closer than 12 inches [305 mm] to the foundation wall around the interior of the foundation perimeter.
3. A loop of 4 inch [102 mm] nominal or larger size perforated pipe placed in a trench along the perimeter of the foundation, with the trench backfilled with clean aggregate having a void ratio of not less than 35 percent or a Size Number 4, 5, 56, or 6 as classified by ASTM C33 such that the pipe is surrounded by aggregate for at least 1/3 of the outside pipe circumference. The pipe shall be placed no closer than 12 inches [305 mm] to the foundation wall around the interior of the foundation perimeter.
4. A loop of interconnected stay-in-place forms used to cast the foundation footing in accordance with 404.1.3.3.6 that is left in place to provide ground water control and provide a separate channel above the ground water channel for soil gas ventilation, with a cross sectional area no less than 12 square inches [77 sq. cm].
5. Other materials, systems or floor designs with demonstrated capability to allow the lateral flow of soil gases from across the entire sub-floor area.

AF103.3.2 Vent pipe connector. A 4 inch [102 mm] nominal diameter tee fitting or equivalent method shall be used to secure the vent pipe opening within the gas permeable layer. Not less than 4 feet [1219 mm] of perforated pipe or geotextile matting shall be connected to each of the two horizontal openings of the tee fitting or the two horizontal openings shall be connected to the interior drain tile system. Alternatively, a sealed sump

cover where the sump communicates directly with the sub-slab aggregate or communicates with it through a drainage system, shall secure the vent pipe opening. A flexible rubber coupling connector shall be provided at the sump cover connection to facilitate servicing the sump.

Revise as follows:

~~AF103.3~~ AF103.3.3 Soil-gas-retarder. A minimum 6-mil (0.15 mm) [or 3-mil (0.075 mm) cross-laminated] polyethylene or equivalent flexible sheeting material shall be placed on top of the gas-permeable layer prior to casting the slab or placing the floor assembly ~~to serve as a soil-gas-retarder by bridging any cracks that develop in the slab or floor assembly, and to prevent concrete from entering the void spaces in the aggregate base material.~~ The sheeting shall cover the entire floor area with separate sections of sheeting lapped not less than 12 inches (305 mm) .The sheeting shall fit closely around any and extend up the surrounding foundation walls not less than 4 inches [101 mm]. Openings in the sheeting caused by pipe, wire or and other penetrations of the material. shall be sealed. Punctures or tears in the material shall be sealed or covered with additional sheeting.

~~AF103.5~~ AF103.4 Passive submembrane Sub-membrane depressurization system. system rough-in. In buildings with a crawl space foundations foundation, the following components of a passive submembrane sub-membrane depressurization system shall be installed during eonstruction. construction in accordance with Sections AF103.4.1 through AF103.6.5.

Exceptions: Exception:

1. Buildings in which an *approved* mechanical crawl space ventilation system ~~or other equivalent system is installed.~~ is installed.
2. Where the soil gas retarder will be covered with concrete, the requirements of Section AF103.3.2 shall apply.

~~AF103.5.3~~ AF103.4.1 Vent pipe. pipe connector. A plumbing tee or other *approved* connection fitting shall be inserted horizontally beneath the sheeting and connected to a 3- or 4-inch diameter (76 or 102 mm) fitting with a vertical vent pipe installed through the sheeting. The vent pipe shall be extended up through the building floors, and terminate not less than 12 inches (305 mm) above the roof in a location not less than 10 feet (3048 mm) away from any window or other opening into the *conditioned spaces* of the building that is less than 2 feet (610 mm) below the exhaust point, and 10 feet (3048 mm) from any window or other opening in adjoining or adjacent buildings. soil gas membrane with not less than 10 feet of perforated pipe connected to each of the two horizontal openings of such fitting or the two horizontal openings of the tee fitting shall connect to the interior drain tile system. The branch opening of the tee fitting shall be connected to the vent pipe in accordance with Section AF103.5.

~~AF103.5.2~~ AF103.4.2 Soil-gas-retarder. Soil gas membrane. The soil in crawl spaces shall be covered with a continuous layer of minimum 6-mil (0.15 mm) polyethylene soil-gas retarder. ~~The ground cover soil gas membrane complying with ASTM E1745 Class A, B or C. The membrane shall be lapped not less than 42-6 inches (305-152 mm) at joints , and shall extend upwards 12 inches (305 mm) and be sealed to all foundation walls enclosing the crawl space area. Seams shall be sealed with polyurethane caulk complying with ASTM C920 class 25 or higher, or taped or equivalent method, installed in accordance with the manufacturer's recommendations.~~

~~AF103.6.1~~ AF103.5 Vent pipe. A minimum 3-inch diameter (76 mm) ABS, PVC or equivalent 3 inch [76 mm] nominal size or larger gas-tight pipe shall be embedded vertically into the subslab aggregate or other permeable material before the slab is cast. A "T" fitting or equivalent method shall be used to ensure that the pipe opening remains within the subslab permeable material. Alternatively, the 3-inch (76 mm) pipe shall be inserted directly into an interior perimeter drain tile loop or through a sealed sump cover where the sump is exposed to the subslab aggregate or connected to it through a drainage system.

~~The pipe shall be extended extended from the tee fitting up through the building floors, in accordance with Sections AF103.5.1 through AF103.5.6. Materials used shall comply with Section P3002.1, and terminate not less than 12 inches (305 mm) above the surface of the roof in a location not less than 10 feet (3048 mm) away from any window or other opening into the conditioned spaces of the building that is less than 2 feet (610 mm) below the exhaust point, and 10 feet (3048 mm) from any window or other opening in adjoining or adjacent buildings.~~

AF103.5.1 Ventilation. Vent pipe termination. ~~Crawl spaces shall be provided with vents to the exterior of the building. The minimum net area of ventilation openings shall comply with Section R408.1. The vent pipe shall terminate vertically upward not less than 12 inches [305 mm] above the roof and in a location not less than two feet [51 mm] vertically above, or not less than 10 feet [3048 mm] measured in any other direction, from openings in the building and adjacent buildings including windows, doors and other gravity air intake openings, exclusive of attic ventilation openings. Where a screen is installed on the terminus of radon exhaust pipe to prevent the entry of animals, such screen shall have a mesh size with a dimension of not less than 0.5 inch (12.7mm).~~

~~**AF103.7 AF103.5.2 Vent pipe drainage.** Components of the The radon vent pipe system shall be installed to provide positive condensate drainage to the ground beneath the slab or soil-gas-retarder membrane. The pipe shall not be trapped and shall have a minimum slope of one-eighth inch per foot (1 percent slope).~~

~~**AF103.9 AF103.5.3 Vent pipe identification.** Exposed and visible interior radon vent pipes shall be identified with not less than one label on each floor and in accessible attics attics. The label shall read: "Radon Reduction System." "This pipe is a component of a radon control system. A radon test is necessary to verify that the radon level is below the level recommended by the US EPA." The height of the label lettering shall be not less than 0.25 inch [6.35 mm].~~

~~**AF103.10 AF103.5.4 Combination foundations.** Combination basement/crawl space or slab-on-grade/crawl space foundations shall have separate radon vent pipes installed in each type of foundation area. Each radon vent pipe shall terminate above the roof or shall be connected Where more than one type of foundation is present, each foundation area shall have a separate radon vent pipe and soil gas collector. Vent pipes shall connect to a single vent that terminates above the roof or each individual vent pipe shall terminate separately above the roof.~~

~~**AF103.6.2 AF103.5.5 Multiple vent pipes. Separate foundation areas** In buildings where interior footings or other barriers separate the subslab aggregate or other gas-permeable material foundation areas, each area shall be fitted with an individual vent pipe. pipe or a pipe loop or equivalent method shall connect such areas below the slab. Vent pipes shall connect to a single vent that terminates above the roof or each individual vent pipe shall terminate separately above the roof.~~

Add new text as follows:

AF103.5.6 Provisions for radon fan. To facilitate possible installation of a radon fan, compliance with Sections AF103.5.6.1 through AF103.5.6.3 shall be required.

Revise as follows:

~~**AF103.8 AF103.5.6.1 Vent pipe accessibility.** Radon vent pipes shall be accessible for future fan installation through provided with access in an attic or other area outside the habitable space for the purpose of installing a fan. The pipe shall be centered in an unobstructed cylindrical space having a vertical height of not less than 48 inches [122 cm] and a diameter of not less than 21 inches [53 cm] in the location where a fan would be installed.~~

Exception: Where an approved electrical supply is installed on the roof ~~**Exception:** The radon vent pipe~~

need not be accessible in an ~~attic space where an approved roof-top electrical supply is provided for future use.~~

Add new text as follows:

AF103.5.6.2 Radon fan location. Fans shall be located outdoors, in attics or in garages that are not beneath conditioned spaces. Fans shall not be installed below ground, in conditioned spaces, in occupiable spaces of a building or in any basement, crawlspace or other interior location that is directly beneath a conditioned or occupiable space of a building. Fans shall not be installed in any location where pipe positively pressured by the fan would be located inside conditioned or occupiable space.

Revise as follows:

~~AF103.12~~ **AF103.5.6.3 Power source.** To provide for future installation of an active submembrane or subslab depressurization system a radon fan, an electrical circuit ~~terminated that terminates~~ in an approved junction box shall be installed during construction in the *attic* or other anticipated location of vent pipe fans. An electrical supply shall be accessible in anticipated locations of system failure alarms. of a fan.

~~AF103.4~~ **AF103.6 Entry routes.** Potential radon entry routes shall be closed in accordance with Sections ~~AF103.4.1~~ AF103.6.1 through ~~AF103.4.10~~ AF103.6.5.

~~AF103.4.1~~ **AF103.6.1 Floor openings.** Openings around bathtubs, showers, water closets, pipes, wires ~~or~~ and other objects that penetrate concrete slabs ~~or other floor assemblies~~ shall be filled with a polyurethane caulk or equivalent sealant applied in accordance with the manufacturer's recommendations. sealed in a permanent manner. Exception: Sealing is not required for floors above conditioned spaces.

~~AF103.4.2~~ **AF103.6.2 Concrete joints.** ~~Control~~ Isolation joints, ~~isolation joints~~, construction joints, and any other joints in concrete slabs or between slabs and foundation walls shall be sealed with a caulk or sealant. Gaps and joints shall be cleared of loose material and filled with polyurethane caulk ~~or other elastomeric sealant~~ applied complying with ASTM C920 class 25 or higher or equivalent method installed in accordance with the manufacturer's recommendations.

~~AF103.4.4~~ **AF103.6.3 Sumps.** Sump pits open to soil or serving as the termination point for subslab or exterior drain tile loops shall be covered with a gasketed or otherwise sealed lid. Sumps used as the suction point in a subslab depressurization system shall have a lid designed to accommodate the vent pipe. Sumps used as a floor drain shall have a lid equipped with a trapped inlet.

~~AF103.4.5~~ **AF103.6.4 Foundation walls.** Hollow block masonry foundation walls shall be constructed with either a continuous course of *solid masonry*, one course of masonry grouted solid, or a solid concrete beam at or above finished ground surface to prevent the passage of air from the interior of the wall into the living space. Where a brick veneer or other masonry ledge is installed, the course immediately below that ledge shall be sealed. Joints, cracks ~~or~~ and other openings around all penetrations of both exterior and interior surfaces of masonry block or wood foundation walls below the ground surface shall be filled with polyurethane caulk ~~or equivalent sealant~~. complying with ASTM C920 class 25 or higher, or equivalent method installed in accordance with the manufacturer's recommendations. Penetrations of concrete walls shall be filled.

~~AF103.4.10~~ **AF103.6.5 Crawl space access.** Access doors and other openings or penetrations between *basements* and adjoining crawl spaces shall be closed, gasketed or otherwise filled to prevent air leakage. leakage. Exception: Air sealing is not required for conditioned crawl spaces.

Delete without substitution:

~~AF103.4.3~~ **Condensate drains.** Condensate drains shall be trapped or routed through nonperforated pipe to daylight.

~~**AF103.4.6 Dampproofing.** The exterior surfaces of portions of concrete and masonry block walls below the ground surface shall be dampproofed in accordance with Section R406.~~

~~**AF103.4.7 Air-handling units.** Air-handling units in crawl spaces shall be sealed to prevent air from being drawn into the unit.~~

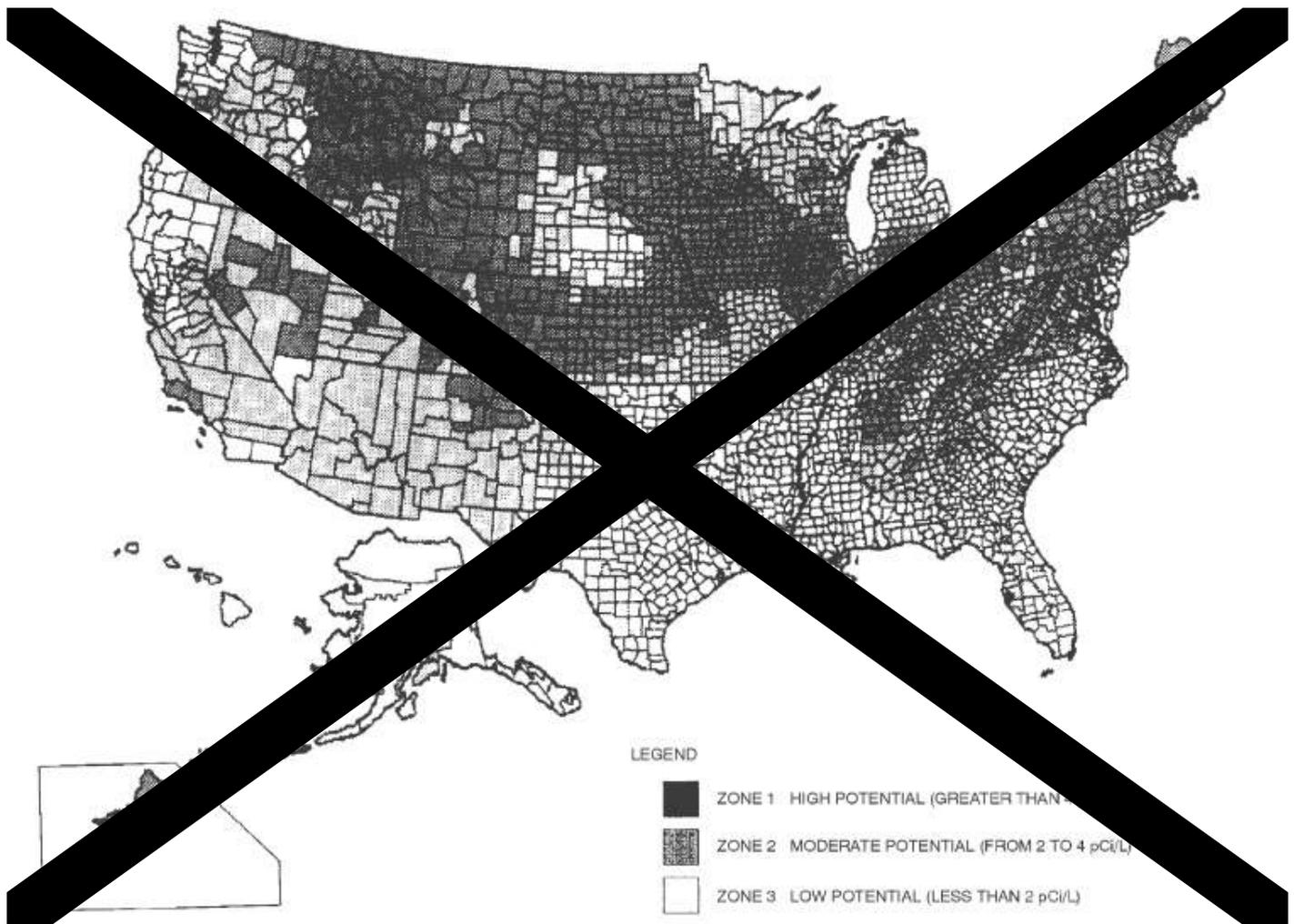
~~**Exception:** Units with gasketed seams or units that are otherwise sealed by the manufacturer to prevent leakage.~~

~~**AF103.4.8 Ducts.** Ductwork passing through or beneath a slab shall be of seamless material unless the air-handling system is designed to maintain continuous positive pressure within such ducting. Joints in such ductwork shall be sealed to prevent air leakage.~~

~~Ductwork located in crawl spaces shall have seams and joints sealed by closure systems in accordance with Section M1601.4.1.~~

~~**AF103.4.9 Crawl space floors.** Openings around all penetrations through floors above crawl spaces shall be caulked or otherwise filled to prevent air leakage.~~

~~**AF103.11 Building depressurization.** Joints in air ducts and plenums in *unconditioned spaces* shall meet the requirements of Section M1601. Thermal envelope air infiltration requirements shall comply with the energy conservation provisions in Chapter 11. Fireblocking shall meet the requirements contained in Section R302.11.~~



a. pCi/L standard for picocuries per liter of radon gas. The U.S. Environmental Protection Agency (EPA) recommends that homes that measure 4 pCi/L and greater be mitigated.

The EPA and the U.S. Geological Survey have evaluated the radon potential in the United States and have developed a map of radon zones designed to assist *building officials* in deciding whether radon-resistant features are applicable in new construction.

The map assigns each of the 3,141 counties in the United States to one of three zones based on radon potential. Each zone designation reflects the average short-term radon measurement that can be expected to be measured in a building without the implementation of radon-control methods. The radon zone designation of highest priority is Zone 1. Table AF101 lists the Zone 1 counties illustrated on the map. More detailed information can be obtained from state-specific booklets (EPA 402-R-93-021 through 070) available through State Radon Offices or from EPA Regional Offices.

**FIGURE AF101
EPA MAP OF RADON ZONES**

TABLE AF101(1)
HIGH RADON-POTENTIAL (ZONE 1) COUNTIES*

Delete table in its entirety

Add new standard(s) as follows:

E1745: Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs

Reason: This code change proposal improves Appendix F by clarifying some construction details, resolving longstanding editorial issues and addressing a few significant installation problems that impact the effectiveness of radon control in new construction.

The requirement subsections are renumbered to facilitate deletions of redundant material and reorganization. The narrative statement below refers to the subsection numbers in the *proposed* text.

- Additional detail has been provided on the vent pipe connector in Section AF103.3.3, the connection between the vertical radon vent pipe and the gas permeable layer below the crawl space or slab. This connection has suffered from consistent clogging with soil, concrete and/or gravel. A requirement for a couple of short lengths of perforated piping in the gas permeable layer and clarification that the tee fitting shall secure the vent pipe will largely prevent this clogging.
- Another latent problem which occurs often in the field is that the vent piping is routed through the attic space without allowing access to the vent pipe and leaving insufficient headroom for a fan if system activation is required. Space considerations are provided to address this problem in Section AF103.5.6. Fan installation remains outside of the scope of AF103.5.6.
- Section AF103.4.1, the required 12-inch lapping of joints is reduced to 6 inches, and extension of the soil gas retarder upward on foundation walls for subslabs is added to match the extension on walls for crawl spaces.
- Clearances to prevent radon entry from the exhaust pipe are clarified, and prevention of pipe obstruction by screening material is added, both within Section AF03.5.1.
- In Section AF103.5.3, the vent pipe identification is expanded to clarify the limit of Appendix F radon control.
- Lack of sealing of the submembrane soil gas retarder creates problems in systems installed in homes with crawl spaces. In this proposal, sealing is added (except for where the crawl space will be covered by concrete and where crawl space ventilation exists) to

Several editorial changes clarify and simplify the Appendix without expanding requirements. Along with some fairly self-explanatory edits, these changes include:

- Section AF101 specifies that the scope of the appendix is “radon control methods in new construction.”
- Section AF101 would no longer include references to EPA radon zone 1, zone 1 county lists, or the EPA radon map. Voluntary use of the Appendix by builders and adoptions in jurisdictions beyond Zone 1 reduce the applicability of these materials. According to the Home Innovations Research Lab report “Radon-Resistant Construction Practices in New U.S. Homes 2016” [see bibliography] 24% of 2016 homes in Zone 2 were built with radon control. In 2016 the State of Connecticut adopted radon control for all counties; previously Minnesota and Illinois did the same. Local jurisdictions are adopting the Appendix.
- In AF102, the definition of radon gas is simplified, a universal term, radon rough-in, is added to clarify the type of system allowed by Appendix F, and duplicative references to active and passive subslab methods are deleted in favor of a single definition for subslab systems.

- In Section AF103.3.1 Gas Permeable Layer, an option for using stay-in-place forms per 404.1.3.3.6 is added to the choices, and the specification allowing for “the lateral flow of gases” is moved from the initial sentence to the fifth and final option.
- The description of materials for vent pipes in Section AF103.5 was changed from “ABS, PVC or equivalent” to “comply with P3002.1.”
- Redundancies with other code requirements for ventilation, foundation and condensate drains, damp proofing, and air handler sealing have been removed.
- An exception for sealing for floors above conditioned spaces is added in AF 103.6.1.
- Sealing requirements for control joints were eliminated in AF 103.6.2.

Most of the changes in this proposal were presented by the proponent in code change proposal or public comment in 2016.

Below for ease of review is the text that would result from the proposed revisions:

APPENDIX F

RADON CONTROL METHODS

AF101.1 General. This appendix contains requirements for radon control methods in new construction.

SECTION AF102 DEFINITIONS

AF102.1 General. For the purpose of these requirements, the terms used shall be defined as follows:

RADON GAS. The element Rn-222, which is a radioactive, colorless, odorless, tasteless, cancer-causing gas that occurs naturally as a decay product of radium.

RADON ROUGH-IN. The installation of all parts and materials of submembrane or subslab depressurization system including gas permeable layers, soil gas retarders, membranes, piping, connectors, terminations, and power sources.

SOIL-GAS-RETARDER. A continuous membrane of 6-mil [0.15 mm] polyethylene or other equivalent material used to retard the flow of soil gases into a building.

SUBMEMBRANE DEPRESSURIZATION SYSTEM. System designed to achieve lower sub-membrane air pressure relative to crawl space air pressure by use of a fan powered vent drawing air from beneath the soil gas retarder membrane.

SUBSLAB DEPRESSURIZATION SYSTEM. System designed to achieve lower sub-slab air pressure by use of a fan-powered vent drawing air from beneath the floor slab.

SECTION AF103 REQUIREMENTS

AF103.1 General. AF103 is intended to reduce radon entry and prepare the building for post-construction radon mitigation if necessary.

AF103.2 Radon Rough-in. A rough-in is required for all foundation types, including crawlspace, basement, slab on grade, and slab on grade garage located below a living area as shown in Figure AF103.2. The rough-in shall be installed prior to pouring of concrete slabs, closure of building cavities, and installation of finish materials.
Figure AF103.2 Foundation Types

AF103.3 Sub-slab depressurization system rough-in. In basement or slab-on-grade buildings, the components of a sub-slab depressurization system shall be installed during construction in accordance with AF103.3.1 through AF103.3 and AF103.5 through AF103.6.5.

AF103.3.1 Gas permeable layer. A gas-permeable layer shall be constructed under all concrete slabs and other floor systems that directly contact the ground and are within the walls of the living spaces of the building. The gas-permeable layer shall consist of one of the following:

A uniform layer of clean aggregate, not less than 4 inches [102 mm] in depth, shall be placed over the soil. The aggregate shall have a void ratio of not less than 35 percent or a Size Number 4, 5, 56, or 6 as classified by

ASTM C33.

A uniform layer of native or fill sand, a minimum of 4 inches [102 mm] in depth, overlain by a layer or strips of geotextile drainage matting. The geotextile drainage matting shall have a cross-sectional area of at least 12 square inches [774 sq mm]. The closest edge of the geotextile matting shall be placed no closer than 12 inches [305 mm] to the foundation wall around the interior of the foundation perimeter.

A loop of 4 inch [102 mm] nominal or larger size perforated pipe placed in a trench along the perimeter of the foundation, with the trench backfilled with clean aggregate having a void ratio of not less than 35 percent or a Size Number 4, 5, 56, or 6 as classified by ASTM C33 such that the pipe is surrounded by aggregate for at least 1/3 of the outside pipe circumference. The pipe shall be placed no closer than 12 inches [305 mm] to the foundation wall around the interior of the foundation perimeter.

A loop of interconnected stay-in-place forms used to cast the foundation footing in accordance with 404.1.3.3.6 that is left in place to provide ground water control and provide a separate channel above the ground water channel for soil gas ventilation, with a cross sectional area no less than 12 square inches [77 sq. cm].

Other materials, systems or floor designs with demonstrated capability to allow the lateral flow of soil gases from across the entire sub-floor area.

AF103.3.2 Vent pipe connector. A 4 inch [102 mm] nominal diameter tee fitting or equivalent method shall be used to secure the vent pipe opening within the gas permeable layer. Not less than 4 feet [1219 mm] of perforated pipe or geotextile matting shall be connected to each of the two horizontal openings of the tee fitting or the two horizontal openings shall be connected to the interior drain tile system. Alternatively, a sealed sump cover where the sump communicates directly with the sub-slab aggregate or communicates with it through a drainage system, shall secure the vent pipe opening. A flexible rubber coupling connector shall be provided at the sump cover connection to facilitate servicing the sump.

AF103.3.3 Soil gas retarder. A minimum 6-mil [.006 in; 0.15 mm] (or 3-mil [.003 in; 0.075 mm] cross-laminated) polyethylene or equivalent flexible sheeting material shall be placed on top of the gas permeable layer prior to casting the slab or placing the floor assembly. The sheeting shall cover the entire floor area with separate sections of sheeting lapped not less than 12 inches [305 mm] and extend up the surrounding foundation walls not less than 4 inches [101 mm]. Openings in the sheeting caused by pipe, wire and other penetrations shall be sealed. Punctures or tears in the material shall be sealed or covered with additional sheeting. AF103.4 Sub-membrane depressurization system rough-in. In buildings with a crawl space foundation, the components of a sub-membrane depressurization system shall be installed during construction in accordance with AF103.4.1 through AF103.6.5.

Exceptions:

Buildings in which an approved mechanical crawl space ventilation system is installed.

Where the soil gas retarder will be covered with concrete, the requirements of 103.3.2 shall apply.

AF103.4.1 Vent pipe connector. A tee fitting shall be installed beneath the soil gas membrane with not less than 10 feet of perforated pipe connected to each of the two horizontal openings of such fitting or the two horizontal openings of the tee fitting shall connect to the interior drain tile system. The branch opening of the tee fitting shall be connected to the vent pipe in accordance with section AF103.5.

AF103.4.2 Soil gas membrane. The soil in crawl spaces shall be covered with a continuous layer of soil gas membrane complying with ASTM E1745 Class A, B or C. The membrane shall be lapped not less than 6 inches [152 mm] at joints and shall extend upwards 12 inches [305 mm] and be sealed to all foundation walls enclosing the crawl space area. Seams shall be sealed with polyurethane caulk complying with ASTM C920 class 25 or higher, or taped or equivalent method, installed in accordance with the manufacturer's recommendations.

AF103.5 Vent pipe. A 3 inch [76 mm] nominal size or larger gas-tight pipe shall be extended from the tee fitting up through the building floors and in accordance with Sections AF103.5.1 through AF103.5.6. Materials used shall comply with P3002.1.

AF103.5.1 Vent pipe termination. The vent pipe shall terminate vertically upward not less than 12 inches [305 mm] above the roof and in a location not less than two feet [51 mm] vertically above, or not less than 10 feet [3048 mm] measured in any other direction from, openings in the building and adjacent buildings including windows, doors and other gravity air intake openings, exclusive of attic ventilation openings. Where a screen is installed on the terminus of radon exhaust pipe to prevent the entry of animals, such screen shall have a mesh

size with a dimension of not less than 0.5 inch (12.7mm).

AF103.5.2 Vent pipe drainage. The radon vent pipe shall be installed to provide condensate drainage to the ground beneath the slab or membrane. The pipe shall not be trapped and shall have a minimum slope of one-eighth inch per foot (1 percent slope).

AF103.5.3 Vent pipe identification. Exposed and visible interior radon vent pipes shall be identified with not less than one label on each floor and in accessible attics. The label shall read "This pipe is a component of a radon control system. A radon test is necessary to verify that the radon level is below the level recommended by the US EPA.." The height of the label lettering shall be not less than 0.25 inch [6.35 mm].

AF103.5.4 Combination foundations. Where more than one type of foundation is present, each foundation area shall have a separate radon vent pipe and soil gas collector. Vent pipes shall connect to a single vent that terminates above the roof or each individual vent pipe shall terminate separately above the roof.

AF103.5.5 Separate foundation areas. In buildings where interior footings or other barriers separate foundation areas, each area shall be fitted with an individual vent pipe or a pipe loop or equivalent method shall connect such areas below the slab. Vent pipes shall connect to a single vent that terminates above the roof or each individual vent pipe shall terminate separately above the roof.

AF103.5.6 Provisions for radon fan. To facilitate possible installation of a radon fan, the following shall be provided:

AF103.5.6.1 Vent pipe accessibility. The radon vent pipes shall be provided with access in an attic or other area outside the habitable space for the purpose of installing a fan. The pipe shall be centered in an unobstructed cylindrical space having a vertical height of not less than 48 inches [122 cm] and a diameter of not less than 21 inches [53 cm] in the location where a fan would be installed.

Exception: Where an approved electrical supply is installed on the roof for future use.

AF103.5.6.2 Radon fan location. Fans shall be located outdoors, in attics or in garages that are not beneath conditioned spaces. Fans shall not be installed below ground, in conditioned spaces, in occupiable spaces of a building or in any basement, crawlspace or other interior location that is directly beneath a conditioned or occupiable space of a building. Fans shall not be installed in any location where pipe positively pressured by the fan would be located inside conditioned or occupiable space.

AF103.5.6.3 Power source. To provide for future installation of a radon fan, an electrical circuit that terminates in an approved junction box shall be installed in the attic or other anticipated location of a fan.

AF103.6 Entry routes. Potential radon entry routes shall be closed in accordance with Sections AF103.6.1 through AF103.6.5.

AF103.6.1 Floor openings. Openings around bathtubs, showers, water closets, pipes, wires and other objects that penetrate concrete slabs or floor assemblies shall be sealed in a permanent manner.

Exception: Sealing is not required for floors above conditioned spaces.

AF103.6.2 Concrete joints. Isolation joints, construction joints and other joints in concrete slabs and between slabs and foundation walls shall be sealed with a caulk or sealant. Gaps and joints shall be cleared of loose material and filled with polyurethane caulk complying with ASTM C920 class 25 or higher or equivalent method installed in accordance with the manufacturer's recommendations.

AF103.6.3 Sumps. Sump pits open to soil or serving as the termination point for subslab or exterior drain tile loops shall be covered with a gasketed or otherwise sealed lid. Sumps used as a suction point in a subslab depressurization system shall have a lid designed to accommodate the vent pipe. Sumps used as a floor drain shall have a lid equipped with a trapped inlet.

AF103.6.4 Foundation walls. Hollow block masonry foundation walls shall be constructed with a continuous course of solid masonry, one course of masonry grouted solid, or a solid concrete beam at or above finished grade to prevent passage of air from the interior of the wall into the living space. Where a brick veneer or other masonry ledge is installed, the course immediately below that ledge shall be sealed. Joints, cracks and other openings around penetrations of both exterior and interior surfaces of masonry block and wood foundation walls below the ground surface shall be filled with polyurethane caulk complying with ASTM C920 class 25 or higher, or equivalent method installed in accordance with the manufacturer's recommendations. Penetrations of concrete walls shall be sealed.

AF103.6.5 Crawl space access. Access doors and other openings or penetrations between basements and

adjoining crawl spaces shall be closed, gasketed or otherwise filled to prevent air leakage.
Exception: Air sealing is not required for conditioned crawl spaces.

Bibliography: "Radon-Resistant Construction Practices in New U.S. Homes 2016," prepared by Home Innovations Research Lab, Annual Builder Practices Survey, 5960-17, for USEPA.

ASTM E1745

Cost Impact: The code change proposal will increase the cost of construction

The additional cost of the code change in materials is \$25: \$10 for 10 feet of 4" perforated pipe; \$10 for caulk to seal the soil gas retarder and \$5 in additional cost for soil retarder material on walls (offset by the reduction in soil retarder material needed to overlap seams). There is also a labor cost component which is minimal for the perforated pipe and variable for the sealing depending on the area of the crawl space.

Installation of the existing Appendix F in a single family home is documented in the Home Innovation Research Labs' 2016 report on radon-resistant construction practices [see bibliography]: "In 2016, the average installation cost for a passive system in a single-family detached home was approximately \$374, up slightly from the \$358 reported for 2015 and \$332 reported for 2014."

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM E1745, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 4315

RB288-19

RB289-19

IRC@: AF104 (New)

Proponent: Craig Conner, representing self (craig.conner@mac.com)

2018 International Residential Code

Add new text as follows:

AF104 Testing. Where radon-resistant construction is required, radon testing shall be as specified in Items 1 through 11:

1. Testing shall be performed after the dwelling passes its air tightness test
2. Testing shall be performed after the radon control system and HVAC installations are complete. The HVAC system shall be operating during the test. Where the radon system has an installed fan, the dwelling shall be tested with the radon fan operating
3. Testing shall be performed at the lowest occupied floor level, whether or not that space is finished. Spaces that are physically separated and served by different HVAC systems shall be tested separately
4. Testing shall not be performed in a closet, hallway, stairway, laundry room, furnace room, bathroom or kitchen
5. Testing shall be performed with a commercially available radon test kit or with a continuous radon monitor that can be calibrated. Testing with test kits shall include two tests, and the test results shall be averaged. Testing shall be in accordance with this section and the testing device manufacturer's instructions
6. Testing shall be performed with the windows closed. Testing shall be performed with the exterior doors closed, except when being used for entrance or exit. Windows and doors shall be closed for at least 12 hours prior to the testing
7. Testing shall be performed by the builder, a registered design professional, or an approved third party.
8. Testing shall be conducted over a period of not less than 48 hours or not less than the period specified by the testing device manufacturer, whichever is longer
9. Written radon test results shall be provided by the test lab or testing party. The final written test results shall be included with construction documents.
10. Where the radon test result is 4 pCi/L or greater, the fan for the radon vent pipe shall be installed as specified in Sections AF103.8 and AF103.12
11. Where the radon test result is 4 pCi/L or greater, the system shall be modified and retested until the test result is less than 4 pCi/L.

Exception: Testing is not required where the occupied space is located above an unenclosed open space.

Reason: Testing is the only way to know if radon levels are below the safety level. Radon is a tasteless colorless gas that can cause lung cancer. Radon tests are relatively simple and inexpensive. The jurisdiction decides if radon-resistant construction applies in the jurisdiction by adopting (or not adopting) Appendix F, most commonly adopting the Appendix F in radon zone 1. Both the occupants and the builder want to know that the radon mitigation system works.

Where radon systems are required, consider this test commissioning for the radon system. Typically the inexpensive radon test kits are mailed off to a testing lab. The testing lab responds fairly quickly with written results. The "safety" level or range is a test below 4 pCi/L. Besides confirming compliance, written test results provide the owner with confirmation the home's radon level is at or below the safety level. For unsold homes, written test results with the construction documents allow the future owner to know that the home passed its safety test.

Often homes will pass without installing the fan described in Appendix F, with is sometimes called a “passive” radon system. Where a passive system does not meet the safety level, adding a fan usually lowers the radon level to the safety range.

Bibliography: The American Cancer Society states that “The leading cause of lung cancer in non-smokers is exposure to radon gas.” (ref 1) The link between radon and lung cancer has been firmly established for about 20 years (ref 2). Radon is estimated to cause about 20,000 deaths per year from lung cancer (ref 2). Children exposed to high levels of radon are more likely to develop lung cancer later in life. (ref 3). Deaths from radon significantly exceed deaths from other building-related risks; such as fires, falls, electrocution, tornadoes, hurricanes, winds, fires, etc. In part this is because the codes have reduced these other risks, but have not addressed radon as well.

1) Lung Cancer Risks for Non-Smokers. American Cancer Society. Nov 6, 2017 <https://www.cancer.org/latest-news/why-lung-cancer-strikes-nonsmokers.html>

Radon “accounts for about 21,000 deaths from lung cancer each year.”

2) U.S. National Research Council Committee on the Biological Effects of Ionizing Radiation. 1999.

<https://www.nap.edu/read/5499/chapter/1#viii> <https://www.nap.edu/read/5499/chapter/5#97>

Historically the link between radon and lung cancer was not understood. Radon is an invisible, tasteless and odorless gas. There is a long period between exposure to radon and the symptoms of lung cancer. Recognition that radon increased lung cancers came from early studies of uranium miners, and was later confirmed more broadly.

<https://www.nap.edu/read/5499/chapter/5#97>

In 1999 it was concluded that residential radon, as well as smoking, were the most important contributors to the lung cancer. Note table 3-10, summed “total male” and “total female” for both “ever-smokers” and “never-smokers” Actual value in table is 21,800, but is rounded to 21,000.

3) “Canadian Lung Cancer Relative Risk from Radon Exposure for Short Periods in Childhood Compared to a Lifetime” International Journal of Environmental Research and Public Health. 2013 May; 10(5): 1916–1926.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3709356/>

The study concluded: “... *exposure to radon during childhood increases the lifetime risk of developing lung cancer ... if a child lived in a home with very high radon concentration for only a few years, the risk of developing lung cancer later in the life could be equivalent to a lifetime exposure to moderate radon concentration.*”

Cost Impact: The code change proposal will increase the cost of construction
Radon test kits are inexpensive, less than \$50 for the two tests including laboratory determination of results.
Tests by radon professionals will likely be more expensive.

RB290-19

IRC@: AJ102.4.4

Proponent: Jeff Inks, representing Window and Door Manufacturers Association (jinks@wdma.com); Jennifer Hatfield, representing American Architectural Manufacturers Association (jen@jhatfieldandassociates.com)

2018 International Residential Code

Revise as follows:

AJ102.4.4 Window control devices. Where window fall prevention devices complying with ASTM F2090 are not provided, window opening control devices complying with ASTM F2090 shall be installed where an existing window, including the sash and glazed portion, is replaced and where all of the following apply to the replacement window:

1. The window is operable.
2. ~~The window replacement includes replacement of the sash and the frame.~~
3. The top of the sill of the window opening is at a height less than 24 inches (610 mm) above the finished floor.
4. The window will permit openings that will allow passage of a 4-inch-diameter (102 mm) sphere where the window is in its largest opened position.
5. The vertical distance from the top of the sill of the window opening to the finished grade or other surface below, on the exterior of the building, is greater than 72 inches (1829 mm).

The window opening control device, after operation to release the control device allowing the window to fully open, shall not reduce the minimum net clear opening area of the window unit.

Reason: This revision makes it clear that regardless of whether replacing the entire existing window (sash and frame), or the sash and glazed portion with an insert window where the existing frame remains, the window fall prevention requirements apply in both applications which is consistent with how the code treats these replacements for energy efficiency.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The intent of this proposal is to ensure window fall prevention requirements are met as intended by the code. It does not have a direct impact on cost.

Proposal # 5398

RB290-19

RB291-19

IRC®: AK102.1, AK103.1, ASTM Chapter 44 (New)

Proponent: Tim Earl, representing The Gypsum Association (tearl@gbhinternational.com)

2018 International Residential Code

Revise as follows:

AK102.1 General. Airborne sound insulation for wall and floor-ceiling assemblies shall meet a sound transmission class (STC) rating of 45 where tested in accordance with ASTM E90 or an apparent STC (ASTC) of 42 when tested in accordance with ASTM ~~E90~~ E336. Penetrations or openings in construction assemblies for piping; electrical devices; recessed cabinets; bathtubs; soffits; or heating, ventilating or exhaust ducts shall be sealed, lined, insulated or otherwise treated to maintain the required ratings. *Dwelling unit* entrance doors, which share a common space, shall be tight fitting to the frame and sill.

AK103.1 General. Floor/ceiling assemblies between *dwelling units*, or between a *dwelling unit* and a public or service area within a structure, shall have an impact insulation class (IIC) rating of not less than 45 when tested in accordance with ASTM ~~E492~~ E492 or an apparent IIC (AIIC) of 42 where tested in accordance with ASTM E1007.

Add new standard(s) as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428

E336-17a: Standard Test Method for Measurement of Airborne Sound Attenuation between Rooms in Buildings

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box
C700
West Conshohocken PA 19428

E1007-16: Standard Test Method for Field Measurement of Tapping Machine Impact Sound Transmission Through Floor-Ceiling Assemblies and Associated Support Structures

Reason: This creates the addition of the option for field testing for ASTC and AIIC – actual field measures versus laboratory measures - with slightly lower requirements for these versus the lab tested assemblies as they are actual numbers of in place systems. This begins to migrate the code to the more preferred field verified apparent measures as reflected in ICC G2-2010 guidance, in the IBC and in ASTM standards on sound, but still leaves it as just an option in an optional appendix.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. This adds an optional method of testing, so it will not increase the cost of construction unless users choose this option, which would add approximately \$1,500 to the cost of a home.

Proposal # 5049

RB291-19

RB292-19

IRC@: AQ (New), AQ106.1 (New), AQ106.1.1 (New), AQ107.1 (New)

Proponent: Hope Medina, representing Self (hmedina@coloradocode.net)

2018 International Residential Code

Add new text as follows:

AQ Energy Conservation

AQ106.1 Testing for tiny houses. The air leakage rate for tiny houses shall not exceed 0.30 cfm at 50 pascals of pressure per ft² of the dwelling unit enclosure area.

Testing shall be conducted in accordance with RESNET/ICC 380, ASTM E 779 or ASTM E 1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). Where required by the code official, testing shall be conducted by an approved third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the code official. Testing shall be performed at any time after creation of all penetrations of the building thermal envelope.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weather stripping or other infiltration control measures.
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.
3. Interior doors, if installed at the time of the test, shall be open.
4. Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed.
5. Heating and cooling systems, if installed at the time of the test, shall be turned off.
6. Supply and return registers, if installed at the time of the test, shall be fully open.

AQ106.1.1 Whole house mechanical ventilation. Where an air leakage rate not exceeding 0.30 cfm per ft² of the dwelling unit enclosure area in accordance with Section AQ106.1 is provided, the tiny house shall be provided with whole house mechanical ventilation in accordance with Section M1505.4.

AQ107.1 Tiny House. Tiny houses shall be deemed to be in compliance with Chapter 11 of this code and Chapter R4 of the *International Energy Conservation Code* provided that the following conditions are met:

1. The insulation and fenestration meet the requirements of Table N1102.1.2
2. The thermal envelope meets the requirements of Section N1102.4.1.1 and Table N1102.4.1.1.
3. Solar, wind, or other renewable energy source supplies not less than 90 percent of the energy use for the structure.
4. Solar, wind, or other renewable energy source supplies not less than 90 percent of the energy for service water heating.
5. Permanently installed lighting is in accordance with Section R404.
6. Mechanical ventilation is provided in accordance with Section M1505 of this code. Operable fenestration is not used for ventilation.

Reason: The appendix currently states that tiny houses must comply with the code except for the following. There are some energy requirements that need to be adjusted for the unique construction of tiny houses. The current test parameters for air tightness are not conducive for houses with smaller volumes. The new testing

parameters and metrics will provide the ability for air leakage of the smaller structures and allowing for them to demonstrate compliance.

When testing to the new metrics there needs to be an understanding that when meeting the testing one must provide a whole house mechanical ventilation system.

This proposal addresses those tiny houses that build to be self-sufficient with their energy consumption. If they meet those requirements they should be considered to comply with the intent of the energy requirements.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. These requirements while are already required would not increase the cost of construction. This proposal provide options for the type of construction that happens for tiny houses to obtain energy compliance.

Staff Analysis: A review of the standards proposed for inclusion in the code, RESNE/ICC 380, ASTM E779 and ASTM E1827, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 5539

RB292-19

RB293-19

IRC®: AQ104.1.2, AQ104.1.3, AQ104.2, AQ104.2.1, AQ104.2.1.2, AQ104.2.1.4 (New), AQ104.2.1.4, AQ104.2.1.5, AQ104.2.1.6, AQ104.2.5, Figure AQ104.1.3 (New)

Proponent: Martin Hammer, representing Martin Hammer, Architect (mfhammer@pacbell.net); Thom Stanton, Tiny Home Industry Association, representing Tiny Home Industry Association (THIA) (gotiny.com@gmail.com); David Eisenberg, representing DCAT (strawnet@gmail.com); Brad Wiseman, Garmin USA, representing Tiny Home Industry Association (chairman@tinyhomeindustryassociation.org); Charles Ballard, PWA, representing PWA; Zachariah Giffin, A+E Network, representing Tiny House Nation (zackgiffin@gmail.com)

2018 International Residential Code

Revise as follows:

AQ104.1.2 Minimum horizontal dimensions. *Lofts* shall be not less than 5 feet (1524 mm) in any horizontal dimension.

AQ104.1.3 Height effect on loft area. Portions of a *loft* with a sloped ceiling measuring less than 3 feet (914 mm) from the finished floor to the finished ceiling shall not be considered as contributing to the minimum required area for the loft. See Figure AQ104.1.3.

Exception: Under gable roofs with a minimum slope of 6 units vertical in 12 units horizontal (50-percent slope), portions of a *loft* with a sloped ceiling measuring less than 16 inches (406 mm) from the finished floor to the finished ceiling shall not be considered as contributing to the minimum required area for the *loft*.

AQ104.2 Loft ~~access~~, access and egress. The access to and primary egress from *lofts* shall be of any type described in Sections AQ104.2.1 through AQ104.2.4. The loft access and egress element along its required minimum width, shall meet the loft where its ceiling height is not less than 3 feet (914 mm).

AQ104.2.1 Stairways. Stairways accessing *lofts* shall comply with this code or with Sections AQ104.2.1.1 through ~~AQ104.2.1.5~~, AQ104.2.1.7.

Revise as follows:

AQ104.2.1.2 Headroom. The headroom ~~in above~~ stairways accessing a *loft* shall be not less than 6 feet 2 inches (1880 mm), as measured vertically, from a sloped line connecting the tread, landing, or landing platform nosings in the middle center of their width, width, and vertically from the landing platform along the center of its width

Add new text as follows:

AQ104.2.1.4 Landings. Intermediate landings and landings at the bottom of stairways shall comply with Section R311.7.6, except that the depth in the direction of travel shall be not less than 24 inches (610 mm).

Revise as follows:

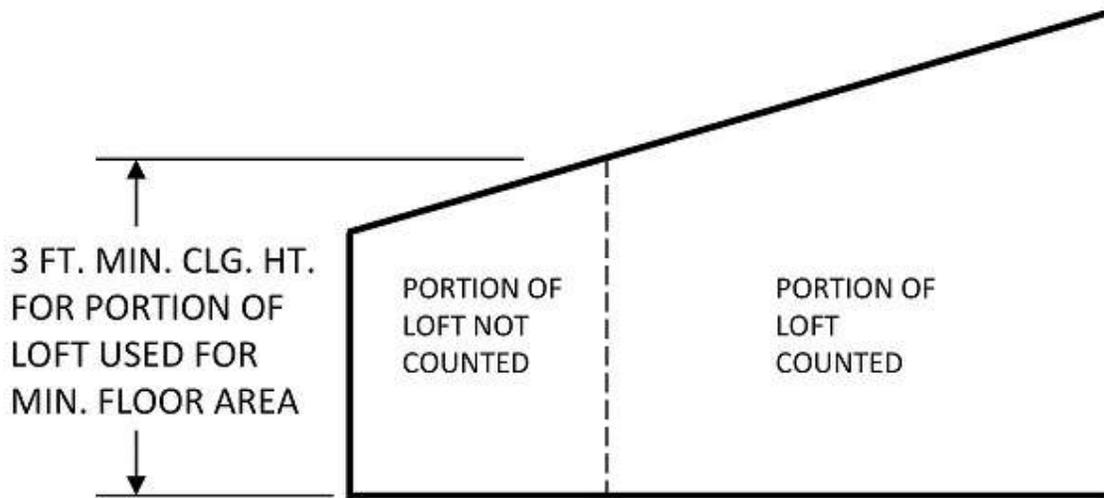
~~**AQ104.2.1.4**~~ **AQ104.2.1.5 Landing platforms.** The top tread and riser of stairways accessing *lofts* shall be constructed as a *landing platform* where the *loft* ceiling height is less than 6 feet 2 inches (1880 mm) where the stairway meets the *loft*. The landing platform shall be ~~18 inches to 22 inches (457 to 559)~~ not less than 20 inches (508 mm) in width and in depth measured horizontally from and perpendicular to the nosing of the landing platform. The landing platform riser height to the edge of the loft, and 16 to floor shall be not less than 16 inches (406 mm) and not greater than 18 inches (406 to 457 mm) in height measured from the landing platform to the loft floor.

~~AQ104.2.1.5~~ **AQ104.2.1.6 Handrails.** Handrails shall comply with Section R311.7.8.

~~AQ104.2.1.6~~ **AQ104.2.1.7 Stairway guards.** Guards at open sides of stairways, landings, and landing platforms shall comply with Section R312.1.

AQ104.2.5 Loft Guards. *Loft guards* shall be located along the open side (s) of *lofts*. Loft guards shall be not less than 36 inches (914 mm) in height or one-half of the clear height to the ceiling, whichever is less. Loft guards shall comply with Section R312.1.3 and Table R301.5 for their components.

Add new text as follows:



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm

Figure AQ104.1.3
Loft Ceiling Height

Reason: This proposal improves Appendix Q by 1) modifying the language in some sections to provide clarity, 2) adding Figure AQ104.1.3 from the Commentary to illustrate the meaning of "height effect, and 3) making other changes to the following sections:

AQ104.2: The added sentence requires the ceiling height of the loft to be a minimum of 3 feet where access and egress element meets the loft. This was previously unaddressed.

AQ104.2.1.2: The change at the end clarifies that the required ceiling height above a landing platform is measured from the landing platform itself, as opposed to a sloping line connecting the landing platform nosing and the loft nosing. This is because a person goes from a standing to a kneeling position when entering a loft from a landing platform.

AQ104.2.1.4: A new section on intermediate and bottom landings for stairways sets their minimum dimensions, which was previously unaddressed. The 24" dimension in the direction of travel is greater than that required for a landing platform (20") because the nature of their use differs. A person goes from standing to kneeling at a landing platform to a loft (or vice versa), whereas a short, standing stride may be needed at an intermediate or bottom landing. The 24" dimension provides for that.

AQ104.2.5: The added sentence refers to related sections in the IRC to clarify that loft guard components must comply with those sections.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposed changes clarify dimensional requirements and language and do not affect cost.

RB294-19

IRC@: AQ104.2.2.1 (New)

Proponent: Jay Hyde, representing Sacramento Valley Association of Building Officials
(jhyde@mogaveroarchitects.com)

2018 International Residential Code

Revise as follows:

AQ104.2.2.1 Size and capacity. Ladders accessing *lofts* shall have a rung width of not less than 12 inches (305 mm), and 10-inch (254 mm) to 14-inch (356 mm) spacing between rungs. Ladders shall be capable of supporting a ~~200~~ 300-pound (75-136 kg) load on any rung. Rung spacing shall be uniform within $\frac{3}{8}$ inch (9.5 mm).

Reason: The proposed 300 pond ladder capacity coordinates with IMC Section 306.5. According to the Centers for Disease Control, the average American male over 30 years of age is 180 pounds. The margin of safety at 200 pounds capacity is inadequate to protect the public.

Cost Impact: The code change proposal will increase the cost of construction
The code change proposal MAY increase the cost of construction.

Proposal # 1427

RB294-19

RB295-19

IRC@: , TABLE AR103.2.3

Proponent: Martin Hammer, representing Martin Hammer, Architect (mfhammer@pacbell.net); Paula Baker-Laporte, representing Econest Architecture Inc. (paula@econest.com); Lou Host-Jablonski, representing self (lou@designcoalition.org); David Eisenberg, representing DCAT (strawnet@gmail.com)

2018 International Residential Code

Revise as follows:

CLAY SLIP. A suspension of clay or clay subsoil particles in water.

CLAY SUBSOIL. Subsoil sourced directly from the earth or refined, containing clay and ~~free from~~ not more than trace amounts of organic matter.

Revise as follows:

**TABLE AR103.2.3
REQUIREMENTS AND PROPERTIES OF LIGHT STRAW-CLAY MIXTURES^a**

Density(pcf)	Straw(pcf)	Subsoil(pcf)	Water(gal/cf) ^b	Min.% clay in subsoil	Minimum clay: silt ratio	Subsoil testing method ^{c, d}	Max. wall thickness, inches
10	6.7	3.3	1.55	70	3.5:1	A	15
12	6.7	5.3	1.63	46	1.7:1	A	15
13	6.7	6.3	1.67	40	1.33:1	A	15
15	6.7	8.3	1.74	35	0.95:1	A	15
20	6.7	13.3	1.93	30	0.60:1	A	12
30	6.7	23.3	2.31	NA	NA	B	12
40	6.7	33.3	2.70	NA	NA	B	12
50	6.7	43.3	3.08	NA	NA	B	12

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- a. Interpolation permitted. Extrapolation not permitted.
- b. Water mixed with subsoil equals clay slip.
- c. Subsoil Testing Methods:
 - A. Lab test for percent of clay, silt and sand via hydrometer method.
 - B. ~~The Figure 2 Ribbon Test or and~~ the Figure 3 Ball Test in the Appendix of ASTM E2392/E2392M.
- d. Trace amounts of organic materials are acceptable.

Reason: The proposed changes to definitions improve clarity and provide consistency with language in footnote 'd' in Table AR103.2.3 and with definitions in Appendix S. The proposed changes to footnote 'c' in Table AR103.2.3 clarifies the referenced test's location, and corrects for the intention that both tests are required to determine subsoil suitability.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The proposed changes for clarity and consistency do not affect cost.

Proposal # 5109

RB295-19

RB296-19

IRC@: SECTION AS102, (New), , 202, 202, 202, 202, AS103.1, AS103.3, AS103.7, AS103.8, AS104.1, AS104.2, AS104.3, AS104.4.3.1, AS104.4.3.2, AS104.4.6.1, AS104.4.6.3, AS104.4.7 (New), AS104.4.7, AS104.4.8, AS105.3, AS105.4.1, TABLE AS105.4, AS105.6.8, AS106.2, AS106.4, AS106.5, AS106.8, AS106.9, AS106.9.1, TABLE AS106.12, AS106.12.3.1, AS106.13, TABLE AS106.13(1), TABLE AS106.13(3), AS106.15

Proponent: Martin Hammer, representing Martin Hammer, Architect (mfhammer@pacbell.net); David Eisenberg, DCAT, representing DCAT (strawnet@gmail.com); David Arkin, representing California Straw Building Association (info@strawbuilding.org); Ian Smith, representing Colorado Straw Bale Association (ian@lopezsmolensengineers.com); Anthony Dente, representing Verdant Structural Engineers (anthony@verdantstructural.com)

2018 International Residential Code

SECTION AS102 DEFINITIONS

Add new text as follows:

BRACED WALL PANEL, STRAWBALE. A strawbale wall designed and constructed to resist in-plane shear loads through the interaction of the stacked straw bales, the reinforced plaster and its connections to the top plate, sill plates and foundation. The panel's length meets the requirements for the particular wall type and contributes toward the total amount of bracing required along its braced wall line in accordance with Sections AS106.13 and R602.10.1.

CLAY. Inorganic soil with particle sizes less than 0.00008 inch (0.002 mm) having the characteristics of high to very high dry strength and medium to high ~~plasticity-~~plasticity, used as the binder of other component materials in *clay* plaster and *straw-clay*.

Revise as follows:

CLAY SLIP. A suspension of *clay* or *clay subsoil* particles in water.

CLAY SUBSOIL. Subsoil sourced directly from the earth ~~or refined,~~ containing *clay* and ~~free-~~ sand and silt, and not more than trace amounts of organic matter.

FINISH. Completed ~~compilation-~~combination of materials on the interior or exterior faces of stacked *bales*.

PLASTER. ~~Gypsum plaster, cement plaster, clay plaster, soil-cement plaster, lime plaster or cement-lime plaster-~~Clay, soil-cement, gypsum, lime, clay-lime, lime-cement, or cement plaster, as described in Section AS104.

Revise as follows:

PRECOMPRESSION. ~~Vertical-~~Permanent vertical compression of stacked *bales* before the application of finish.

Add new text as follows:

ROOF BEARING ASSEMBLY In load-bearing *strawbale* walls, a structural assembly at the top of the wall that bears and distributes roof loads to the wall.

Revise as follows:

SHEAR WALL. A *strawbale* wall designed and constructed to resist in-plane lateral seismic and wind forces parallel to the plane of the wall in accordance with Section AS106.13. ~~Synonymous with braced wall panel.~~

AS103.1 Shape. *Bales* shall be rectangular in ~~shape.~~ shape, except for partial bales made to fill non-rectangular spaces in accordance with AS103.6.

AS103.3 Ties. *Bales* shall be confined by synthetic fiber, natural fiber or metal *ties* sufficient to maintain required *bale* density. *Ties* shall be not less than 3 inches (76 mm) and not more than 6 inches (152 mm) from the two untied faces without ties and shall be spaced not more than 12 inches (305 mm) apart. *Bales* with broken *ties* shall be retied with sufficient tension to maintain required bale density.

AS103.7 Types of straw. *Bales* shall be composed of *straw* from wheat, rice, rye, barley or oat. The dry stems of other cereal grains or similar crops shall be acceptable where approved by the building official. *Bales* shall not be composed of hay.

AS103.8 ~~Other baled material.~~Orientation of bales. ~~The dry stems of other cereal grains shall be acceptable where approved by the building official.~~ Straw bales shall be placed laid flat, on-edge, or on-end in accordance with this appendix.

AS104.1 General. Finishes applied to *strawbale* walls shall be ~~any type permitted by this code, and shall comply with this section and with Chapters 3 and 7 unless stated otherwise in this section.~~ plasters in accordance with Section AS104.4, or non-plaster exterior wall coverings in accordance with Section R703 and other finish systems complying with all of the following:

1. With approved specifications and details showing the finish system's means of attachment to the wall or its independent support, and a means of draining or evaporating water that penetrates the exterior finish to the exterior.
2. The vapor permeance of the combination of finish materials shall be 5 perms or greater to allow the transpiration of water vapor through the wall.
3. Finish systems with weights >10 and < 20 pounds per square foot (> 48.9 and < 97.8 kg/m²) of wall area require a factor of 1.2 for minimum total length of braced wall panels in Table AS106.13(3).
4. Finish systems with weights > 20 pounds per square foot (97.8 kg/m²) of wall area require an engineered design.

Revise as follows:

AS104.2 Purpose, and where required. *Strawbale* walls shall be finished so as to provide mechanical protection, fire resistance and protection from weather and to restrict the passage of air through the *bales*, in accordance with this appendix and this code. Vertical *strawbale* wall surfaces shall receive a coat of *plaster* not less than ³/₈ inch (10 mm) thick, or greater where required elsewhere in this appendix, or shall fit tightly against a solid wall panel or dense-packed cellulose insulation with a density of not less than 3.5 pounds per cubic foot (56 kg/m³) blown into an adjacent framed wall. The tops of *strawbale* walls shall receive a coat of *plaster* not less than ³/₈ inch (10 mm) thick ~~where straw would otherwise be exposed, or be tightly covered by gypsum board or a roof bearing assembly.~~

Exception: *Truth windows* shall be permitted where a fire-resistance rating is not required. Weather-exposed *truth windows* shall be fitted with a weather-tight cover. Interior *truth windows* in Climate Zones 5, 6, 7, 8 and Marine 4 shall be fitted with an air-tight cover.

AS104.3 Vapor retarders. Class I and II vapor retarders shall not be used on a *strawbale wall*, nor shall any other material be used that has a vapor permeance rating of less than ~~3~~ 5 perms, except as permitted or required elsewhere in this appendix.

AS104.4.3.1 General. *Clay plaster* shall be any plaster having a clay or *clay subsoil* binder. Such plaster shall contain sufficient clay to fully bind the ~~plaster, sand or other inert granular material~~ aggregate, and shall be permitted to contain reinforcing fibers. Acceptable reinforcing fibers include chopped straw, sisal and animal hair.

AS104.4.3.2 Clay subsoil requirements. The suitability of *clay subsoil* shall be determined in accordance with the Figure 2 Ribbon Test ~~or~~ and the Figure 3 Ball Test in the appendix of ASTM E2392/E2392M.

AS104.4.6.1 General. Lime *plaster* is any *plaster* with a binder that is composed of calcium hydroxide (CaOH) including Type N or S hydrated lime, hydraulic lime, natural hydraulic lime or slaked quicklime. Hydrated lime shall comply with ASTM ~~E206-C206~~. Hydraulic lime shall comply with ASTM C1707. Natural hydraulic lime shall comply with ASTM C141 and EN 459. Quicklime shall comply with ASTM C5.

Revise as follows:

AS104.4.6.3 On structural walls. Lime *plaster* on *strawbale* structural walls in accordance with Table AS106.12 or Table AS106.13(1) shall use a ~~binder of~~ hydraulic or natural hydraulic lime.

Add new text as follows:

AS104.4.7 Clay-lime plaster. Clay-lime plaster shall be composed of refined *clay* or *clay subsoil*, sand, and lime, and shall be permitted to contain reinforcing fibers.

AS104.4.7 AS104.4.8 Cement-lime plaster. Cement-lime plaster shall be *plaster* mixes CL, F or FL, as described in ASTM C926.

AS104.4.8 AS104.4.9 Cement plaster. Cement *plaster* shall conform to ASTM/C926 and shall comply with Sections R703.7.4 and R703.7.5, except that the amount of lime in plaster coats shall be not less than 1 part lime to ~~6~~ 4 parts cement to allow a minimum acceptable vapor permeability. The combined thickness of *plaster* coats shall be not more than $1\frac{1}{2}$ inches (38 mm) thick.

Revise as follows:

AS105.3 Sill plates. Sill plates shall be installed in accordance with Figure AS105.1(1) or AS105.1(2). Sill plates shall support and be flush with each face of the *straw bales* above and shall be of naturally durable or preservative-treated wood where required by this code. Sill plates shall be not less than nominal 2 inches by 4 inches (51 mm by 102 mm) with anchoring complying with Section R403.1.6 and the additional requirements of ~~Tables Table AS105.4 and AS106.6(1), where applicable;~~ where applicable and Sections AS106.13.2 and AS106.13.3 for strawbale braced wall panels.

AS105.4.1 Determination of out-of-plane loading. Out-of-plane loading for the use of Table AS105.4 shall be in terms of the ultimate design wind speed and seismic design category as determined in accordance with Sections R301.2.1 and R301.2.2. An engineered design in accordance with Section R301.2.1 shall be required where the building is located in a Special Wind Region or a Wind Design Required location in accordance with Figure R301.2(5).

Revise as follows:

**TABLE AS105.4
OUT-OF-PLANE RESISTANCE METHODS AND UNRESTRAINED WALL DIMENSION LIMITS**

METHOD OF OUT-OF-PLANE LOAD RESISTANCE ^a	FOR ULTIMATE DESIGN WIND SPEEDS (mph)	FOR SEISMIC DESIGN CATEGORIES	UNRESTRAINED WALL DIMENSIONS, H ^b		MESH STAIR SPACING, BOUNDARY RESISTANCE
			Absolute limit in feet	Limit based on base thickness T ^c in feet (mm)	
Nonplaster finish or unreinforced plaster	≤ 130	A, B, C, D ₀	H ≤ 8	H ≤ 5T	None required
Pins per Section AS105.4.2	≤ 130	A, B, C, D ₀	H ≤ 12	H ≤ 8T	None required
Pins per Section AS105.4.2	≤ 140	A, B, C, D ₀ , D ₁ , D ₂	H ≤ 10	H ≤ 7T	None required
Reinforced ^d clay plaster	≤ 140	A, B, C, D ₀ , D ₁ , D ₂	H ≤ 10	H ≤ 8T ^{0.5} (H ≤ 140T ^{0.5})	≤ 6 inches
Reinforced ^d clay plaster	≤ 140	A, B, C, D ₀ , D ₁ , D ₂	10 < H ≤ 12	H ≤ 8T ^{0.5} (H ≤ 140T ^{0.5})	≤ 4 inches
Reinforced ^d cement, cement-lime, lime or soil-cement plaster	≤ 140	A, B, C, D ₀ , D ₁ , D ₂	H ≤ 10	H ≤ 9T ^{0.5} (H ≤ 157T ^{0.5})	≤ 6 inches
Reinforced ^d cement, cement-lime, lime or soil-cement plaster	≤ 155	A, B, C, D ₀ , D ₁ , D ₂	H ≤ 12	H ≤ 9T ^{0.5} (H ≤ 157T ^{0.5})	≤ 4 inches
2×6 load-bearing <u>wood studs</u> ^f at max. 6' o.c.	≤ 140	A, B, C, D ₀ , D ₁ , D ₂	H ^g ≤ 9	N/A	None required
2×6 load-bearing <u>wood studs</u> ^f at max. 4' o.c.	≤ 140	A, B, C, D ₀ , D ₁ , D ₂	H ^g ≤ 10	N/A	None required
2×6 load-bearing <u>wood studs</u> ^f at max. 2' o.c.	≤ 140	A, B, C, D ₀ , D ₁ , D ₂	H ^g ≤ 12	N/A	None required
2×4 load-bearing <u>wood studs</u> ^f at max. 2' o.c.	≤ 140	A, B, C, D ₀ , D ₁ , D ₂	H ^g ≤ 10	N/A	None required

2x6 nonload-bearing wood studs ^f at max. 6' o.c.	≤ 140	A, B, C, D ₀ , D ₁ , D ₂	H ^g ≤ 12	N/A	None requi
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For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s.

N/A = Not Applicable

- a. Finishes applied to both sides of stacked bales. Where different finishes are used on opposite sides of a wall, the more restrictive requirements shall apply.
- b. H = Stacked bale height in feet (mm) between sill plate and top plate or other approved horizontal restraint, or the horizontal distance in feet (mm) between *approved* vertical restraints. For load-bearing walls, H refers to vertical height only.
- c. T = Bale thickness in feet (mm).
- d. Plaster reinforcement shall be any mesh allowed in Table AS106.16 for the matching plaster type, and with staple spacing in accordance with this table. Mesh shall be installed in accordance with Section AS106.9.
- e. Sill plate attachment shall be with $\frac{5}{8}$ -inch anchor bolts or *approved* equivalent at not more than 48 inches on center where staple spacing is required to be ≤ 4 inches.
- f. Bales shall be attached to the studs by an approved method. Horizontal framing and attachment at top and bottom of studs shall be in accordance with Section R602 or an *approved* alternative. Table R602.7(1) shall be used to determine the top framing member where load-bearing stud spacing exceeds 24 inches o.c.
- g. H is vertical height only.

AS105.6.8 Separation of wood and plaster. Where wood framing or wood sheathing occurs at the exterior face of *strawbale* walls, such wood surfaces shall be separated from exterior plaster with two layers of Grade D paper, No. 15 asphalt felt or other *approved* material in accordance with Section ~~R703.7.3~~, R703.7.3, extending not less than 1 inch (25 mm) past the edges of the framing member.

Exceptions:

1. Where the wood is preservative treated or *naturally durable* and is not greater than 1 $\frac{1}{2}$ inches (38 mm) in width.
2. Clay plaster shall not be required to be separated from untreated wood that is not greater than 1 $\frac{1}{2}$ inches (38 mm) in width.

AS106.2 Building limitations and requirements for use of strawbale structural walls. *Buildings* using strawbale *structural* walls shall be subject to the following limitations and requirements:

1. Number of stories: Not more than ~~one~~, one, except that two stories shall be allowed with an *approved* engineered design.
2. *Building* height: Not more than 25 feet (7620 mm)-, except that greater heights shall be allowed with an *approved* engineered design.
3. Wall height: In accordance with Table AS105.4, AS106.13(2) or AS106.13(3) as applicable, whichever is most restrictive.
4. Braced wall panel lengths: The greater of the values determined in accordance with Tables AS106.13(2) and AS106.13(3) for *buildings* using strawbale braced wall panels, or in accordance with Item 4 of Section AS105.2 for *buildings* with *load-bearing strawbale walls* that do not use *strawbale* braced wall panels.

AS106.4 Foundations. Foundations for plastered *strawbale* walls shall be in accordance with Chapter 4, and Figure AS105.1(1) or Figure AS105.1(2) or an approved engineered design.

AS106.5 Configuration Orientation and configuration of bales. *Bales* in *strawbale* structural walls shall be laid flat or on-edge and in a running bond or stack bond, except that bales in structural walls with unreinforced plasters shall be laid in a running bond only.

AS106.8 Plaster and membranes- membranes on structural walls. *Strawbale* structural walls shall not have a membrane between straw and plaster, or shall have attachment through the *bale* wall from one plaster skin to the other in accordance with an *approved* engineered design.

AS106.9 Mesh. Mesh in plasters on *strawbale* structural walls, and where required by Table AS105.4, and where used to resist wind uplift in accordance with Section AS106.14, shall be installed in accordance with Sections AS106.9.1 through AS106.9.4.

AS106.9.1 Mesh laps. Mesh required by Table AS105.4 or AS106.12 shall be installed with not less than 4-inch (102 mm) laps. Mesh required by Table AS106.13(1) or in walls designed to resist wind uplift of more than 100 plf (1459 N/m) in accordance with Section AS106.14, shall run continuous vertically from sill plate to the top plate or roof-bearing element, or shall lap not less than 8 inches (203 mm). Horizontal laps in such mesh shall be not less than 4 inches (102 mm).

**TABLE AS106.12
ALLOWABLE SUPERIMPOSED VERTICAL LOADS (LBS/FOOT) FOR PLASTERED LOAD-BEARING
STRAWBALE WALLS**

WALL DESIGNATION	PLASTER^a(both sides) Minimum thickness in inches each side	MESH^b	STAPLES^c	ALLOWABLE BEARING CAPACITY^d(plf)
A	Clay 1 1/2	None required	None required	400
B	Soil-cement 1	Required	Required	800
C	Lime ^e 7/8	Required	Required	500
D	Cement-lime 7/8	Required	Required	800
E	Cement 7/8	Required	Required	800

For SI: 1 inch = 25.4mm, 1 pound per foot = 14.5939 N/m.

- a. Plasters shall conform to Sections AS104.4.3 through AS104.4.8, AS106.7 and AS106.10.
- b. Any metal mesh allowed by this appendix and installed in accordance with Section AS106.9.
- c. In accordance with Section AS106.9.2, except as required to transfer roof loads to the plaster skins in accordance with Section AS106.11.
- d. For walls with a different plaster on each side, the lower value shall be used. For walls with plaster on only one side, half of the tabular value shall be used.
- e. Shall use hydraulic or natural hydraulic lime.

AS106.12.3.1 Roof-bearing assembly spanning openings. Roof-bearing assemblies that span openings in *strawbale* walls shall comply with the following at each opening:

1. Lumber on each side of the assembly shall be of the dimensions and quantity required to span each opening in accordance with Table R602.7(1).
2. The required lumber in the assembly shall be supported at each side of the opening by the

number of jack studs required by Table R602.7(1), or shall ~~shall~~ extend beyond the opening on both sides a distance, D, using the following ~~formula~~ equation:

$$D = S \times R/2 / (1-R)$$

(Equation AS-1)

where:

D = Minimum distance (in feet) for required spanning lumber to extend beyond the opening

S = Span (in feet)

$$R = B_L/B_C$$

B_L = Design load on the wall (in pounds per lineal foot) in accordance with Sections R301.4 and R301.6

B_C = Allowable bearing capacity of the wall in accordance with Table AS106.12

AS106.13 Braced wall panels. Plastered *strawbale* walls used as braced wall panels for one-story *buildings* shall be in accordance with Section R602.10 and Tables AS106.13(1), AS106.13(2) and AS106.13(3). Wind design criteria shall be in accordance with Section R301.2.1. Seismic design criteria shall be in accordance with Section R301.2.2. An approved engineered design in accordance with Section R301.2.1 shall be required where the building is located in a Special Wind Region or Wind Design Required location in accordance with Figure R301.2(5)B.

Revise as follows:

**TABLE AS106.13(1)
PLASTERED STRAWBALE BRACED WALL PANEL TYPES**

WALL DESIGNATION	PLASTER ^a (both sides)		SILL PLATES ^b (nominal size in inches)	ANCHOR BOLT ^c SPACING(inches on center)	MESH ^d (inches)	STAPLE SPACING ^e (inches on center)
	Type	Thickness(minimum in inches each side)				
A1	Clay	1.5	2 x 4	32	None	None
A2	Clay	1.5	2 x 4	32	2 x 2 high- density polypropylene	2
A3	Clay	1.5	2 x 4	32	2 x 2 x 14 gage	4
B	Sol- cement	1	4 x 4	24	2 x 2 x 14 gage	2
C1	Lime ^f	7/8	2 x 4	32	17-gage woven wire	3
C2	Lime ^f	7/8	4 x 4	24	2 x 2 x 14 gage	2
D1	Cement- lime	7/8	4 x 4	32	17-gage woven wire	2
D2	Cement- lime	7/8	4 x 4	24	2 x 2 x 14 gage	2
E1	Cement	7/8	4 x 4	32	2 x 2 x 14 gage	2
E2	Cement	1.5	4 x 4	24	2 x 2 x 14 gage	2

SI: 1 inch = 25.4 mm.

- a. Plasters shall comply with Sections AS104.4.3 through AS104.4.8, AS106.7, AS106.8 and AS106.12.
- b. Sill plates shall be Douglas fir-larch or southern pine and shall be preservative treated where required by the International Residential Code.
- c. Anchor bolts shall be in accordance with Section AS106.13.3 at the spacing shown in this table.
- d. Installed in accordance with Section AS106.9.
- e. Staples shall be in accordance with Section AS106.9.2 at the spacing shown in this table.
- f. Shall use hydraulic or natural hydraulic lime

**TABLE AS106.13(3)
BRACING REQUIREMENTS FOR STRAWBALE-BRACED WALL PANELS BASED ON SEISMIC DESIGN**

CATEGORY

• SOIL CLASS D ^f • WALL HEIGHT = 10 FEET ^d • 15 PSF ROOF-CEILING DEAD LOAD ^d • BRACED WALL LINE SPACING ≤ 25 FEET ^d			MINIMUM TOTAL LENGTH (FEET) OF STRAWBALE-BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE ^{a, b, c, d}	
Seismic Design Category	Story location	Braced wall line length(feet)	Strawbale-braced wall panel ^e A2, A3 ^d , C1, C2, D1	Strawbale-braced wallpanel ^e B, D2, E1, E2
C	One-story building	10	5.7	4.6
		20	8.0	6.5
		30	9.8	7.9
		40	12.9	9.1
		50	16.1	10.4
D ₀	One-story building	10	6.0	4.8
		20	8.5	6.8
		30	10.9	8.4
		40	14.5	9.7
		50	18.1	11.7
D ₁	One-story building	10	6.3	5.1
		20	9.0	7.2
		30	12.1	8.8
		40	16.1	10.4
		50	20.1	13.0
D ₂	One-story building	10	7.1	5.7
		20	10.1	8.1
		30	15.1	9.9
		40	20.1	13.0
		50	25.1	16.3

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 pound per square foot = 0.0479 kPa.

- a. Linear interpolation shall be permitted.
- b. Braced wall panels shall be without openings and shall have an aspect ratio (H:L) ≤ 2:1.
- c. Tabulated minimum total lengths are for braced wall lines using single braced wall panels with an aspect ratio (H:L) ≤ 2:1, or using multiple braced wall panels with aspect ratios (H:L) ≤ 1:1. For braced wall lines using two or more braced wall panels with an aspect ratio (H:L) > 1:1, the minimum total length shall be multiplied by the largest aspect ratio (H:L) of braced wall panels in that line.
- d. Subject to applicable seismic adjustment factors associated with “All methods” in Table R602.10.3(4), except “Wall dead load.”
- e. Strawbale braced wall panel types indicated shall comply with Sections AS106.13.1 through AS106.13.3 and Table AS106.13(1).
- f. Wall bracing lengths are based on a soil site class “D.” Interpolation of bracing lengths between S_{ds} values associated with the seismic design categories is allowable where a site-specific S_{ds} value is determined in accordance with Section 1613.3 of the International Building Code.
- g. Where using wall type A3, the minimum total length of braced wall panels in this column shall be

multiplied by 1.25.

AS106.15 Post-and-beam with strawbale infill. Post-and-beam with *strawbale* infill systems shall be in accordance with Figure AS105.1(4) and Items 1 through 6, or be of an *approved* engineered design.

1. Beams shall be of the dimensions and number of members in accordance with Table R602.7(1), where the space between posts equals the span in the table.
2. Beam ends shall bear over posts not less than 1¹/₂ inches (38 mm) or be supported by a framing anchor in accordance with Table R602.7(1).
3. Discontinuous beam ends shall be spliced with a metal strap with not less than 1,000-pound (454 kg) wind or seismic load tension capacity. Where the wall line includes a braced wall pane,l the strap shall have not less than a 4,000-pound (1814 kg) capacity.
4. Each post shall equal NJ + 1 in accordance with Table R602.7(1), where the space between posts equals the span in the table.
5. Posts shall be connected to the beam by an *approved* means.
6. Roof and ceiling framing shall be attached to the beam in accordance with Table R602.3(1), Items 2 and 6.
7. Posts shall be supported by the sill plate of the bale wall in accordance with Sections AS105.3 or AS106.13.2, with fastening in accordance with Table R602.3(1), Item 16, or shall be supported and fastened at their base by an *approved* means.

Reason: This proposal does the following:

- 1) Removes ambiguous language and corrects errors in the 2018 Appendix S.
- 2) Corrects for internal consistency.
- 3) Adds a definition for Braced Wall Panel specific to strawbale construction, and adds a definition for Roof Bearing Assembly.
- 4) Expands the acceptable types of straw at the discretion of the building official, and prohibits the use of hay which is well known as inappropriate for strawbale construction.
- 5) Greatly clarifies which wall finishes are acceptable on strawbale walls and adds requirements for non-plaster finishes.
- 6) Adds clay-lime plaster as a plaster choice, which has a successful history of use on strawbale buildings.
- 7) Clarifies that the studs in Table AS105.4 used for out-of-plane resistance were intended to be wood studs.
- 8) Adds wall type A3 to the seismic braced wall panel table with an adjustment factor of 1.25, which was previously mentioned only in the Commentary.
- 9) Adds language regarding wind design based on input from an engineer practicing in a high wind zone. Thus the proposed explicit requirement for an approved engineered design in Special Wind Regions or Wind Design Required locations per Figure R301.2(5) of the IRC. This clarifies that strawbale construction is subject to these same requirements as other methods of construction in the IRC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal makes corrections, improves clarity and internal consistency, but does not affect cost.

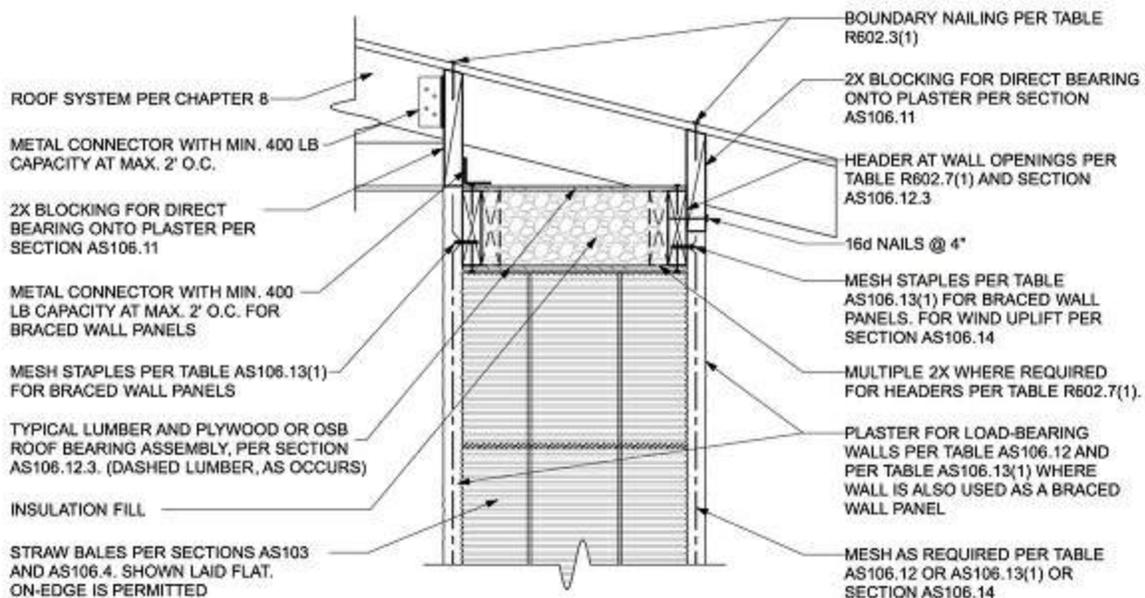
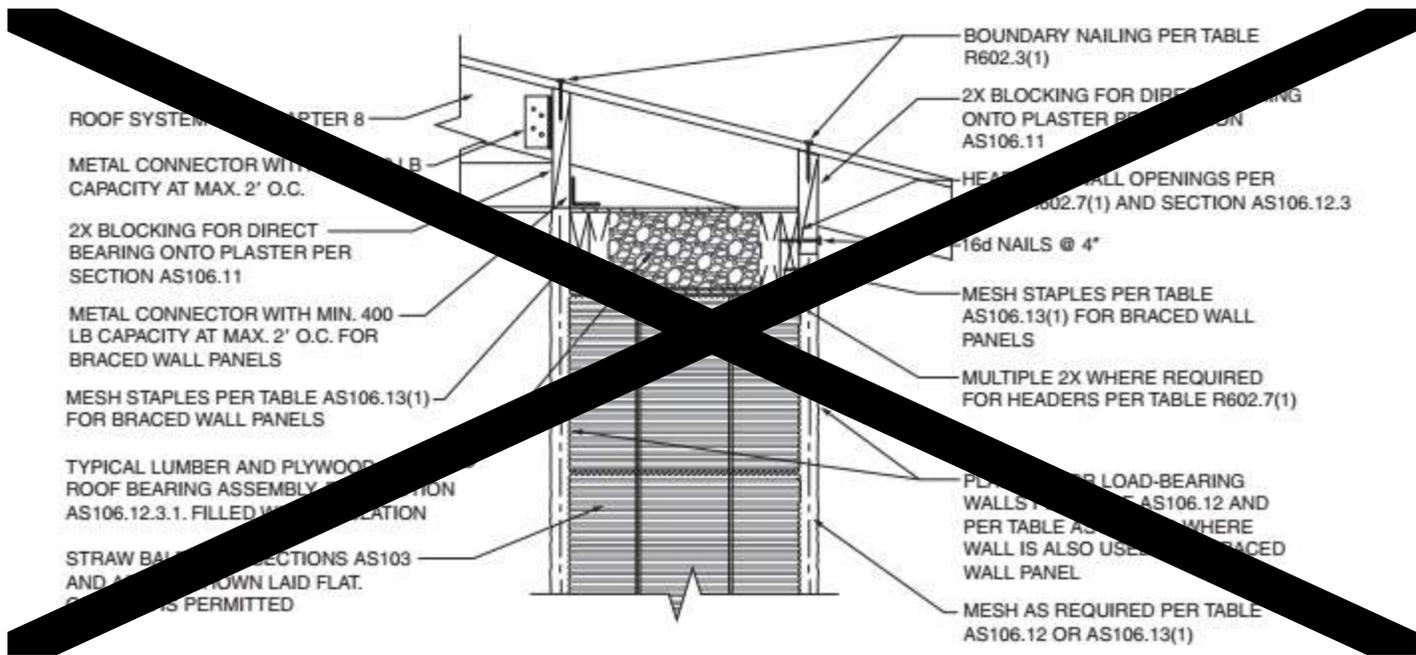
RB297-19

IRC@: FIGURE AS105.1(3), FIGURE AS105.1(4)

Proponent: Martin Hammer, representing Martin Hammer, Architect (mfhammer@pacbell.net); David Eisenberg, representing DCAT (strawnet@gmail.com); Anthony Dente, representing Verdant Structural Engineers (anthony@verdantstructural.com); David Arkin, representing California Straw Building Association (info@strawbuilding.org)

2018 International Residential Code

Revise as follows:



For SI: 1 inch = 25.4 mm

**FIGURE AS105.1(3)
TYPICAL TOP OF LOAD-BEARING STRAWBALE WALL**

For SI: 1 inch = 25.4 mm, 1 pound = 2.2 kg.

**FIGURE AS105.1(3)
TYPICAL TOP OF LOAD-BEARING STRAWBALE WALL**

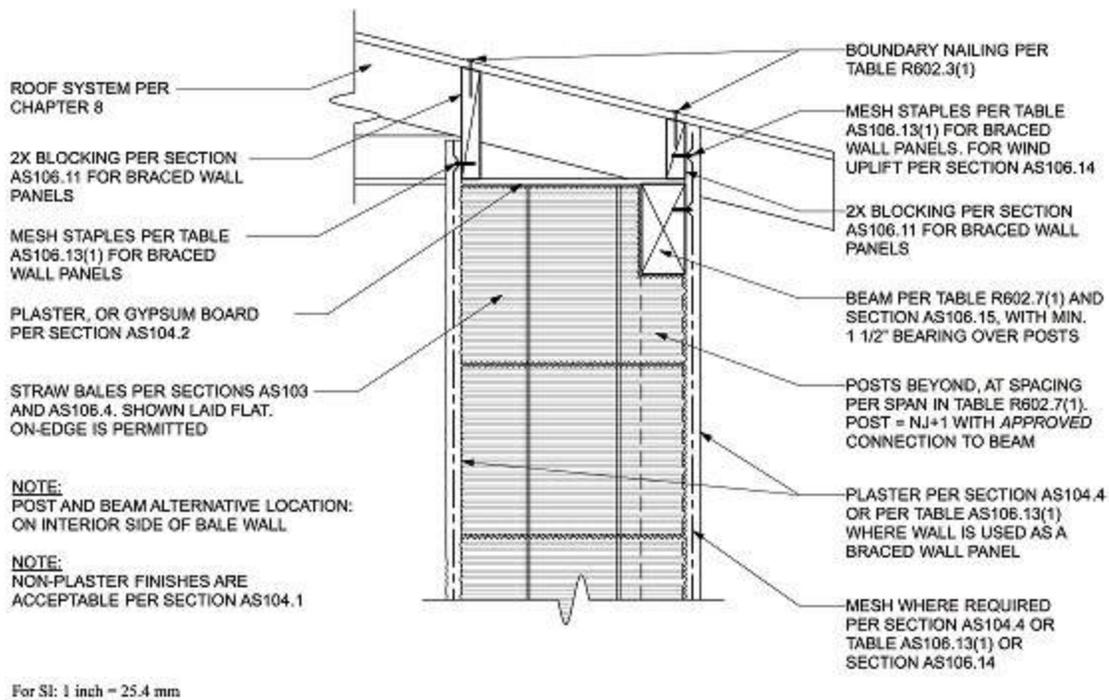
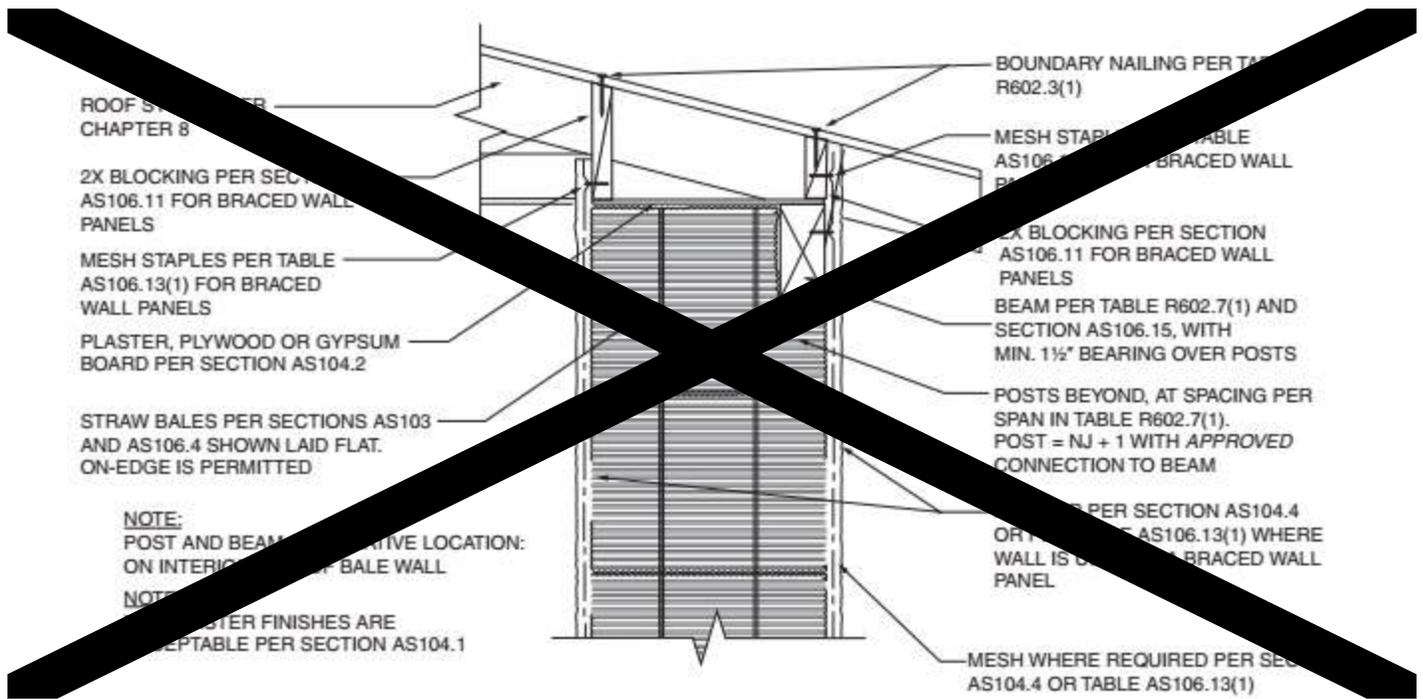


FIGURE AS105.1(4)
TYPICAL TOP OF POST-AND-BEAM WALL
WITH PLASTERED STRAW BALE INFILL

For SI: 1 inch = 25.4 mm.

FIGURE AS105.1(4)
TYPICAL TOP OF POST-AND-BEAM WALL WITH PLASTERED STRAWBALE INFILL

Reason: The revision and substitution of these two Figures: 1) removes ambiguous language, 2) adds

references to a section on wind uplift that was added to the 2018 Appendix S, 3) addresses comments made by a representative of the Structural Engineers Association of California (SEAOC) at the IRC hearings in 2016

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The revised and substituted Figures clarify meaning and add references to existing sections, but do not change code requirements. Therefore there is no cost impact.

Proposal # 5286

RB297-19

RB298-19

IRC@: AS107.1.1, AS107.1.2

Proponent: Martin Hammer, representing Martin Hammer, Architect (mfhammer@pacbell.net); David Eisenberg, DCAT, representing DCAT (strawnet@gmail.com); David Arkin, representing California Straw Building Association (info@strawbuilding.org)

2018 International Residential Code

Revise as follows:

AS107.1.1 One-hour-rated clay-plastered wall. One-hour fire-resistance-rated nonload-bearing clay plastered *strawbale* walls shall comply with all of the following:

1. *Bales* shall be laid flat or on-edge in a running bond.
2. *Bales* shall maintain thickness of not less than 18 inches (457 mm).
3. *Bales* shall have a minimum dry density of ~~7.5~~7.25 pounds per cubic foot (120 kg/m³).
4. Gaps shall be stuffed with *straw-clay*.
5. *Clay* plaster on each side of the wall shall be not less than 1 inch (25 mm) thick and shall be composed of a mixture of 3 parts clay, 2 parts chopped straw and 6 parts sand, or an alternative approved *clay* plaster.
6. Plaster application shall be in accordance with Section AS104.4.3.3 for the number and thickness of coats.

AS107.1.2 Two-hour-rated cement-plastered wall. Two-hour fire-resistance-rated nonload-bearing cement-plastered *strawbale* walls shall comply with all of the following:

1. *Bales* shall be laid flat or on-edge in a running bond.
2. *Bales* shall maintain a thickness of not less than 14 inches (356 mm).
3. *Bales* shall have a minimum dry density of ~~7.5~~7.25 pounds per cubic foot (120 kg/m³).
4. Gaps shall be stuffed with *straw-clay*.
5. A single section of 1/2-inch (38 mm) by 17-gage galvanized woven wire mesh shall be attached to wood members with 1 1/2-inch (38 mm) staples at 6 inches (152 mm) on center. 9 gage U-pins with not less than 8-inch (203 mm) legs shall be installed at 18 inches (457 mm) on center to fasten the mesh to the *bales*.
6. Cement plaster on each side of the wall shall be not less than 1 inch (25 mm) thick.
7. Plaster application shall be in accordance with Section AS104.4.8 for the number and thickness of coats.

Reason: This proposed change clarifies that the density of the straw bales in the two fire-resistance rated wall assemblies as tested was not dry density and therefore the density number was adjusted accordingly. The change to the minimum density numbers for both the tested wall assemblies are based on our research revisiting some inconsistencies between our notes and information when the test panels were constructed at the ETL Semko Laboratory in Elmendorf, Texas and the descriptions of the bales and density in the test reports for the two walls. The two wall panels were constructed using the same batch of straw bales, which were all made by the same baler, thus they were all the same dimensions in height and width, though varying slightly in length. The bales all measured 18" x 14" x approximately 36."

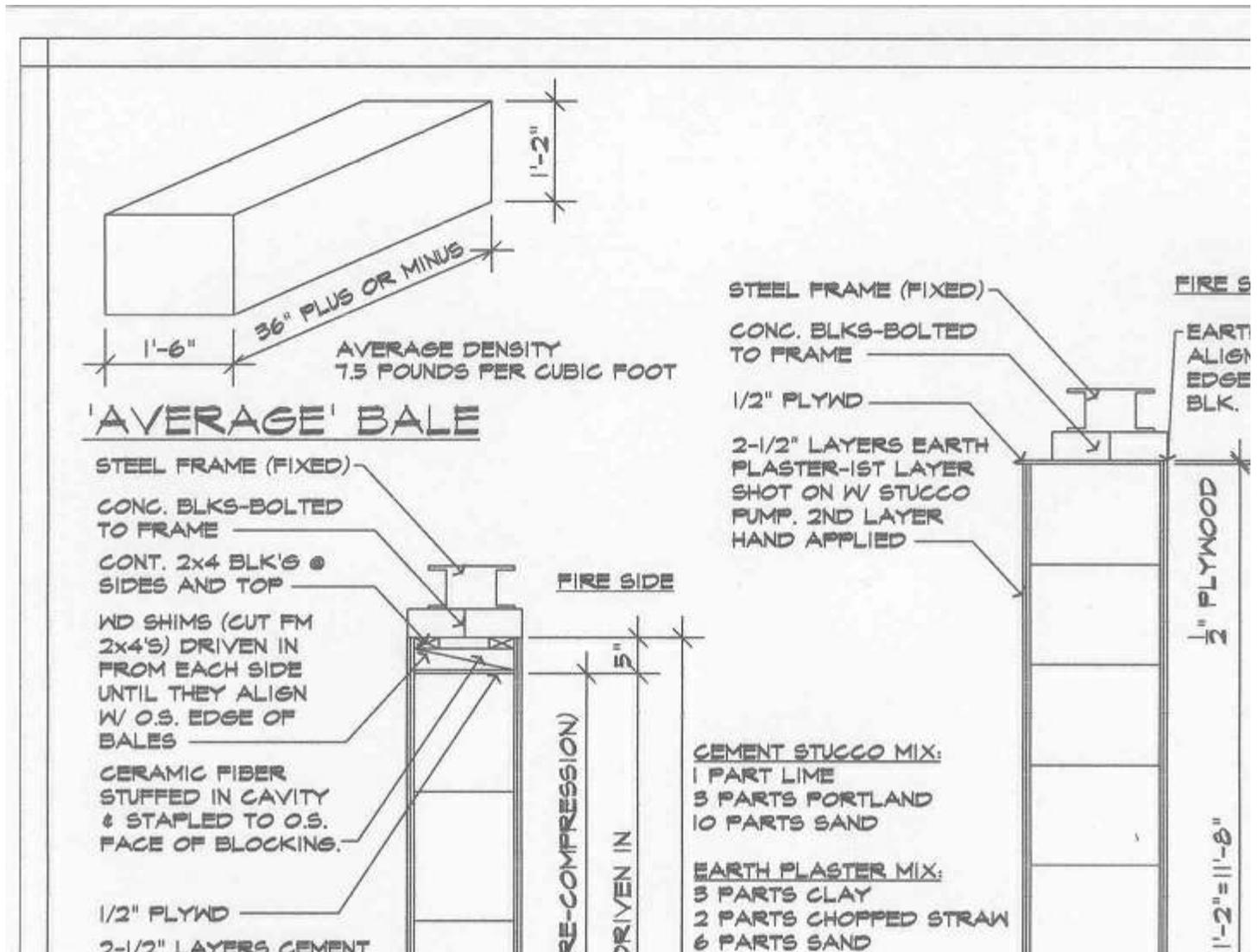
The test reports however indicated that two different bale dimensions – 18"x14"x36" for the earth plastered wall panel and 18"x15"x36" for the cement/lime plastered wall panel. Two string bales are typically 18"x14"x36" and our notes and drawings indicated the bales were 14" high. We know that bales are not easy to accurately

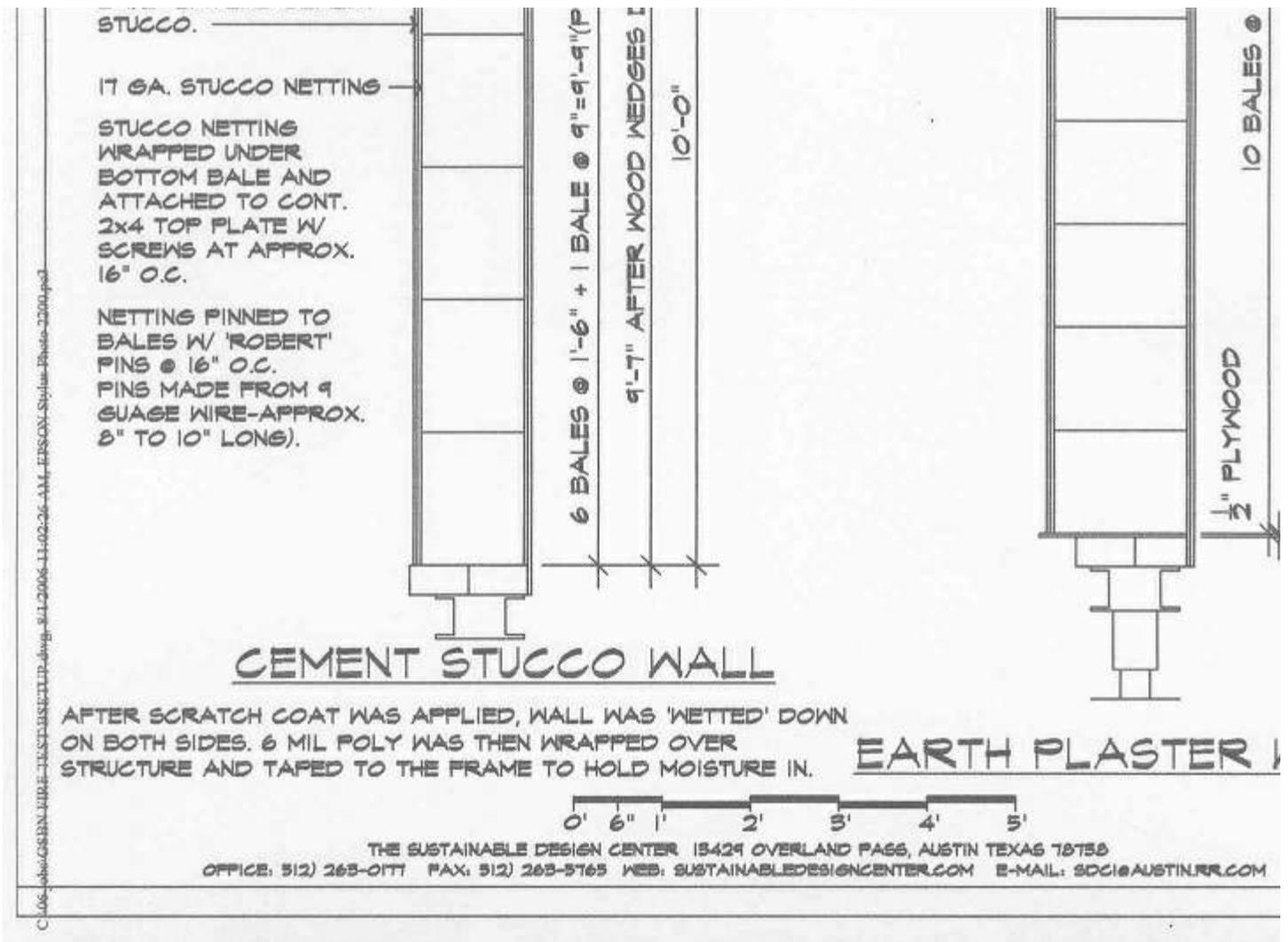
measure because some straw tends to stick up above the solidly compressed mass of straw within the strings. We had requested that the test reports be corrected but that ultimately was not done.

The procedure at the lab, which took place once the bales were delivered but before our crew was on site at the lab was that the workers measured and weighed a sample of the bales and calculated the density from those measurements. They did not, however measure the moisture content of the bales at that time. Their notes indicated that the average bale density was 7.5 pounds per cubic foot. They noted the average weight of the bales was 42.3 pounds. We know that though the bales were very dry, they still contained some moisture. Having worked with straw bales for many years for construction purposes, and having measured the moisture content of the bales after the wall panels were built and plastered, we estimate that the bales conservatively contained about 10% moisture by weight. This would result in a calculated dry density of approximately 6.75 pounds per cubic foot if the bales had been 15" high and 7.25 pounds per cubic feet if the bales were 14" high.

Because there is no reasonable way to use wet density as a constant without stating exact moisture content, we have converted the density in this section to dry density and have based it on our evidence that the bales were 14" high.

The calculations for this dry density were determined using an average of 10% moisture content, an average 42.3 pounds per bale, and the average bale dimension of 18"x14"x36". Thus 42.3 pounds per bale divided by 5.25 cu.ft. (36x14x18 = 5.25 cu.ft.) = 8.05 pcf wet density minus 10% moisture content = 7.245 pounds per cubic foot, rounded up to 7.25.





Cost Impact: The code change proposal will not increase or decrease the cost of construction
 The proposed change is a clarification that does not affect cost.

Proposal # 5661

RB298-19

RB299-19

IRC®: Appendix (New), SECTION AU101 (New), AU101.1 (New), AU101.2 (New), AU101.3 (New), AU101.4 (New), FIGURE AU101.4 (New), SECTION AU102 (New), AU102.1 (New), SECTION AU103 (New), AU103.1 (New), AU103.2 (New), AU103.3 (New), AU103.4 (New), AU103.4.1 (New), AU103.5 (New), AU103.6 (New), AU103.7 (New), AU103.8 (New), AU103.9 (New), SECTION AU104 (New), AU104.1 (New), AU104.2 (New), AU104.3 (New), AU104.4 (New), AU104.4.1 (New), AU104.4.2 (New), AU104.4.3 (New), AU104.4.3.1 (New), AU104.4.3.2 (New), AU104.4.4 (New), AU104.4.5 (New), AU104.4.6 (New), AU104.4.7 (New), AU104.4.8 (New), AU104.4.9 (New), SECTION AU105 (New), AU105.1 (New), AU105.2 (New), AU105.3 (New), AU105.3.1 (New), TABLE AU105.3 (New), AU105.3.2 (New), AU105.3.3 (New), AU105.3.4 (New), AU105.3.4.1 (New), AU105.3.4.2 (New), AU105.3.4.3 (New), AU105.3.5 (New), AU105.4 (New), AU105.4.1 (New), AU105.4.2 (New), AU105.4.3 (New), AU105.4.4 (New), AU105.4.5 (New), AU105.5 (New), SECTION AU106 (New), AU106.1 (New), AU106.2 (New), AU106.3 (New), AU106.4 (New), AU106.5 (New), AU106.6 (New), AU106.6.1 (New), AU106.7 (New), AU106.7.1 (New), AU106.8 (New), AU106.8.1 (New), AU106.8.2 (New), AU106.9 (New), AU106.9.1 (New), AU106.9.1.1 (New), AU106.9.1.2 (New), AU106.9.1.3 (New), AU106.9.2 (New), AU106.9.3 (New), AU106.9.4 (New), AU106.9.5 (New), AU106.9.6 (New), AU106.10 (New), TABLE AU106.10 (New), AU106.11 (New), AU106.11.1 (New), AU106.11.2 (New), AU106.11.3 (New), FIGURE AU106.11.3 (New), TABLE AU106.11(1) (New), TABLE AU106.11(2) (New), TABLE AU106.11(3A) (New), AU106.11(3B) (New), AU106.11(3C) (New), AU106.12 (New), TABLE AU106.12 (New), AU106.13 (New), AU106.14 (New), SECTION AU107 (New), AU107.1 (New), SECTION AU108 (New), AU108.1 (New), AU108.2 (New), SECTION AU109 (New), AU109.1 (New), AU109.2 (New), AU109.3 (New), SECTION AU110 (New)

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2018 International Residential Code

Add new text as follows:

APPENDIX U Cob Construction (Monolithic Adobe)

SECTION AU101 GENERAL

AU101.1 Scope. This appendix provides prescriptive and performance-based requirements for the use of *natural cob* as a building material. *Buildings* using *cob* walls shall comply with this code except as otherwise stated in this appendix.

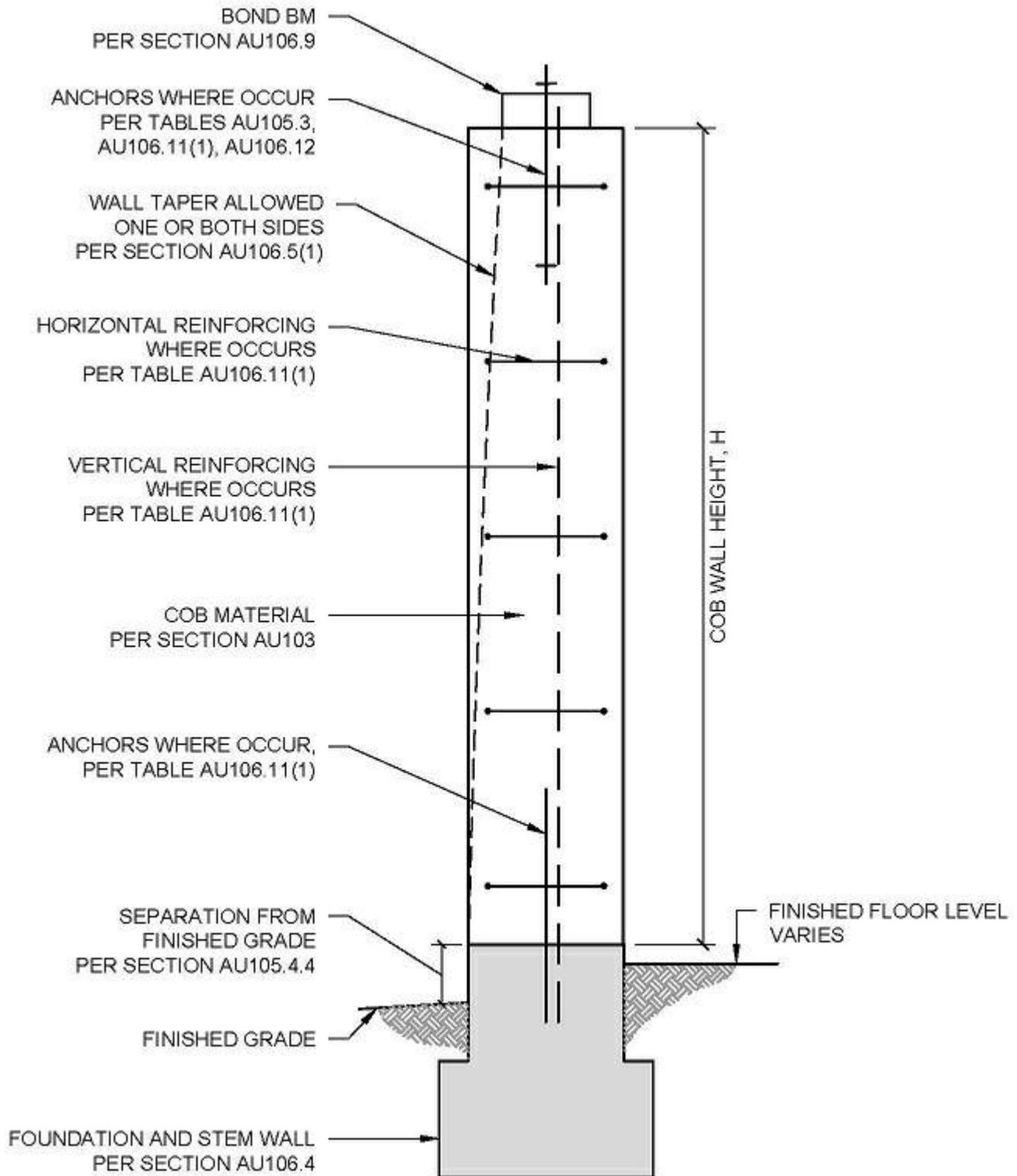
AU101.2 Intent. In addition to the intent described in Section R101.3, the purpose of this appendix is to establish minimum requirements for cob structures that provide flexibility in the application of certain provisions of the code, to permit the use of site-sourced and local materials, and innovative combinations of proven historical and modern techniques that are safe, reduce life-cycle impacts, and increase affordability.

AU101.3 Tests and empirical evidence. Tests for an alternative material, design or method of construction shall be in accordance with Section R104.11.1, and the *building official* shall have the authority to consider

evidence of a history of successful use in lieu of testing.

AU101.4 Cob wall systems. Cob wall systems include those shown in Figure AU101.4 and *approved variations*.

FIGURE AU101.4 TYPICAL COB WALL



SECTION AU102

DEFINITIONS

AU102.1 Definitions. The following words and terms shall, for the purposes of this appendix, have the meanings shown herein. Refer to Chapter 2 of the *International Residential Code* for general definitions.

BRACED WALL PANEL. A *cob* wall designed and constructed to resist in-plane shear loads through the interaction of the *cob* material, its reinforcing and its connections to its bond beam and foundation. The panel's length meets the requirements for the particular wall type and contributes toward the total amount of bracing required along its braced wall line in accordance with Sections AU106.11 and R602.10.1.

BUTTRESS. A mass set at an angle to, or bonded to a wall that it strengthens or supports.

CLAY. Inorganic soil with particle sizes less than 0.00008 inch (0.002 mm) having the characteristics of high to very high dry strength and medium to high plasticity, used as the binder of other component materials in a mix of *cob* or of *clay* plaster.

CLAY SUBSOIL. Subsoil sourced directly from the earth, containing *clay*, sand, and silt, and not more than trace amounts of organic matter.

COB. A composite building material consisting of refined clay or clay subsoil wet-mixed with loose straw and sometimes sand. Also known as *monolithic adobe*.

COB CONSTRUCTION. A wall system of layers or *lifts* of moist *cob* placed to create monolithic walls, typically without formwork.

DRY JOINT. The boundary between a layer of moist *cob* and a previously laid and significantly drier, non-malleable layer of *cob* that requires wetting to achieve bonding between the layers.

FINISH. Completed combination of materials on the face of a *cob* wall.

LIFT. A layer of installed *cob*.

LOAD-BEARING WALL. A *cob* wall that supports more than 100 pounds per linear foot (1459 N/m) of vertical load in addition to its own weight.

MONOLITHIC ADOBE. Synonymous with *cob*.

NATURAL COB. *Cob* not containing admixtures such as Portland cement, lime, asphalt emulsion, or oil. Synonymous with *unstabilized cob*.

NONSTRUCTURAL WALL. Walls other than *load-bearing* walls or *shear walls*.

PLASTER. *Clay*, soil-cement, gypsum, lime, clay-lime, cement-lime, or cement plaster as described in Section AU104.

SHEAR WALL. A *cob* wall designed and constructed to resist in-plane lateral seismic and wind forces in accordance with Section AU106.11. Synonymous with *braced wall panel*.

STABILIZED. *Cob* or other earthen material containing admixtures such as Portland cement, lime, asphalt

emulsion, or oil, that are intended to help limit water absorption, stabilize volume, increase strength, and increase durability.

STRUCTURAL WALL. A wall that meets the definition for a *load-bearing wall* or *shear wall*.

STRAW. The dry stems of cereal grains after the seed heads have been removed.

UNSTABILIZED. A *Cob* or other earthen material that does not contain admixtures such as Portland cement, lime, asphalt emulsion, or oil.

SECTION AU103 **MATERIALS, MIXING, AND INSTALLATION**

AU103.1 Clay subsoil. *Clay subsoil* for a *cob* mix shall be acceptable if the mix it produces meets the requirements of Section AU103.4.

AU103.2 Sand. Sand or other aggregates such as, but not limited to, gravel, pumice and lava rock, when added to *cob* mixes, shall yield a mix that meets the requirements of Section AU103.4.

AU103.3 Straw. *Straw* for *cob* mixes shall be from wheat, rice, rye, barley or oat, or similar reinforcing fibers with similar performance. Before mixing, the straw or other reinforcing fibers shall be dry to the touch and free of visible decay.

AU103.4 Mix proportions. *Cob* mixes shall be of any proportion of refined *clay* or *clay subsoil*, added sand (if any) and straw that produces a dried mix that passes the shrinkage test in accordance with Section AU103.4.1, complies with the compressive strength requirements of Section AU106.6 and complies with the modulus of rupture requirements of Section AU106.7.

AU103.4.1 Shrinkage test for cob mixes. Each proposed *cob* mix of different mix proportions shall be placed moist to completely fill a 24-inch by 3 1/2-inch by 3 1/2-inch (610 mm by 89 mm by 89 mm) wooden form on a plastic or paper slip sheet and dried to ambient moisture conditions, or oven dried. The total shrinkage of the length shall not exceed 1 inch (25 mm), as measured from the dried edges of the material to the insides of the form. Cracks in the sample > 1/16 inch (1.5 mm) shall first be closed manually. The shrinkage test shall be shown to the building official for approval before placement of the *cob* mix onto walls.

AU103.5 Mixing. The clay subsoil, sand and straw for *cob* shall be thoroughly mixed by manual or mechanical means with water sufficient to produce a mix of a plastic consistency capable of bonding of successively placed layers or *lifts*.

AU103.6 Installation. *Cob* shall be installed on the wall in *lifts* of a height that supports itself with minimal slumping.

AU103.7 Dry joints. Each layer of *cob* shall be prevented from drying until the next layer is installed, to ensure bonding of successive layers. The top of each layer shall be kept moist and malleable with one or more of the following methods:

1. Covering with a material that prevents loss of or holds moisture.
2. Covering with a material that shades it from direct sun, or
3. Wetting.

When dry joints are unavoidable, the previous layer shall be wetted prior to application of the next layer.

AU103.8 Drying holes. Where holes to facilitate drying are used, such holes shall be of any depth and not

exceeding 3/4-inch (19 mm) in diameter on the face of cob walls. Drying holes shall not be spaced closer than ten hole-diameters. Drying holes shall not be placed in braced wall panels. The design load on load-bearing walls with drying holes shall not exceed 90% of the allowable bearing capacity as determined in accordance with Section AU106.8. Drying holes shall be filled with cob before final inspection.

AU103.9 Adding roof loads to walls. Roof and ceiling loads shall not be added until walls are sufficiently dry to support them without compressing.

SECTION AU104 **FINISHES**

AU104.1 General. Cob walls shall not require a finish, except as required by Section AU104.2. Finishes applied to cob walls shall be plasters in accordance with Section AU104.4, non-plaster exterior wall coverings in accordance with Section R703 or other finish systems in accordance with the following:

1. Specifications and details of the finish system's means of attachment to the wall or its independent support and means of draining or evaporating water that penetrates the exterior finish shall be provided.
2. The vapor permeance of the combination of finish materials shall be 5 perms or greater to allow the transpiration of water vapor from the wall.
3. Finish systems with weights >10 and ≤ 20 pounds per square foot (> 48.9 and ≤ 97.8 kg/m²) of wall shall require that the minimum total length of braced wall panels in Table AU106.11(3) be multiplied by a factor of 1.2.
4. Finish systems with weights > 20 pounds per square foot (> 97.8 kg/m²) of wall area shall require an engineered design.

AU104.2 Where required. Cob walls exposed to rain due to local climate, building design and wall orientation shall be finished or clad to provide protection from excessive erosion.

AU104.3 Vapor retarders. Class I and II vapor retarders shall not be used on cob walls, except at cob walls surrounding showers or as required or addressed elsewhere in this appendix.

AU104.4 Plaster. Plaster applied to cob walls shall be any type described in this section. Plaster thickness shall not exceed 3 inches (76 mm) on each face except where an approved engineered design is provided.

AU104.4.1 Plaster and membranes. Plaster shall be applied directly to cob walls to facilitate transpiration of moisture from the walls and to secure a mechanical bond between the plaster and the cob. A membrane shall not be located between the cob wall and the plaster.

AU104.4.2 Plaster lath. The surface of cob walls shall be permitted to function as lath for plaster, with no other lath required. Metal, plastic, and natural fiber lath shall be permitted to be used to limit plaster cracking or increase the plaster bond to the wall, or to bridge dissimilar materials.

AU104.4.3 Clay plaster. Clay plaster shall comply with Sections AU104.4.3.1 and AU104.4.3.2.

AU104.4.3.1 General. Clay plaster shall be any plaster having a clay or clay subsoil binder. Such plaster shall contain sufficient clay to fully bind the sand or other aggregate and any reinforcing fibers. Reinforcing fibers shall be chopped straw, sisal, hemp, animal hair or other similar approved fibers.

AU104.4.3.2 Clay subsoil requirements. The suitability of clay subsoil shall be determined in accordance with the Figure 2 Ribbon Test and the Figure 3 Ball Test in the appendix of ASTM E2392/E2392M.

AU104.4.4 Soil-cement plaster. Soil-cement plaster shall be composed of clay subsoil, sand, not more than 7 percent Portland cement by volume and, where provided, reinforcing fibers.

AU104.4.5 Gypsum plaster. Gypsum plaster shall comply with Section R702.2.1 and shall be limited to interior use.

AU104.4.6 Lime plaster. Lime plaster is any plaster with a binder composed of calcium hydroxide including Type N or S hydrated lime, hydraulic lime, natural hydraulic lime or slaked quicklime. Hydrated lime shall comply with ASTM C206. Hydraulic lime shall comply with ASTM C1707. Natural hydraulic lime shall comply with ASTM C141 and EN 459. Quicklime shall comply with ASTM C5.

AU104.4.7 Clay-lime plaster. Clay-lime plaster shall be composed of refined *clay* or *clay subsoil*, sand, lime and, where provided, reinforcing fibers.

AU104.4.8 Cement-lime plaster. Cement-lime plaster shall be plaster mix types CL, F or FL, as described in ASTM C926.

AU104.4.9 Cement plaster. Cement plaster shall have not less than 1 part lime to 4 parts cement and be not thicker than 1-1/2 inches (38 mm), to ensure minimum acceptable vapor permeability

SECTION AU105 **COB WALLS—GENERAL**

AU105.1 General. *Cob walls* shall be designed and constructed in accordance with this section and Figure AU101.4 or an *approved* alternative design. In addition to the general requirements for *cob walls* in this section, *cob structural walls* shall comply with Section AU106.

AU105.2 Building limitations and requirements for cob wall construction. *Cob walls* shall be subject to the following limitations and requirements:

1. Number of stories: not more than one.
2. Building height: not more than 25 feet (7620 mm).
3. Seismic design categories: limited to use in Seismic Design Categories A, B and C, except where an *approved* engineered design is provided.
4. Wall height: in accordance with Table AU105.4, and with Table AU106.11(1) for *braced wall panels*.
5. Wall thickness, excluding finish, shall be not less than 10 inches, not greater than 24 inches at the top two-thirds, not limited at the bottom third and, for structural walls, shall comply with Section AU106.2(2). Wall taper is permitted in accordance with Section AU106.5(1).
6. Interior *cob walls* shall require an *approved* engineered design that accounts for the seismic load of the interior *cob walls*, except in Seismic Design Category A for walls with a height to thickness ratio \leq to 6.

AU105.3 Out-of-plane resistance methods and unrestrained wall height limits. *Cob walls* shall employ a method of out-of-plane load resistance in accordance with Table AU105.3, and comply with its associated height limits and requirements.

AU105.3.1 Determination of out-of-plane loading. Out-of-plane loading for the use of Table AU105.3 shall be in accordance with the ultimate design wind speed and seismic design category requirements of Sections R301.2.1 and R301.2.2 respectively. An *approved* engineered design shall be required where the building is located in a Special Wind Region or a Wind Design Required location in accordance with Figure R301.2(5)B.

TABLE AU105.3 OUT-OF-PLANE RESISTANCE METHODS AND UNRESTRAINED WALL HEIGHT LIMITS

WALL TYPE ^{a, g, h} and METHOD OF	FOR ULTIMATE DESIGN WIND SPEEDS	FOR SEISMIC DESIGN CATEGORIES	UNRESTRAINED COB WALL HEIGHT		TOP ANCHOR ^e SPACING (inches)	TENSION TIE ^f SPACING (inches)
			Absolute limit in	Limit based on		

OUT-OF-PLANE LOAD RESISTANCE	(mph)		feet	wall thickness T^d in feet		
Wall 1 ⁱ : no anchors, no steel wall reinforcing	≤ 110	A	$H \leq 8$	$H \leq 6T$	none	48
Wall 2: top anchors ^j , continuous vertical 6"x6"x6 gage steel mesh in center of wall embedded in foundation 12"	≤ 140	A, B, C	$H \leq 8$	$H \leq 8T$	12	24
Wall A ⁱ : top anchors, no vertical steel reinforcing	≤ 120	A, B	$H \leq 8$	$H \leq 6T$	12	48
Wall B ⁱ : top & bottom anchors, no vertical steel reinforcing	≤ 130	A, B	$H \leq 8$	$H \leq 6T$	12	48
Wall C: top and bottom anchors, continuous vertical threaded rod at 4' oc embedded in foundation and connected to bond beam	≤ 140	A, B, C	$H \leq 8$	$H \leq 8T$	12	24
Wall D: continuous vertical threaded rod at 1' oc embedded in foundation and connected to bond beam	≤ 140	A, B, C	$H \leq 8$	$H \leq 8T$	NA	24
Wall E: top anchors, continuous vertical 6"x6"x6 gage steel mesh 2" from each face of wall embedded in foundation	≤ 140	A, B, C	$H \leq 8$	$H \leq 8T$	12	24

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s.

N/A = Not Applicable

a. See Table AU106.11(1) for reinforcing and anchorage specifications for wall types A, B, C, D and E.

b. H = height of the cob portion of the wall only. See Figure AU101.4. The maximum H is the absolute limit or the limit based on wall thickness, whichever is more restrictive.

c. Bond beams or other horizontal restraints are capable of separating a wall into more than one unrestrained wall height with an *approved* engineered design.

d. T = Cob wall thickness (in feet) at its minimum, without plaster.

e. 5/8-inch threaded rod anchors at prescribed spacing with 12" embedment in cob, full embedment in concrete bond beams or full penetration in wood bond beam with a nut and washer.

f. Attach rafters to bond beam with 4-inch by 3-inch by 3-inch by 18 gage tension tie angles at prescribed spacing. See Figure R608.9(9). Where rafters are attached to tension ties shall, roof sheathing shall be edge nailed.

g. All walls shall be tested for compressive strength in accordance with Section AU106.6.

h. For curved walls with an arc length:radius ratio of 1.5:1 or greater, the H/T factor shall be increased by 1, and the absolute height limit by 1 foot.

i. Wall type requires a modulus of rupture test in accordance with Section AU106.7.

j. See wall type A in Table AU106.11(1) for top anchor requirements.

AU105.3.2 Bond beams for nonstructural walls. Nonstructural *cob* walls shall be provided with a bond beam at the top of the wall that complies with Section AU106.9, except for requirements relating to roof and/or ceiling loads or *braced wall panels*.

AU105.3.3 Lintels in nonstructural walls. Door, window, and other openings in nonstructural *cob* walls shall require a lintel in accordance with Section AU106.10, except for requirements relating to roof and/or ceiling loads or *braced wall panels*.

AU105.3.4 Reinforcing at wall openings. Reinforcing shall be installed at window, door, and similar wall openings and penetrations greater than 2 feet (610 mm) in width in accordance with this section. Surface voids deeper than 25 percent of the wall thickness shall be considered an opening.

AU105.3.4.1 Opening size limit. Openings shall not exceed 6 feet (1829 mm) in width, and the height of the *cob* wall below openings shall not exceed 6 feet (1829 mm) above the top of the foundation.

AU105.3.4.2 Horizontal reinforcing. 2-inch by 2-inch (51 mm by 51 mm) 14 gage galvanized steel mesh shall be embedded 4 inches (102 mm) in the *cob* above the rough opening and below the rough opening for windows, and shall extend 12 inches (305 mm) beyond the sides of the opening. Walls below rough window openings greater than 4 foot 6 inches (1372 mm) in height shall be provided with additional horizontal reinforcing at mid-height.

AU105.3.4.3 Vertical reinforcing. Full-height 5/8-inch (16 mm) threaded rod shall be installed 4 inches (102 mm) from each side of the opening, centered in the thickness of the *cob* wall. The threaded rods shall be embedded 7 inches (178 mm) in the foundation, and 4 inches (102 mm) in concrete bond beams or shall penetrate through wood bond beams and be secured with a nut and washer. The threaded rods shall be embedded in concrete lintels, or pass through a drilled hole in wood lintels.

AU105.3.5 Minimum length of cob walls. Sections of *cob* walls between openings shall be not less than 2 foot 6 inches (762 mm) in length. Wall sections less than 4 feet (1219 mm) and not less than 2 foot 6 inches (762 mm) in length shall contain vertical reinforcing in accordance with Section AU105.3.4.3

AU105.4 Moisture control. *Cob* walls shall be protected from moisture intrusion and damage in accordance with Sections AU105.4.1 through AU105.4.5.

AU105.4.1 Water-resistant barriers and vapor permeance. *Cob* walls shall be constructed without a membrane barrier between the *cob* wall and *plaster* to facilitate transpiration of water vapor from the wall, and to secure a mechanical bond between the *cob* and *plaster*, except as otherwise required elsewhere in this appendix. Where a water-resistant barrier is placed behind an exterior finish, it shall be considered part of the finish system and shall comply with Section AU104.1(2) for the combined vapor permeance rating.

AU105.4.2 Horizontal surfaces. *Cob* walls and other *cob* elements shall be provided with a water-resistant barrier at weather-exposed horizontal surfaces. The water-resistant barrier shall be of a material and installation that will prevent erosion and prevent water from entering the wall system. Horizontal surfaces, including exterior window sills, sills at exterior niches, and exterior buttresses, shall be sloped not less than 1 unit vertical in 12

units horizontal to drain away from cob walls or other cob elements.

AU105.4.3 Separation of cob and foundation. A liquid-applied or bituminous Class II vapor retarder shall be installed between cob and supporting concrete or masonry

Exception: Where local climate, site conditions and foundation design limit ground moisture migration into the base of the cob wall, including but not limited to the use of a moisture barrier or capillary break between the supporting concrete or masonry and the earth.

AU105.4.4 Separation of cob and finished grade. Cob shall be not less than 8 inches (203 mm) above finished grade.

Exception: The minimum separation shall be 4 inches (102 mm) in Dry climate zones as defined in Table N1101.7.2(1) [R302.3(1)], and shall be 2 inches (51mm) on walls that are not weather-exposed.

AU105.4.5 Installation of windows and doors. Windows and doors shall be installed in accordance with the manufacturer's instructions to a wooden frame of not less than nominal 2x4 (51 mm by 102 mm) wood members anchored into the cob wall with 16d galvanized nails half-driven at a maximum 6-inch (152 mm) spacing, with the protruding half embedded in the cob. The wood frame shall be embedded not less than 1-1/2 inches (38 mm) in the cob and shall be set in from each face of the wall not less than 3 inches (76 mm). Alternative window and door installation methods shall be capable of resisting the wind loads in Table R301.2(2). Windows and doors in cob walls shall be installed so as to mitigate the passage of air or moisture into or through the wall system. Window sills shall comply with Section AU105.4.2.

AU105.5 Inspections. The building official shall inspect the following aspects of cob construction in addition to the required tests of, and accordance with Section R109.1:

1. Anchors and vertical and horizontal reinforcing in cob walls, where required in accordance with Tables AU105.2 and AU106.11(1) and Sections AU105.3.4 and AU105.3.5.
2. Reinforcing in any concrete bond beams or lintels, in accordance with Sections AU106.9.2 and Table AU106.10.

SECTION AU106 **COB WALLS—STRUCTURAL**

AU106.1 General. Cob structural walls shall be in accordance with the prescriptive provisions of this section. Designs or portions of designs not complying with this section shall require an approved engineered design.

AU106.2 Requirements for cob structural walls. In addition to the requirements of Section AU105.2, cob structural walls shall be subject to the following:

1. Wall height: shall be in accordance with Table AU105.3 for load-bearing cob walls or AU106.11(1) for cob braced wall panels, as applicable and most restrictive.
2. Wall thickness: shall be in accordance with Section AU105.2(5) and Section AU106.8.1 for load-bearing cob walls or AU106.11(1) for cob braced wall panels, as applicable and most restrictive.
3. Braced wall panel lengths: for buildings using cob braced wall panels, the greater of the values determined in accordance with Tables AU106.11(2) for wind loads and AU106.11(3) for seismic loads shall be used.

AU106.3 Loads and other limitations. Live and dead loads and other limitations shall be in accordance with Section R301, except that the dead load for cob walls shall be determined with the following equation:

$$CW_{DL} = (H \times T_{avg} \times D) \text{ (Equation AU-1)}$$

where:

CW_{DL} = Cob wall dead load (in pounds per lineal foot of wall)

H = Height of cob portion of wall (in feet)

T_{avg} = Average thickness of wall (in feet)

D = Density of cob = 110 (in pcf), unless a lesser value at equilibrium moisture content is demonstrated to the building official

AU106.4 Foundations. Foundations for *cob* walls shall be in accordance with Chapter 4. The width of foundations for cob walls shall be not less than the width of the cob at its base, excluding *finish*.

AU106.5 Wall taper, straightness and surface voids for cob walls. *Cob* walls shall be in accordance with the following:

1. *Cob structural and nonstructural walls* shall be vertical, or shall taper from bottom to top with the wall thickness in accordance with Section AU105.2(5) and the wall height in accordance with AU105.2(4).
2. *Cob structural and nonstructural walls* shall be straight or curved. Curved *braced wall panels* shall be in accordance with Sections AU106.11.2 and AU106.11.3.
3. Niches and other surface voids in *load-bearing walls* are limited to 12 inches (305 mm) in width and height and 25 percent of the wall thickness, and shall be located in the top two-thirds of the wall. Surface voids that exceed these limits shall be considered wall openings, and shall receive a lintel in accordance with Section AU106.10 and be reinforced in accordance with Section AU105.3.4. Surface voids are prohibited in *braced wall panels*.

AU106.6 Compressive strength of cob structural and nonstructural walls. All *cob* walls shall have a minimum compressive strength of 60 psi (414 kPa). *Cob* in walls used as *braced wall panels* shall have a minimum compressive strength of 85 psi (586 kPa).

AU106.6.1 Demonstration of compressive strength. The compressive strength of the *cob* mix to be used in *structural walls* and *nonstructural walls* as required in Section AU106.6 shall be demonstrated to the *building official* before the placement of cob onto walls, with compressive strength tests and an associated report by an *approved laboratory* or with an *approved on-site test* as follows:

1. Five samples of the proposed *cob* mix shall be placed moist to completely fill a 4-inch by 4-inch by 4-inch (102 mm by 102 mm by 102 mm) form and dried to ambient moisture conditions. Samples shall not be oven dried. Any opposite faces shall be faced with plaster of Paris if needed to achieve smooth, parallel faces, after which the sample shall reach ambient moisture conditions before testing. The horizontal cross-section of the dried sample as tested, and the maximum applied load at failure shall be used to calculate the sample's compressive strength. The fourth lowest value shall be used to determine the mix's compressive strength.

AU106.7 Modulus of rupture of cob structural walls. *Cob* in walls used as *braced wall panels* shall have a minimum modulus of rupture of 50 psi (345 kPa).

AU106.7.1 Demonstration of modulus of rupture. The modulus of rupture of *cob* used in structural walls as required in Section AU106.7 shall be demonstrated to the *building official* before the placement of cob onto walls, with modulus of rupture tests and an associated report by an *approved laboratory* or with an *approved on-site test* as follows:

1. Five samples of the proposed *cob* mix shall be placed moist to completely fill a 6-inch by 6-inch by 12-inch (152 mm by 152 mm by 305 mm) form and dried to indoor ambient moisture conditions. Samples shall not be oven dried. Each sample shall be tested with the 12-inch (305 mm) dimension horizontal. The fourth lowest value shall be used to determine if the mix's meets the minimum required modulus of rupture.

AU106.8 Bearing capacity. The allowable bearing capacity for *cob load-bearing walls* supporting vertical roof

and/or ceiling loads imposed in accordance with Section R301 shall be determined with the following equation:

$$BC = (C \times T_{min})/3 - (H \times T_{avg} \times D) \text{ (Equation AU-2)}$$

where:

BC = Allowable bearing capacity of wall (in pounds per lineal foot of wall)

C = Compressive strength (in psi) as determined in accordance with Section AU106.6

T_{min} = Thickness of wall (in feet) at its minimum

H = Height of cob portion of wall (in feet)

T_{avg} = Average thickness of wall (in feet)

D = Density of cob = 110 (in pcf), unless a lesser value at equilibrium moisture content is demonstrated

AU106.8.1 Support of uniform loads. Uniform roof and/or ceiling loads shall be supported by cob load-bearing walls not exceeding their allowable bearing capacity, as demonstrated in accordance with the following equation:

$$BL \leq BC \text{ (Equation AU-3)}$$

where:

BL = Design load on the wall (in pounds per lineal foot) determined in accordance with Sections R301.4 and R301.6

BC = Allowable bearing capacity of wall (in pounds per lineal foot of wall) determined in accordance with Section AU106.8

AU106.8.2 Support of concentrated loads. Concentrated roof and/or ceiling loads shall be distributed by structural elements capable of distributing the loads to the cob load-bearing wall and within its allowable bearing capacity as determined in accordance with Section AU106.8. Concentrated loads over lintels or over bond beams spanning openings shall require an approved engineered design.

AU106.9 Bond beams. Cob structural walls shall require a bond beam at the top of the wall in accordance with Sections AU106.9.1, AU106.9.2 or AU106.9.3, and shall be anchored to the cob below in accordance with Tables AU105.3, AU106.11(1) and AU106.12 as applicable and most restrictive. Bond beams spanning openings shall be in accordance with Section AU106.9.4.

AU106.9.1 Wood bond beams. Wood bond beams shall be not less than nominal 4 inches high by 8 inches wide and shall comply with Sections AU106.9.1.1 through AU106.9.1.3.

AU106.9.1.1 Wood species and grade. Wood bond beams shall be of a species with an extreme fiber in bending (F_b) of not less than 850 psi (5.9 MPa), a modulus of elasticity (E) of not less than 1,300,000 psi (8964 MPa), and of No. 2 grade or better. Composite lumber bond beams shall have an extreme fiber in bending (F_b) of not less than 850 psi (5.9 MPa), and a modulus of elasticity (E) of not less than 1,300,000 psi (8964 MPa).

AU106.9.1.2 Discontinuity. Discontinuous wood bond beams shall be spliced on top with a metal strap with not less than the allowable wind or seismic load tension capacity in accordance with the following, whichever is more restrictive:

1. For seismic design categories: A: 2500 pounds (11 kN). B: 4500 pounds (20 kN). C: 6000 pounds (26.7 kN).
2. For braced wall line lengths, when wind governs: 10 feet: 2500 pounds (11 kN). 20 feet: 3400 pounds (15.1 kN). 30 feet: 5000 pounds (22.2 kN).

AU106.9.1.3 Corners and curved walls. Wood bond beams at corners and discontinuities atop curved walls shall be connected across their exterior faces with a metal strap with a capacity of not less than that determined in accordance Section AU106.9.2.

AU106.9.2 Concrete bond beams. Concrete bond beams shall be not less than 6 inches (152 mm) high by 8 inches (305 mm) wide. Concrete bond beams shall be reinforced with two # 4 bars, 2 inches (51 mm) clear from the bottom and 2 inches (51 mm) clear from the sides. Lap splices shall comply with Table R608.5.4(1). Reinforcing at corners shall be in accordance with the horizontal reinforcing requirements in Section R608.6.4. The concrete shall have a compressive strength of not less than 2500 psi (17.2 MPa) at 28 days.

AU106.9.3 Other bond beams. Bond beams of other materials, including earthen materials, require an approved engineered design.

AU106.9.4 Bond beams spanning openings. Bond beams that support uniform roof and/or ceiling loads and span openings in cob walls shall be in accordance with Table AU106.10. Bond beams shall be continuous across the opening and not less than 1 foot (305 mm) beyond each side of the opening.

AU106.9.5 Connection of roof framing to bond beams. Roof and ceiling framing shall be attached to bond beams in accordance with Table R602.3(1), Items 2, 6, 30, 31, and 32. Tension ties shall be provided in accordance with Figure R608.9(9) and Footnote f of Table AU105.3. 10d toe nails at 6 inches (152 mm) on center shall be provided from the rim blocking to top plate for the entirety of braced wall lines, instead of the 43 mil strap shown in Figure R608.9(9). A nominal 2-inch by 6-inch (51 mm by 152 mm) wood plate shall be installed on concrete bond beams with 5/8-inch (16 mm) diameter anchor bolts with 5-inch (127 mm) embedment at 2 feet (610 mm) on center to allow the required fastening of roof and ceiling framing, including tension ties and toe nailing of rim blocking.

AU106.9.6 Bond beams at gable and shed roof end walls. Bond beams at end walls of buildings with gable or shed roofs shall comply with the following:

1. End walls shall not exceed 20 feet (6096 mm) in length.
2. Shall be continuous and straight for the entire wall line.
3. Wood bond beams when used shall comply with the following:
 - 3.1. Not less than nominal 4x8 (102 mm by 203 mm) when wind design governs in accordance with Tables AU106.11(2) and AU106.11(3), and for wall lengths ≤ 20 feet (6096 mm) in Seismic Design Category A, and for wall lengths ≤ 10 feet (3048 mm) in Seismic Design Categories B and C.
 - 3.2. Not less than nominal 4x10 (102 mm by 254 mm) for wall lengths ≤ 20 feet (6096 mm) in Seismic Design Category B.
 - 3.3. Not less than nominal 6x12 (152 mm by 305 mm) or 4x16 (102 mm by 406 mm) for wall lengths ≤ 20 feet (6096 mm) in Seismic Design Category C.
4. Concrete bond beams when used shall be in accordance with Section AU106.9.2 in Seismic Design Categories A, B, and C and for ultimate design wind speeds ≤ 140 mph (63.6 m/s).
5. Walls between the bond beam and roof shall be of wood-framed construction in accordance with Section R602.

AU106.10 Lintels. Door, window, and other openings in load-bearing cob walls shall be provided with a lintel of

wood or concrete in accordance with Table AU106.10.

TABLE AU106.10 LINTELS AND BOND BEAMS SPANNING OPENINGS

• GROUND SNOW LOAD ≤ 30 PSF			WOOD:		CONCRETE:	
			F_b ≥ 850 PSI E ≥ 1,300,000 PSI NO. 2 GRADE OR BETTER ORIENTED FLAT 1 PIECE OR 2 EQUAL-WIDTH PIECES EXTEND 1 FT BEYOND OPENING SIDES		2500 PSI COMPRESSIVE STRENGTH HEIGHT = 6" EXTEND 1 FT BEYOND OPENING SIDES REINFORCEMENT: 2 - #4 BARS^a 2" CLEAR FROM BOTTOM 2" CLEAR FROM SIDES^a	
Building width (feet)	Cob above lintel (feet)	Total cob wall and plaster thickness (inches)	SIZE OF WOOD LINTEL OR BOND BEAM H x W (nominal inches)		WIDTH OF CONCRETE LINTEL OR BOND BEAM (inches)	
			For Span ≤ 4'	For Span ≤ 6'	For Span ≤ 6'	For Span ≤ 8'
10	0	≤ 27	4x8	4x8	8	8
10	1	15	4x12	4x12	12	12
10	1	19	4x16	4x16	16	16
10	1	27	4x24	4x24	24	24
10	2	15	4x12	6x12	12	12
10	2	19	4x16	6x16	16	16
10	2	27	4x24	4x24	24	24
20	0	≤ 27	4x8	6x8	8	8
20	1	15	4x12	6x12	12	12
20	1	19	4x16	6x16	16	16
20	1	27	4x24	4x24	24	24
20	2	15	4x12	6x12	12	NP
20	2	19	4x16	6x16	16	NP
20	2	27	4x24	6x24	24	NP
30	0	≤ 27	4x8	6x8	8	NP
30	1	15	4x12	6x12	12	NP
30	1	19	4x16	6x16	16	NP

30	1	27	4x24	6x24	24	NP
30	2	15	4x12	6x12	12	NP
30	2	19	4x16	6x16	16	NP
30	2	27	4x24	6x24	24	NP

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm

NP = Not Permitted

a. Concrete bond beams spanning openings, and lintels greater than 16 inches in width, shall have an additional #4 bar in the center of their width.

AU106.11 Cob braced wall panels. *Cob braced wall panels shall be in accordance with Section R602.10 and Tables AU106.11(1), AU106.11(2) and AU106.11(3A), AU106.11(3B) and AU106.11(3C). Wind design criteria shall be in accordance with Section R301.2.1. Seismic design criteria shall be in accordance with Section R301.2.2. An approved engineered design shall be required in accordance with Section R301.2.1 where the building is located in a Special Wind Region or a Wind Design Required location in accordance with Figure R301.2(5)B.*

AU106.11.1 Non-orthogonal braced wall panels. *Braced wall panels at an angle to the orthogonal braced wall lines shall be considered to contribute to the minimum total braced wall lengths in Tables AU106.11(2) and AU106.11(3) as follows:*

1. A braced wall panel not more than 45 degrees and greater than 30 degrees to an adjacent orthogonal braced wall line shall contribute 50% of its length to that line.
2. A braced wall panel not more than 30 degrees to an orthogonal braced wall line shall contribute 65 percent of its length to that line.
3. A braced wall panel greater than 45 degrees and not more than 60 degrees to an orthogonal braced wall line shall contribute 35 percent of its length to that line.
4. The angle of a curved braced wall panel to a braced wall line shall be determined with the chord of that section of wall, connecting the end points of the arc at the center of the wall.

AU106.11.2 Braced wall lines for buildings with curved walls. *Buildings with curved cob walls shall contain two braced wall lines in two orthogonal directions. The spacing of the braced wall lines for wind design in Table AU106.11(2) and the spacing and length of the braced wall lines for seismic design in Table AU106.11(3), shall be the maximum widths of the building in the two orthogonal directions.*

AU106.11.3 Radius, thickness and length of curved braced wall panels. *Cob curved braced wall panels shall have an inside radius of not less than 5 feet (1524 mm), shall be of the thickness required in Table AU106.11(1) and of the length determined in accordance with Section AU106.11. The curved wall's length shall be considered to be the length of the arc at the center of the wall, in accordance with Figure AU106.11.3 and determined with the following equation:*

$$ARC_C = .0175 R_C \times A \text{ (Equation AU-4)}$$

where:

ARC_C = Length of arc at center of wall (in feet)

R_C = Radius at center of wall = R_{I+} .5T (in feet)

R_I = Inside radius of wall (in feet)

T = Thickness of wall without finish (in feet)

A = Angle of extent of braced wall panel from the center of the arc (in degrees)

FIGURE AU106.11.3 CURVED BRACED WALL PANEL

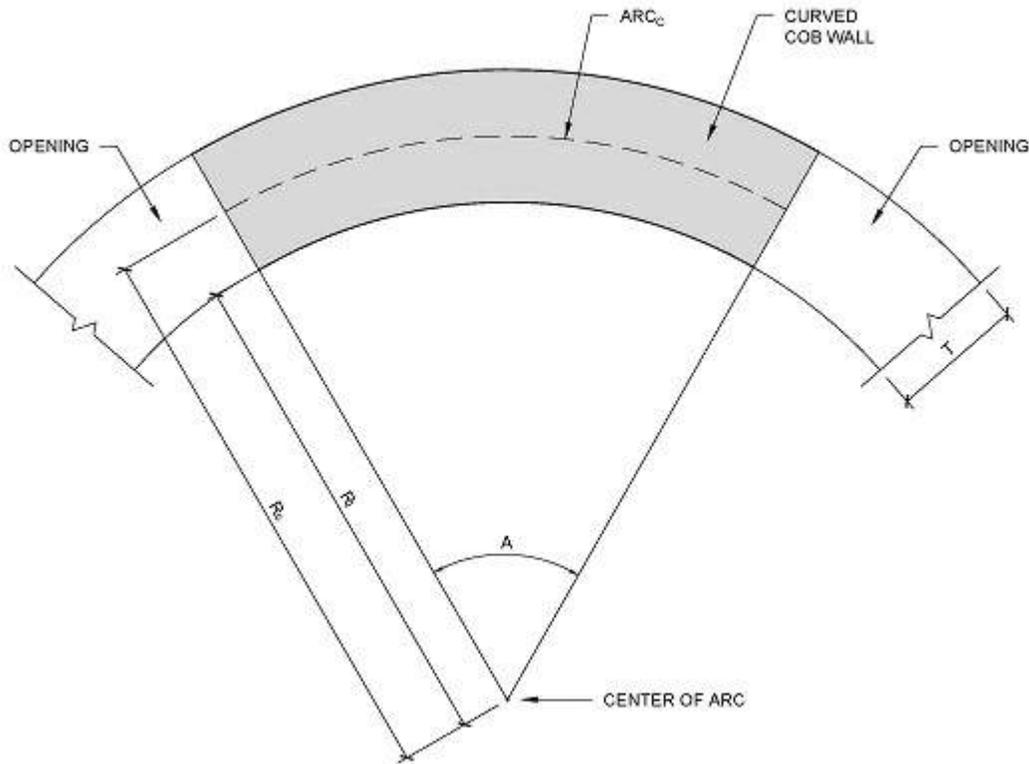


TABLE AU106.11(1) COB BRACED WALL PANEL TYPES

WALL TYPE ^a DESIGNATION	ANCHORS TO FOUNDATION ^b	ANCHORS TO BOND BEAM ^c	VERTICAL STEEL REINFORCING ^{b, c}	HORIZONTAL STEEL REINFORCING	MAXIMUM HEIGHT H ^d (in feet)	MAXIMUM ASPECT RATIO (H:L)
A	none	5/8" threaded rod @12" 4" from wall ends 12" embedment in cob	none	none	7 ^e	1:1
B	#5 bar @ 12" 16" embedment in cob	5/8" threaded rod @12" 4" from wall ends 16"	none	2"x2"x14 gage welded wire mesh ^f @ 18", 6" from foundation and bond beam	7 ^e	1:1

		embedment in cob 2"x2"x1/4" washer and nut at cob end				
C	#5 bar @ 12" 16" embedment in cob	5/8" threaded rod @12" 16" embedment in cob	5/8" threaded rod 4" from each end of braced wall panel continuous from foundation to bond beam	2"x2"x14 gage welded wire mesh ^f @ 18", 6" from foundation and bond beam	7 ^e	2:1
D	(see vertical steel reinforcing)	(see vertical steel reinforcing)	5/8" threaded rod 4" from each end of braced wall panel and @12", continuous from foundation to bond beam	2"x2"x14 gage welded wire mesh ^f @ 18", 6" from foundation and bond beam	7 ^e	2:1
E	6"x6"x6 gage welded wire mesh 12"embedment in foundation	5/8" threaded rod @12" 4" from wall ends 12" embedment in cob	6"x6"x6 gage welded wire mesh 2" from each wall face	none	7.5	1:1

SI: 1 inch = 25.4 mm.

a. Braced wall panel types A, B, C, and D shall be not less than 16 inches thick. Brace wall panel type E shall be not less than 12 inches thick. All braced wall panels shall be not greater than 24 inches thick.

b. Not less than 8" embedment into foundation, unless otherwise stated.

c. Not less than 4" embedment into concrete bond beams. Full penetration through wood bond beam, secured with nut and washer.

d. H = height of the cob portion of the wall only. See Figure AU101.4.

e. Maximum height shall be 8 feet when wall thickness is increased to 18".

f. Galvanized mesh.

TABLE AU106.11(2) BRACING REQUIREMENTS FOR COB BRACED WALL PANELS BASED ON WIND

SPEED

<ul style="list-style-type: none"> • EXPOSURE CATEGORY B^d • 25-FOOT MEAN ROOF HEIGHT • 10-FOOT EAVE-TO-RIDGE HEIGHT^d • 10-FOOT WALL HEIGHT^d • 2 BRACED WALL LINES^d 			MINIMUM TOTAL LENGTH (FEET) OF COB BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE ^{a, b, c, d}			
Ultimate Design Wind Speed (mph)	Story Location	Braced Wall Line Spacing (feet)	Cob braced wall panel ^e A (aspect ratio H:L ≤ 1:1)	Cob braced wall panel ^e B (aspect ratio H:L ≤ 1:1)	Cob braced wall panel ^e C, D (aspect ratio H:L ≤ 2:1)	Cob braced wall panel ^e E (aspect ratio H:L ≤ 1:1)
10	6.0	6.0	3.7	NP		
≤ 110	One-story building	20	7.9	7.4	7.4	NP
30	11.8	11.0	11.0	NP		
10	6.0	6.0	4.1	NP		
≤ 115	One-story building	20	8.7	8.1	8.1	NP
30	13.0	12.1	12.1	NP		
10	6.0	6.0	4.4	NP		
≤ 120	One-story building	20	9.4	8.8	8.8	NP
30	14.1	13.1	13.1	NP		
10	6.0	6.0	5.1	NP		
≤ 130	One-story building	20	11.0	10.3	10.3	NP
30	16.5	15.4	15.4	NP		
10	6.0	6.0	5.9	NP		
≤ 140	One-story building	20	12.7	11.9	11.9	NP
30	19.1	17.8	17.8	NP		

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 mile per hour = 0.447 m/s.

a. Linear interpolation shall be permitted.

b. Braced wall panels shall be without openings.

c. Braced wall panel types A, B and E shall have an aspect ratio (H:L) ≤ 1:1. Braced wall panel types C and D shall have an aspect ratio (H:L) ≤ 2:1.

d. Subject to applicable wind adjustment factors associated with Items 1 and 2 of Table R602.10.3(2)

e. Cob braced panel types indicated shall comply with Sections AU106.11.1, AU106.11.2 and Table AU106.11(1).

TABLE AU106.11(3A) BRACING REQUIREMENTS FOR COB-BRACED WALL PANELS BASED ON SEISMIC DESIGN CATEGORY A

<ul style="list-style-type: none"> • SOIL CLASS D^e • TOTAL WALL HEIGHT = 10 FEET (INCLUDING STEM WALL AND BOND BEAM) • COB WALL HEIGHT PER TABLE AS106.11(1) • 15 PSF ROOF-CEILING DEAD LOAD^d • STORY LOCATION: ONE-STORY BUILDING • SEISMIC DESIGN CATEGORY A • 1.5" PLASTER THICKNESS EACH SIDE^h 				MINIMUM TOTAL LENGTH (FEET) OF COB-BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE^{a, b, c, d}		
Braced wall line spacing (feet)	Braced wall line length (feet)	Braced wall line % openings	Perpendicular braced wall line % openings	Cob-braced wall panel ^e A, B	Cob-braced wall panel ^e C, D	Cob-braced wall panel ^e E
10	30	Any % ^g	Any % ^g	Wind ⁱ	Wind ⁱ	NP
20	20	Any % ^g	Any % ^g	Wind ⁱ	Wind ⁱ	NP
20	30	Any % ^g	Any % ^g	Wind ⁱ	4.5	NP
30	30	Any % ^g	Any % ^g	Wind ⁱ	Wind ⁱ	NP

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 pound per square foot = 0.0479 kPa.

a. Interpolation is not permitted.

b. Braced wall panels shall be without openings.

c. Braced wall panel types A, B and E shall have an aspect ratio (H:L) ≤ 1:1. Braced wall panel types C and D shall have an aspect ratio (H:L) ≤ 2:1.

d. Subject to applicable seismic adjustment factors associated with item 5 in Table R602.10.3(4).

e. Cob braced panel types indicated shall comply with Sections AU106.11.1 and AU106.11.2 and Table AU106.11(1).

f. Wall bracing lengths are based on a soil site class "D." Interpolation of bracing lengths between S_{ds} values associated with the seismic design categories is allowable where a site-specific S_{ds} value is determined in accordance with Section 1613.3 of the *International Building Code*.

g. Openings in the braced wall line shall not be limited, except that the minimum total braced wall panel length shall be as determined by Tables AU106.11(3A) and AU106.11(2).

h. For total plaster thickness between 3-inches and 6-inches, the minimum total length of braced wall panels shall be multiplied by 1.2.

i. The minimum total braced wall panel length shall be governed by Table AU106.11(2).

AU106.11(3B) BRACING REQUIREMENTS FOR COB-BRACED WALL PANELS BASED ON SEISMIC DESIGN CATEGORY B

<ul style="list-style-type: none"> • SOIL CLASS D^e • TOTAL WALL HEIGHT = 10 FEET (INCLUDING STEM WALL AND BOND BEAM) • COB WALL HEIGHT PER TABLE AS106.11(1) • 15 PSF ROOF-CEILING DEAD LOAD^d • STORY LOCATION: ONE-STORY BUILDING • SEISMIC DESIGN CATEGORY B • 1.5" PLASTER THICKNESS EACH SIDE^h 				MINIMUM TOTAL LENGTH (FEET) OF COB-BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE^{a, b, c, d}		
Braced wall line spacing (feet)	Braced wall line length (feet)	Braced wall line % openings	Perpendicular braced wall lines % openings	Cob-braced wall panel ^e A, B	Cob-braced wall panel ^e C, D	Cob-braced wall panel ^e E
10	10	Any % ^g	Any % ^g	Wind ⁱ	Wind ⁱ	NP
10	20	0	Any % ^g	6.0	4.9	NP
10	20	50	Any % ^g	6.0	Wind ⁱ	NP
10	30	0	Any % ^g	7.1	6.6	NP
10	30	50	Any % ^g	6.0	4.5	NP
20	10	0	0	6.0 ^j	4.9 ^j	NP
20	10	0	50	6.0	Wind ⁱ	NP
20	10	50	Any % ^g	6.0	4.2	NP
20	10	50	50	6.0	4.2	NP
20	20	0	0	7.4	6.9	NP
20	20	0	50	6.0	5.5	NP
20	20	50	0	6.0	5.5	NP
20	20	50	50	6.0	4.1	NP
20	30	0	0	9.4	8.8	NP

20	30	0	50	7.9	7.4	NP
20	30	50	0	7.2	6.7	NP
20	30	50	50	6.0	5.3	NP
30	10	Any % ^g	Any % ^g	Wind ⁱ	Wind ⁱ	NP
30	20	0	0	9.4	8.8	NP
30	20	0	50	Wind ⁱ	Wind ⁱ	NP
30	20	50	Any % ^g	7.9	Wind	NP
30	30	0	0	11.8	11.0	NP
30	30	0	50	9.5	8.9	NP
30	30	50	0	9.5	8.9	NP
30	30	50	50	Wind ⁱ	Wind ⁱ	NP

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 pound per square foot = 0.0479 kPa.

NP = Not Permitted

- a. Interpolation is not permitted.
- b. Braced wall panels shall be without openings.
- c. Braced wall panel types A, B and E shall have an aspect ratio (H:L) ≤ 1:1. Braced wall panel types C and D shall have an aspect ratio (H:L) ≤ 2:1.
- d. Subject to applicable seismic adjustment factors associated with Item 5 in Table R602.10.3(4)
- e. Cob braced panel types indicated shall comply with Sections AU106.11.1, AU106.11.2 and Table AU106.11(1).
- f. Wall bracing lengths are based on a soil site class “D.” Interpolation of bracing lengths between *S_d* values associated with the seismic design categories is allowable where a site-specific *S_d* value is determined in accordance with Section 1613.3 of the *International Building Code*.
- g. Openings in the braced wall line shall not be limited, except that the minimum total braced wall panel length shall be as determined by Tables AU106.11(3A) and AU106.11(2).
- h. For total plaster thicknesses 3-inches to 6-inches, the minimum total length of braced wall panels shall be multiplied by 1.2.
- i. The minimum total braced wall panel length shall be governed by Table AU106.11(2).
- j. Total plaster thicknesses shall be not greater than 3-inches. Substitute 15/32” roof sheathing and 10d at 6” edge nailing for requirements in Table R602.3(1).

AU106.11(3C) BRACING REQUIREMENTS FOR COB-BRACED WALL PANELS BASED ON SEISMIC DESIGN CATEGORY C

<p>• SOIL CLASS D^e</p>	<p>MINIMUM TOTAL LENGTH (FEET) OF COB-BRACED WALL PANELS REQUIRED ALONG</p>
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<ul style="list-style-type: none"> • TOTAL WALL HEIGHT = 10 FEET (INCLUDING STEM WALL AND BOND BEAM) • COB WALL HEIGHT PER TABLE AS106.11(1) • 15 PSF ROOF-CEILING DEAD LOAD^d • STORY LOCATION: ONE-STORY BUILDING • SESIMIC DESIGN CATEGORY C • 1.5" PLASTER THICKNESS EACH SIDE^h 	EACH BRACED WALL LINE ^{a, b, c, d}
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Braced wall line spacing (feet)	Braced wall line length (feet)	Braced wall line % openings	Perpendicular braced wall lines % openings	Cob-braced wall panel ^e A, B	Cob-braced wall panel ^e C, D	Cob-braced wall panel ^e E
10	10	0	0	8.3 ⁱ	7.8 ⁱ	NP
10	10	0	50	6.5	6.1	NP
10	10	25	0	7.4 ⁱ	6.9 ⁱ	NP
10	10	50	50	4.7	4.4	NP
10	15	0	0	10.6	9.9	NP
10	15	0	50	8.7	8.2	NP
10	15	50	0	7.8	7.3	NP
10	15	50	50	6.0	5.6	NP
10	20	0	0	12.8	11.9	NP
10	20	0	50	11.0	10.2	NP
10	20	50	0	9.1	8.5	NP
10	20	50	50	7.3	6.8	NP
15	10	25	0	9.6	9.0	NP
15	10	0	50	7.8	7.3	NP
15	10	50	0	8.7	8.2	NP
15	10	50	50	6.0	5.6	NP
15	15	0	0	12.9	12.1	NP
15	15	0	50	10.2	9.5	NP
15	15	50	0	10.2	9.5	NP
15	15	50	50	7.5	7.0	NP
15	20	0	0	15.3	14.3	NP
15	20	0	50	12.6	11.7	NP
15	20	50	0	11.7	10.9	NP
15	20	50	50	8.9	8.3	NP
20	10	25	0	NP	NP	NP
20	10	0	50	9.1	8.5	NP
20	10	50	Any % ^g	NP	NP	NP

20	10	50	50	7.3	6.8	NP
20	15	0	0	NP	NP	NP
20	15	0	50	11.7 ⁱ	10.9 ⁱ	NP
20	15	50	0	NP	NP	NP
20	15	50	50	8.9 ⁱ	8.3 ⁱ	NP
20	20	0	0	NP	NP	NP
20	20	0	50	14.2	13.3	NP
20	20	50	0	NP	NP	NP
20	20	50	50	NP	9.9	NP

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 pound per square foot = 0.0479 kPa.

NP = Not Permitted

a. Interpolation is not permitted.

b. Braced wall panels shall be without openings.

c. Braced wall panel types A, B and E shall have an aspect ratio (H:L) ≤ 1:1. Braced wall panel types C and D shall have an aspect ratio (H:L) ≤ 2:1.

d. Subject to applicable seismic adjustment factors associated with item 5 in Table R602.10.3(4).

e. Cob braced panel types indicated shall comply with Sections AU106.11.1, AU106.11.2 and Table AU106.11(1).

f. Wall bracing lengths are based on a soil site class "D." Interpolation of bracing lengths between *S_{ds}* values associated with the seismic design categories is allowable where a site-specific *S_{ds}* value is determined in accordance with Section 1613.3 of the *International Building Code*.

g. Openings in the braced wall line shall not be limited, except that the minimum total braced wall panel length shall be as determined by Tables AU106.11(3A) and AU106.11(2).

h. For total plaster thicknesses 3" to 6", multiply the minimum total length of braced wall panels by 1.2.

i. Total plaster thickness > 3" is not permitted. Substitute 15/32" roof sheathing and 10d at 6" edge nailing for requirements in Table R602.3(1).

AU106.12 Resistance to wind uplift forces. Cob walls that resist uplift forces from the roof assembly, as determined in accordance with Section R802.11, shall be in accordance with Table AU106.12.

TABLE AU106.12 ANCHORAGE OF BOND BEAMS FOR WIND UPLIFT

<p>· ANCHORS: 5/8" ALL THREAD AT 12" O.C. a, b</p> <p>· 2"x2"x1/4" WASHERS AND NUT AT END IN COB</p> <p>· 4" EMBEDMENT IN CONCRETE BOND BEAMS</p>
--

· FULL PENETRATION THROUGH WOOD BOND BEAMS WITH 2"x2"x1/4" WASHER AND NUT			
ANCHORAGE DEPTH IN INCHES, PER WALL WIDTH AND WIND UPLIFT FORCE			
WIND UPLIFT FORCE FROM TABLE R802.11 (PLF)	≤ 12" wall width ^c	≤ 16" wall width ^c	≤ 24" wall width ^c
< 75	16	12	12
< 100	24	16	12
< 150	4' o.c. continuous from foundation to bond beam ^d	24	16
< 200	4' o.c. continuous from foundation to bond beam ^d	4' o.c. continuous from foundation to bond beam ^d	24

a. For wood bond beams a maximum of 6" from bond beam ends.

b. For min. 6"x8" concrete bond beams, at 18" o.c. for wind uplift forces < 75 plf., and at 16" o.c. for wind uplift forces < 100 plf.

c. Excluding finishes.

d. With 7-inch embedment in foundation, 4-inch embedment in concrete bond beam or full penetration through wood bond beam with 2"x2"x1/4" washer and nut.

AU106.13 Post-and-beam with cob infill. Post-and-beam with *cob* infill wall systems shall be in accordance with an *approved* engineered design.

AU106.14 Buttresses. *Cob* buttresses that are intended to provide out-of-plane wall bracing, or additional capacity for *braced wall panels* shall be in accordance with an *approved* engineered design.

SECTION AU107 **COB FLOORS**

AU107.1 Cob floors. *Cob* floors supported by grade shall be in accordance with an *approved* specification. Straw shall not be required in the material mix.

SECTION AU108 **FIRE RESISTANCE**

AU108.1 Fire-resistance rating. *Cob* walls shall be considered to exhibit a 1-hour fire-resistance rating in accordance with the following:

1. Wall thickness shall be 10 inches (254 mm) or greater.
2. Density shall be 70 pcf (1121 kg/m³) or greater.
3. When used as a *load-bearing wall*, the maximum design load shall be 1000 pounds per lineal foot (14,590 N/m) in accordance with Section AS106.8.
4. When used as a *braced wall panel*, the wall shall be in accordance with Section AS106.11.

AU108.2 Clearance to fireplaces and chimneys. *Cob* walls or other *cob* surfaces shall not require clearance to fireplaces and chimneys, except where clearance to non-combustibles is required by the manufacturer's instructions.

SECTION AU109

THERMAL PERFORMANCE

AU109.1 Thermal characteristics. *Cob walls* shall be classified as mass walls in accordance with Section N1102.2.5 (R402.2.5) and shall meet the R-value requirements for mass walls in Table N1102.1.2 (R402.1.2).

AU109.2 Thermal resistance. The unit R-value for *cob* walls with a density of 110 pcf (1762 kg/m³) shall be R-0.22 per inch of *cob* thickness. Walls that vary in thickness along their height or length shall use the average thickness of the wall to determine its R-value. The thermal resistance values of air films and finish materials or additional insulation shall be added to the *cob* wall's thermal resistance value to determine the R-value of the wall assembly.

AU109.3 Additional insulation. When insulating materials are added to the face of a *cob* wall, the combination of additional insulation and any associated connecting, weather-resisting, or protective materials shall comply with Section AU104.1, Items 1-4.

SECTION AU110 REFERENCED STANDARDS ASTM C5—10 Standard Specification for Quicklime for Structural Purposes - AU104.4.6.1

ASTM C141/C141M—14 Standard Specification for Hydrated Hydraulic Lime for Structural Purposes - AU104.4.6.1

ASTM C206—14 Standard Specification for Finishing Hydrated Lime - AU104.4.6.1

ASTM C1707—11 Standard Specification for Pozzolan Hydraulic Lime for Structural Purposes - AU104.4.6.1

ASTM E2392/ E2392M—10 Standard Guide for Design of Earthen Wall Building Systems - AU104.4.3.2

ASTM BS1, ASTM BS EN 459—2015 Part 1: Building Lime. Definitions, Specifications and Conformity Criteria; Part 2: Test Methods - AU104.4.6.1

Reason: Cob is an earthen material mix of clay-soil, sand, straw, and water, placed onto a wall in layers to create a monolithic wall. Because the material mix and density of cob are very similar to those of adobe bricks, cob is sometimes known as “monolithic adobe.”

Cob has been used for thousands of years around the world, notably in England and Northern Europe, the Middle East, West Africa, China, and the Southwestern United States. An estimated 20,000 cob homes are still inhabited in the English county of Devon alone, some dating from the 15th century. The term “cob” derives from an Old English word for “lump,” since historical structures were often constructed one handful at a time.



Today, cob is often mixed mechanically using a tractor or mortar mixer, but the wall construction is still generally manual. Cob buildings typically feature raised impermeable foundations and extended roof eaves to protect the walls from moisture and weather. Walls are often plastered with clay, lime or gypsum plasters which protect and beautify the cob without leading to the moisture problems associated with less vapor-permeable finishes such as cement stucco on historic adobe structures.

Since the 1990's, there has been increasing interest in cob construction in the United States and much of the world. Like other earthen construction methods, cob can greatly reduce embodied energy and life-cycle CO2 emissions of buildings. Cob is highly recyclable, and with good design, construction and maintenance, can withstand centuries of use. The constituent materials are inexpensive compared with lumber, steel, concrete and other commonly used building materials. Cob is non-combustible and non-toxic in all stages of construction and use. Cob's thermal mass and moisture management properties modulate interior temperature and humidity, creating healthful building.



While adobe is included in the masonry chapter of the IBC, and cob building codes or guidelines exist in England and New Zealand, there is currently no cob building code in the United States. As a result, permitting of cob buildings has been left to individual building officials on a case-by-case basis. Designers, builders and officials may be unaware of proper practices to make cob buildings safe and durable. Nevertheless, the desire to utilize cob construction continues, and promises to accelerate in response to economic and environmental pressures. These include the need for non-combustible construction systems that can withstand the increased frequency and intensity of wildfires in the western U.S. The lack of a cob building code has been an impediment to the proper and broader use of cob construction.



The proposed Cob Construction appendix for the IRC was created in response to this need. It is based on New Zealand's earthen building standards, on US codes for the closely-related earthen building systems of adobe and straw-clay, and on the experience and the testing of cob buildings over the past 25 years by architects, engineers, builders, and academics throughout the U.S. and the world. It has received review and input from over 25 experts including 4 architects and 6 civil engineers, including the architect and chair of the Committee that developed the New Zealand Standard for Earth Buildings. Much of the recent testing and research has been compiled or performed by the California-based Cob Research Institute, a non-profit organization founded in 2008 to remove legal barriers to cob construction and promote its safe use. If adopted, the proposed appendix will serve designers, builders, owners, inhabitants, and building officials alike in the design and construction of safe and durable cob buildings.

Supporting documents for the proposed Cob Construction appendix is available at:
<https://www.cobcode.org/cobcode-documents>

Rationale for Specific Sections of Proposed Appendix U – Cob Construction

GENERAL:

Cob construction can help address the increasing need to reduce our buildings' negative impacts on the environment, including the global climate, and address the impacts of a changing climate on buildings, including increased firestorms. Like other earthen wall systems, cob is among the most fire-resistant building materials available, while also having a low environmental impact. The ability to build with site- or locally-sourced materials further reduces processing and transportation impacts as well as costs.

Though cob construction is not an industrialized building system, its centuries of continuous use in many parts of the world provide empirical evidence and guidance for good practice. This appendix gives the building official greater flexibility to consider empirical evidence and lifecycle impacts in meeting the intent of the code while not abridging health and life-safety requirements.

DEFINITIONS:

Cob-specific terms not found in the IRC are defined. Some terms already defined in the IRC are adjusted to give

specific meaning for cob construction. Some definitions are consistent with identical terms defined in IRC Appendix R – Light Straw Clay Construction, and Appendix S – Strawbale Construction.

MATERIALS, MIXING AND INSTALLATION:

The provisions for materials, mixing, and installation are based on existing codes, standards, and guidelines from the UK, New Zealand and the U.S., including ASTM E2392-10 Standard Guide for the Design of Earthen Wall Systems, as well as the experience of designers and builders of cob and earthen buildings in the U.S. and other countries.

Though the materials for cob can vary considerably, the material specifications coupled with the mix design tests for shrinkage, compressive strength and modulus of rupture ensure adequate strength and stability of the wall materials.

FINISHES:

Where cob walls are not substantially rain-exposed they are allowed to remain without finish. Minor erosion has proven to be acceptable on cob walls, and is a matter of maintenance, not unlike the need to periodically repaint the exterior of buildings of conventional construction. However, where cob walls are susceptible to excessive erosion or water intrusion from weather, finishes are necessary to protect the wall while ensuring that any moisture that might enter the wall is able to escape without causing harm. Thus, finishes and finish assemblies must be a minimum of 5 perms, the IRC defined threshold of vapor permeable. Class I and II vapor retarders are prohibited on cob walls except where specifically permitted or required, for example at showers.

A range of plaster types are allowed and described, specifying critical components and characteristics of the plasters, the recognized standards with which they must comply, and other necessary details for their installation. The plasters allowed in the appendix have a history of successful use on cob and other earthen wall systems.

Non-plaster finishes systems are allowed with approved specifications that ensure: adequate attachment or support, the ability to safely discharge moisture, a minimum vapor permeance rating, and compliance with stated weight limits.

COB WALLS - GENERAL:

General limits are given for all cob buildings, including: one story; maximum building height of 25 feet; Seismic Design Categories A, B, and C (except with an approved engineered design); wall height and wall thickness limitations; and an approved engineered design for interior cob walls that addresses their seismic lateral loads (except in Seismic Design Category A).

A method of out-of-plane resistance is required for all walls, and wall height limits are given. Bond beams are required and described for all cob walls, as are lintels over door and window openings. Reinforcing at window and door openings is required for openings wider than 2 feet. Window openings are limited to 6 feet in width and horizontal and vertical reinforcing at window and door openings is required and described. A minimum cob wall length between openings is given and reinforcing required to ensure the wall's stability.

Moisture control requirements address potential moisture intrusion from rain or snow, or through capillary action from the ground and help ensure that moisture that might enter is not trapped. That protection includes limiting the use of membranes and barriers between the cob and plaster finishes. Limiting the use of membranes also enables a mechanical bond between the plaster and the cob.

A Class I or II vapor retarder is required between the bottom of the cob wall and the foundation to prevent ground moisture from rising into the wall, unless the particular project conditions and design eliminate this need. A minimum separation of the cob wall above finished grade is required. Protection of horizontal surfaces is required to prevent erosion and water intrusion.

Requirements for installing windows and doors are given so they are secure and prevent the passage of air or moisture through or into the wall.

In addition to inspections normally required, inspections specific to cob construction are required for the anchors connecting cob walls to the foundation and the bond beam, for required vertical or horizontal reinforcing in the walls, and for reinforcing in any concrete bond beams or lintels.

COB WALLS - STRUCTURAL:

Cob walls are a compression dominant wall system containing a micro-reinforcing system of straw throughout. Testing has shown this increases ductility compared to earthen materials with no straw. Cob can be reinforced with other standard reinforcing materials such as steel bar and welded wire mesh, making it akin to concrete construction in this respect. Cob wall systems using these reinforcing materials are included in the proposed appendix.



First Permitted Cob Structure in Berkeley, California Under Construction

University and independent lab structural tests on cob have been conducted and documented since the 1990s. Testing this proposed code has used as the bases of its analysis include: In-Plane Reverse Cyclic Tests as well as small scale batch testing at Santa Clara University; Small Scale batch testing at the University of Plymouth (England); Federal Institute for Materials Research and Testing, Berlin, Germany; The University of Oregon; Wuhan University of Technology, China; the University of San Francisco; and the Washington State University. Shake table test results were also used from the University of Sydney (Australia), and the University of British Columbia (Canada).



This proposed code also drew on the following codes, standards and earthen engineering texts: ASTM E2392 Standard Guide for Design of Earthen Wall Building Systems; the engineered and prescriptive New Zealand Standard for Earth Buildings NZS4297-99; The New Mexico Earthen Building Materials Code; the prescriptive German Earthen Building Standard, DIN 4102; and earthen engineering texts such as Building with Earth: Design and Technology of a Sustainable Architecture, by Gernot Minke.

Gravity load-bearing values are based on project specific, required material tests. Lateral loads are limited to Seismic Design Categories (SDC) A, B, and C, with increased safety factors and decreased Response Modification Factors for SDC C. Gravity and earthquake effects of the cob weight itself have been generated assuming a material density of 110 pcf which is the upper limit of density for all tests assessed. A common density range of 80-105 pcf is expected in the field. Appropriate adjustment factors have been applied for other structural elements and connections contained in other parts of the IRC that may be uniquely affected by the increased dead load of cob walls, such as the roof diaphragm. A full report of the structural analysis that generated this proposed appendix is available at: <https://www.cobcode.org/cobcode-documents>

COB FLOORS:

Cob floors on grade, with or without straw, are permitted in cob buildings, but the specifications must be approved by the building official. There are numerous viable cob floor systems. The modern evolution and growing use of cob and other earthen floors in high-end custom homes is testament to their serviceability, aesthetic appeal, and low environmental impact.

FIRE RESISTANCE:

ASTM E119 Fire-Resistance Rating Equivalency for Monolithic Adobe (Cob) walls.

To establish the minimum 1-hour fire resistance rating for a 10" thick cob wall included in this appendix, extensive research was done into existing ratings in codes and standards, testing, and fire experience in earthen wall buildings. A technical equivalency evaluation was conducted by Reax Engineering, Inc., which is summarized below. In addition, it is worth noting that in Australia as in the western U.S., devastating wildfires, or bushfires as they are called in Australia, have been increasing in frequency and intensity. Because of a tradition of buildings with earthen walls in areas that have experienced the most intense bushfires, they have had the opportunity to observe how earthen walls perform in firestorms.



The Australian Standard AS 3959-2009, "Construction of buildings in bushfire-prone areas," was developed as a result. This standard lists "earth wall including mud brick" as one of only three external wall materials not needing additional testing even in the most extreme and vulnerable bushfire zones, BAL FZ (Bushfire Attack Level- Flame Zone). The standard stipulates that the exposed components of external walls shall be of non-combustible material at least 90mm (3.54 inches) thick. Along with earth walls, the other materials listed as acceptable without additional testing for external walls are full masonry and precast or in situ concrete. The minimum 10-inch thick 1-hour cob wall in this proposed appendix is almost three times as thick as the minimum

thickness of the earth wall accepted by that standard for the highest fire risk zones in Australia.

Additionally, the Australian Earth Building Handbook, HB195-2002, in Section 4.6 Fire Resistance Level, states, "In the absence of specific test data, the general fire resistance level (FRL) of earth walls satisfying the minimum thickness requirements outlined in Clause 4.3.4 may be taken as not greater than 120/120/120, or 90/90/90 where wall thickness is less than 200 mm." Clause 4.3.4 Structural Adequacy states: "Minimum recommended thicknesses for mud brick, stabilized pressed block and rammed earth are as follows: External walling - 200 mm, Internal walling - 125 mm. The minimum wall thickness for poured earth and cob wall construction is also recommended to be 200 mm, though in practice wall thickness will often exceed this value."

The three numbers in the FRL represent minutes before failure for structural adequacy/integrity/insulation. In other words the time for the wall to be able to maintain a load, maintain its integrity, and before heat increase on the unheated side of the wall exceeds accepted limits. Thus Australia gives a 2-hour fire resistance rating for a 200 mm (7.87") earth wall. This Standards Australia handbook is available via the supporting documents link above.

Summary of the Reax Engineering Inc. evaluation and analysis of historical tests and other relevant evidence to determine a fire-resistance rating equivalency for cob walls.

Code Requirement

IRC Section R302.1 Exterior Walls and Table R302.1(1) requires 1-hour fire-resistance rated walls to be tested in accordance with ASTM E119 or UL 263 with exposure from both sides. E119 fire-resistance ratings \geq 1 hour must include a one-minute hose stream test following the fire-resistance test.

Proposed Equivalency

ASTM E119 and equivalent international tests AS 1530 and EN 1363 on closely-related compressed earth block and adobe block walls, were used to demonstrate a minimum of 1-hour fire resistance of Monolithic Adobe (Cob) walls greater than or equal to 10 inches thick, including a significant factor of safety.

Rational Engineering Analysis of Proposed Equivalency

Reax Engineering Inc. evaluated results from standardized testing, published standards, and empirical evidence, to establish a conservative minimum value for the fire resistance of monolithic adobe (sand, straw and unfired clay in monolithic form). Data was from allied construction systems using the same sand, clay, straw materials in brick form (brick and monolithic walls of these materials are referred to collectively as "earthen walls").

The tests are described below and summarized in Table 1. All tests except test (c) (run to insulation failure) passed all parameters tested: loadbearing, integrity, insulation. Test (a) also included and passed a hose stream test. All wall specimen sizes were 10' x 10' or the close metric equivalent of 3.1 x 3.1 meters.

Test Descriptions

- a.** A test of a 10" thick, compressed earth block wall was conducted in 2013 in Texas to the ASTM E119 2-hour load-bearing standard. Results for the test including the hose stream component are proprietary but a video is available at the following link: [Urban Earth Fire Resistance Test \(video\)](#)
- b.** A test of a 9.84" thick compressed earth block wall was conducted in 2011 in South Africa to a 1-hour

standard using an ISO 834 time/temperature curve identical to the ASTM E119 temperature curve. This test provided the basis for a 2-hour loadbearing fire-resistance rating for 9.84” thick compressed earth block wall.

c. A test of a 5.9” thick Cinva-ram earth block wall was conducted in Australia to insulation failure at 3 hrs 41 minutes, to the AS1530.4 standard. It was reported in the Commonwealth Scientific and Industrial Research Organization’s (CSIRO) Bulletin 5: Earth Wall Construction, 1976. CISRO is an independent Australian federal government agency responsible for scientific research.

d. A test was conducted in Australia in 1982 to the AS1530.4-1975 4-hour standard, which is nearly identical to the ASTM E119 4-hour standard. The test provided a 4-hour loadbearing fire-resistance rating for a 9.8” thick adobe block wall. The test was stopped after 4 hours. Researchers extrapolated a 6 to 7-hour rating had the test continued, with heat rise on the unexposed face the predicted limiting factor.

e. A test of a 5.9” thick walls was conducted at the Laboratory for Structures and Fire Resistance at the University of Aveiro, Portugal, using ISO 834 time-temp curve and the European Standards for testing fire resistance (EN1363-1 and EN 1364-1). One wall tested soil stabilized with cement, and one tested soil stabilized with Kraft fibers.

Table 1. Summary of Testing

Test	Material	Rating (hours) / Test duration (hours)	Load Bearing	Hose Stream	Thickness (in.)	Standard / Variation from E119
a	Compressed Earth Block	2.0 / 2.4	Y	Pass	10	ASTM E119 / no variation
b	Compressed Earth Block	2.0 / 2.4	Y	Not done	9.84	ISO 834 / Nearly identical to ASTM E119
c	Ram Earth Block	3.6 / 7.3	Y	Not done	5.9	AS 1530-1975 / Based on ISO 834
d	Adobe Block	4.0 / 4.9	Y	Not done	9.8	AS 1530-1975 / Based on ISO 834
e	Compressed Earth Block	2.0 / 4.1	N	Not done	5.9	EN 1363-1 w ISO 834 time temp curve to 120

						minutes
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Several of these tests are on compressed earth block systems which lack the straw component of cob wall construction. Straw adds resistance to heat transfer thus decreasing the rate of surface temperature rise on the unexposed side. Straw in the wall will not combust due to lack of oxygen, and it will continue to offer its primary role in adobe of limiting crack propagation, a property expected to enhance a cob wall's resistance to thermally induced structural failure.

As a massive system, a monolithic adobe wall can absorb a significantly greater amount of heat when compared to a standard stuccoed wood-framed wall. For slow growing fires, this translates to less heat on the interior, and prolonged time to flashover with increased protection and time for escape.

Photos were reviewed of surviving earthen walls with completely incinerated wooden floor and roof structures in California and Australian firestorms. These show further evidence of the resistance of earthen wall systems to intense fire conditions.

Monolithic adobe is used to construct fireplaces, ovens, kilns, and forges, a testament to its ability to contain fire. It is favored for these applications over concrete, rock, and red brick, for its lesser tendency to crack or spall.

Comparison to Tests and Adopted Standards

The engineering judgment was checked against standards from two jurisdictions with prescribed fire-resistance ratings for earthen walls. The Pima County Approved Standard for Earthen IBC Structures, provides a 2-hour rating for a 10" thick wall. New Zealand's NZS 4297 Engineering Design of Earth Buildings provides a 2-hour rating for a 5.9" thick wall. Thus an engineering judgment of a 1-hour fire-resistance rating for a 10" thick monolithic adobe wall provides a 100% safety margin compared to these standards and as compared to four of the five described tests. A 1-hour rating provides a 300% safety margin compared with the Australian adobe block test that yielded a 4-hour rating.

Conclusion

All relevant evidence strongly supports the judgment that monolithic adobe (cob) walls constructed to a minimum thickness of 10 inches provide a conservative minimum fire-resistance rating of 1-hour.

Fire testing reports, related documents and the equivalency report are available at <https://www.cobcode.org/cobcode-documents>

THERMAL PERFORMANCE:

Cob walls are classified as mass walls in accordance with Section N1102.2.5 because the heat capacity of cob walls is greater than the $6 \text{ Btu/ft}^2 \times ^\circ\text{F}$ threshold defined in that section. The lowest heat capacity of a cob wall is $16 \text{ Btu/ft}^2 \times ^\circ\text{F}$, for the required minimum wall thickness of 10" and at the lowest practical density of 70 pcf.

Cob's assigned unit R-value of 0.22 per inch with a density of 110 pcf was determined with an ASTM C1363 thermal resistance test at Intertek Laboratory in Fresno, CA in December 2018. The R-value of the wall assembly is determined by adding the thermal resistance of the air films and any finish or additional insulation.

Adding insulation to the face of cob walls can allow them to be used more readily in cold climates. This is allowed, providing the insulation assembly complies with the requirement in Section AU104.1 for attachment or

support, vapor permeance, and weight limits.

Bibliography: The following documents relate to one or more categories in the code proposal as indicated: General (G), Structural (S), Fire (F).

Australian Earth Building Handbook, HB195-2002, Peter Walker, Standards Australia. G, S, F

CSIRO-Australia, Bulletin 5 Earth-Wall Construction 4th Edition, 1992 Division of Building Construction and Engineering. G, S, F

AS 3959-2009, Australian Standard Construction of Buildings in Bushfire Prone Areas, (incorporating Amendments 1, 2 and 3), Standards Australia, 2009-2011. S, F

NZS 4297.1998 Engineering Design of Earth Buildings, Standards New Zealand, 1998. S, F

NZS 4298.1998, Materials and Workmanship for Earth Buildings, Standards New Zealand, 2000 (incorporates June 2000 Amendment). G, S

NZS 4299.1998, Earth Buildings Not Requiring Specific Design, Standards New Zealand, 1999 (incorporates December 1999 amendment). G, S

"NZS 4297-99, The New Zealand Earth Building Standards: Their History and Current Status," Graeme North and Min Hall, 2018. G, S

"Moisture Properties of Plaster and Stucco for Strawbale Buildings," John Straube, PE, 2003 G

CSIRO EBS Technical Record 490, "Fire-Resistance Test on a Loadbearing Masonry Wall of 250mm-Thick Adobe Blockwork," Experimental Building Station, Australia, 1982. F

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Keynote Address, "Rammed Earth Building in (western) Australia and Earthbuilding worldwide," Earth Building Association of Australia, Stephen Dobson, 2009. F

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"Fire resistance of walls made of soil-cement and Kraftterra compressed earth blocks," M. Buson, N. Lopes, H. Varum, R. M. Sposto, P. Vila Real, 2012. G, S, F

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ASTM E2392-10 Standard Guide for the Design of Earthen Wall Systems. *G, S*

"Cob: A Sustainable Building Material," D. Eberhard, J. Novara, B. Popovec, Santa Clara University Department of Civil Engineering, 2018. *S*

"Cob Property Analysis," G. Brunello, J. Espinoza, A. Golitz, Santa Clara University Department of Civil Engineering, 2018. *S*

Building With Earth: Design and Technology of Sustainable Architecture, Gernot Minke, 2006. *G, S*

"Transforming building regulatory systems to address climate change," David Eisenberg, Building Research and Information, 2016. *G*

Cost Impact: The code change proposal will not increase or decrease the cost of construction. As a wall system cob can be more costly or less costly than conventional wall systems found in the IRC, depending on many variables. The materials for cob walls or clay soil (often from the site), sand, and straw are relatively inexpensive whereas the cob walls can be more labor intensive. Other elements or systems in the building such as the foundation, roof, electrical, plumbing and mechanical can be very similar to those used in conventional construction and therefore the same cost. As an overview this proposal will not affect the cost of construction.

Proposal # 4700

RB299-19

RB300-19

IRC®: Appendix (New), SECTION AU101 (New), AU101.1 (New), AU101.2 (New), SECTION AU102 (New), AU102.1 (New), AU102.1.1 (New), AU102.1.2 (New), AU102.1.3 (New), AU102.1.4 (New), AU102.1.5 (New), SECTION AU103 (New), AU103.1 (New), AU103.1.1 (New), AU103.1.2 (New), SECTION AU104 (New), AU104.1 (New), SECTION AU105 (New), AU105.1 (New), AU105.1.1 (New), AU105.1.2 (New), AU105.1.3 (New), AU105.1.4 (New), AU105.1.5 (New), SECTION AU106 (New), AU106.1 (New)

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2018 International Residential Code

Add new text as follows:

Appendix U Physical Security

SECTION AU101 General

AU101.1 Purpose. The purpose of this appendix is to establish minimum standards that incorporate physical security to make dwelling units resistant to unlawful entry.

AU101.2 Scope. The provisions of this appendix shall apply to all new structures and to additions and alterations made to existing buildings.

SECTION AU102 Doors

AU102.1 Doors. All exterior swinging doors of residential dwelling units and attached garages, including doors leading from the garage area into the dwelling unit, shall comply with Sections AU102.1.1 through AU102.1.5 based on the type of door installed.
Exceptions: Vehicular access doors.

AU102.1.1 Wood doors. Exterior wood doors shall be of solid core construction such as high-density particleboard, solid wood, or wood block core with a minimum thickness of 1-3/4 inches (45 mm) at any point. Doors with panel inserts shall be solid wood with the insert being a minimum of 1-inch (25.4 mm) in thickness.

AU102.1.2 Steel doors. Exterior steel doors shall be a minimum thickness of 24 gauge and have reinforcement material at the location of the deadbolt.

AU102.1.3 Fiberglass doors. Fiberglass doors shall have a minimum skin thickness of one-sixteenth inch and have reinforcement material at the location of the deadbolt.

AU102.1.4 Double doors. The inactive leaf of an exterior double door shall be provided with flush bolts having an engagement of not less than 1-inch (25.4 mm) into the head and threshold of the door frame, or by other approved methods.

AU102.1.5 Sliding doors. Exterior sliding doors shall be installed to prevent the removal of the panels and the glazing from the exterior.

SECTION AU103

Door Frames

AU103.1 Door frames. The exterior door frames shall be installed prior to the rough-in inspection. Horizontal blocking shall be placed between studs at the door lock height for three stud spaces of equivalent bracing on each side of the door opening. Door frames shall comply with Sections AU103.1.1 through AU103.1.2 based on the type of door installed.

AU103.1.1 Wood frames. Wood frame doors shall be set in frame openings constructed of double studding or equivalent construction. Door frames, including those with sidelights, shall be reinforced in accordance with ASTM F476 Grade 40.

AU103.1.2 Steel frames. Steel door frames shall be constructed of 18 gauge or heavier steel and reinforced at the hinges and strikes. Doors are to be anchored to the wall in accordance with the manufacturer's instructions.

SECTION AU104

Door Jambs

AU104.1 Door jambs. Door jambs shall comply with one of the following:

1. Door jambs constructed as per ASTM F476.
2. Door stops on wooden jambs for in-swinging doors shall be of one-piece construction.

SECTION AU105

Door Hardware

AU105.1 Door hardware. Exterior door hardware shall comply with Sections AU105.1.1 through AU105.1.5.

AU105.1.1 Hinges. Hinges for exterior swinging doors shall comply with the following:

1. At least two screws, 3 inches (76 mm) in length, penetrating at least 1-inch (25.4 mm) into the wall structure shall be used. Solid wood fillers or shims shall be used to eliminate any space between the wall structure and the door frame behind each hinge.
2. Hinges for out-swinging doors shall be equipped with mechanical interlock to prevent removal of the door from the exterior.

AU105.1.2 Escutcheon plates. All exterior doors shall have escutcheon plates protecting the door's interior side.

AU105.1.3 Locks. Exterior doors shall be provided with a deadbolt with a minimum grade 2 as determined by ANSI/BHMA.

AU105.1.4 Entry vision and glazing. All main or front entry doors to dwelling units shall be arranged so that the occupant has a view of the area immediately outside the door without opening the door. The view may be provided by a door viewer having a field of view of not less than 180 degrees, through windows or through view ports.

AU105.1.5 Side light entry doors. Side light doors units shall have framing of double stud construction or equivalent construction that complies with Sections AU103.1.1 or AU103.1.2. Double stud construction or equivalent construction shall exist between the glazing unit of the side light and the wall structure of the dwelling.

SECTION AU106

Alternate Materials and Methods of Construction

AU106.1 Alternate materials and methods of construction. The provisions of this appendix are not intended to prevent the use of any material or method of construction not specifically prescribed by this appendix, provided any such alternate has been approved. Nor is it the intention of this section to exclude any sound method of structural design or analysis not specifically provided for in this appendix. The materials, method of construction and structural design limitations provided for in this appendix shall be used unless otherwise approved. Compliance with ASTM F476 will be deemed to be in compliance with this appendix.

Reason: In the summer of 1996, Overland Park, Kansas, experienced a series of home invasions resulting in the sexual assault of several women. For the victims of a home invasion, it's more than a property crime; it scares the victim into thinking that the criminal will return only to commit a more violent or heinous crime. To have an emotional investment in their residence is priceless.

As a result of these home invasions, the City's Police Department conducted hundreds of surveys of residents in an effort to develop a solution to the home invasions. The results of the surveys lead the City to develop a building code that makes home more safe and secure. You may ask, why secure the front door? What about installing an alarm? Communities across the country continue to report a growing increase in false alarms. In an effort to provide physical security to the homeowner, there needs to be a more reliable option available.

The longer a criminal spends trying to gain access to a home, the greater the risk of detection. In addition, most home invaders will not attempt to break a window, as that makes noise that neighbors could potentially hear. Rather than face these risks, the invader is more likely to try to kick in an exterior door, where they can easily gain access without being detected.

This code change will provide for minimal provisions to be made to a new home under construction that will give the homeowner safety and peace of mind, while delaying and frustrating the criminal. Since this proposal is not dependent on electrical power, these provisions will always be available to the homeowner and will require no further action after installation. There is no on-going cost to the homeowner and these provisions will not affect the overall aesthetics of the home.

Cost Impact: The code change proposal will increase the cost of construction. The cost to secure a single door ranges from \$40-\$60 for a single door unit and between \$140 and \$180 for a double sidelite unit.

Staff Analysis: A review of the standards proposed for inclusion in the code, ASTM F476 and ANSI/BHMA, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 4864

RB300-19

RB301-19

IRC: APPENDIX U(New)

Proponent: Deck Code Coalition, Charles Bajnai (chair), North American Deck and Railing Assoc (NADRA), representing Deck Code Coalition (csbajnai@gmail.com)

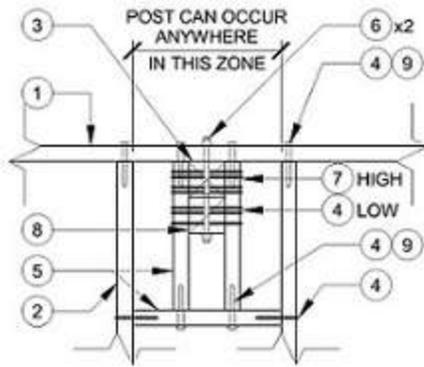
2018 International Residential Code

Add new text as follows:

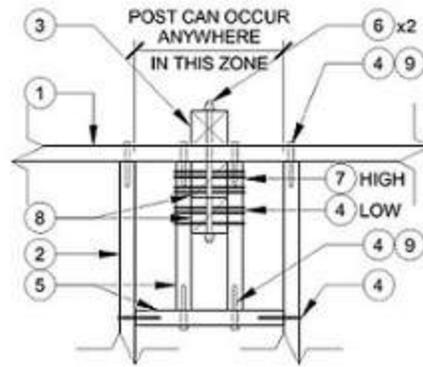
APPENDIX U DECK GUARD DETAILS

SECTION AU101 GENERAL

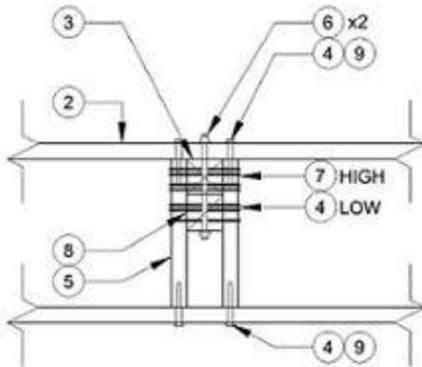
AU101.1 Deck guards. Figures AU101.1(1) and AU101.1(2) are prescriptive options for deck guard, wood post connections to deck framing.



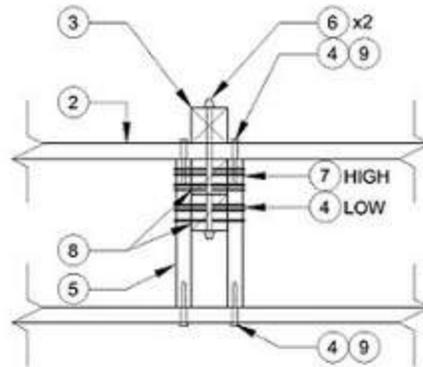
RIM WITH POST INSIDE FRAMING



RIM WITH POST OUTSIDE FRAMING



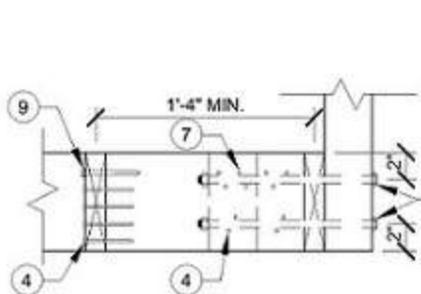
SIDE JOIST WITH POST INSIDE FRAMING



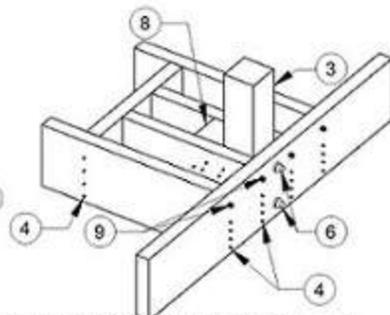
SIDE JOIST WITH POST OUTSIDE FRAMING

NOTES:

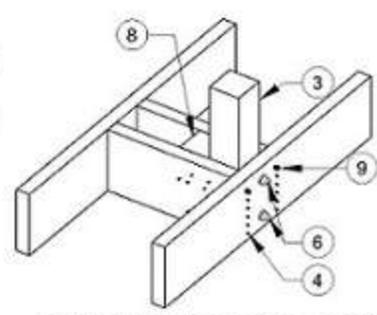
1. MIN. 2x8 RIM BOARD OR DECK BEAM
2. MIN. 2x8 DECK JOIST
3. MIN. 4x4 GUARD POST, 36" GUARD HEIGHT MAX
4. 4 - 16d COMMON (3 1/2" x 0.162") NAILS, TYP.
5. FULL HEIGHT BLOCKING
6. 1/2" Ø HOT-DIPPED GALVANIZED BOLTS WITH NUTS AND WASHERS
7. 7 - 16d COMMON (3 1/2" x 0.162") NAILS, TYP.
8. 4x4 BLOCKING FULL DEPTH
9. 5/16" x 4" GALVANIZED LAG SCREW



ELEVATION: HARDWARE LOCATIONS



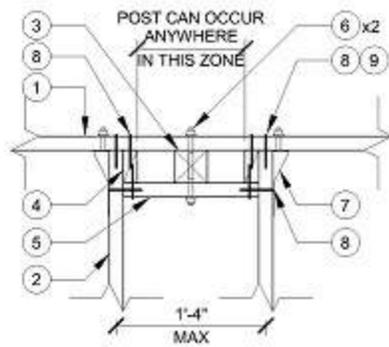
AXON: RIM WITH POST INSIDE FRAMING



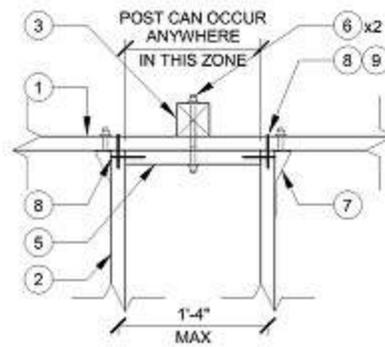
AXON: SIDE WITH POST INSIDE FRAMING

**FIGURE AU1
GUARD POST CONNECTIONS WITH COMMODITY FASTENERS**

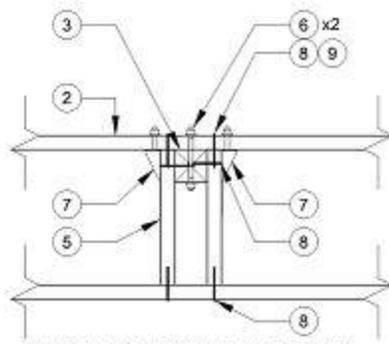
**UA101.1(1)
GUARD POST CONNECTION WITH COMMODITY FASTENERS**



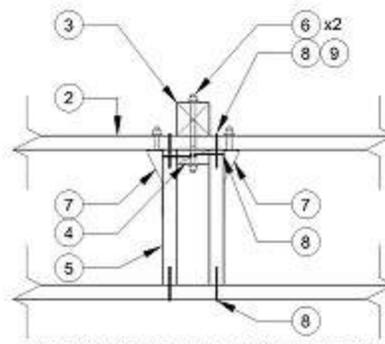
RIM WITH POST INSIDE FRAMING



RIM WITH POST OUTSIDE FRAMING



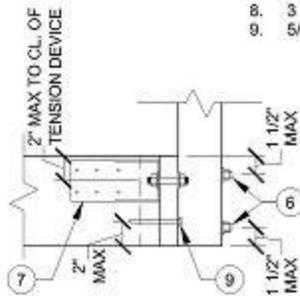
SIDE JOIST WITH POST INSIDE FRAMING



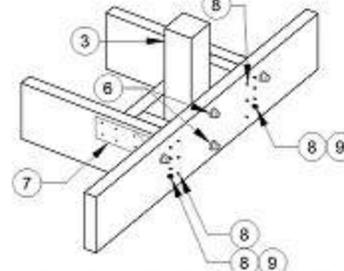
SIDE JOIST WITH POST OUTSIDE FRAMING

NOTES:

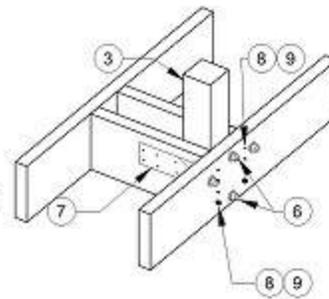
1. MIN. 2x8 RIM BOARD OR DECK BEAM
2. MIN. 2x8 DECK JOIST
3. MIN. 4x4 GUARD POST, 36" GUARD HEIGHT MAX
4. 2x4 BLOCKING FULL DEPTH
5. FULL HEIGHT BLOCKING
6. 1/2" Ø HOT-DIPPED GALVANIZED BOLTS WITH NUTS AND WASHERS
7. TENSION DEVICE WITH 1800# CAPACITY
8. 3 - 16d COMMON (3 1/2" x 0.162") NAILS, TYP.
9. 5/16" x 4" GALVANIZED LAG SCREW



ELEVATION: HARDWARE LOCATIONS



AXON: RIM WITH POST INSIDE FRAMING



AXON: SIDE WITH POST INSIDE FRAMING

**FIGURE AU2
GUARD POST CONNECTIONS WITH TENSION DEVICES**

**AU2
GUARD POST CONNECTIONS WITH TENSION DEVICE**

Reason: The Deck Code Coalition (DCC) proposes a new appendix to offer direction for constructing exterior guards on decks where the code is currently silent. The members of the DCC recognize that there are many methods for constructing guards, and that the inclusion of a single detail within the body of the code may restrict creativity in the building community. However,

there are many people building, specifying, and reviewing decks that are eager for guidance with the complicated connection that is required for connecting deck guard posts to deck framing. Providing a prescriptive detail in an appendix allows us to provide the guidance of an engineered solution that meets the intent of the code.

Homeowners need these details. Empirical evidence shows us that over fifty percent of the decks constructed in the country are built by the homeowners themselves. These details might not be the typical by professional, customized deck builders, but they will be infinitely valuable for the homeowner who has little or no construction knowledge, does not want to pay for design services and will build one deck in his/her lifetime. Without prescriptive details, they will either resort to friends, YouTube or other sources, such as DCA6, for guidance. They say, "just show me how you want it, and I will build it that way".

Building officials need these details. Short of having every deck design tested in a lab or sealed by an engineer, there is not a building official who knows if the guards pass muster. The hip check is not a proper testing method. These details are a minimum engineered design which they can look for if they have no other evidence of code compliance.

Cost Impact: The code change proposal will increase the cost of construction. Two figures are offered. One figure offers generic, cheap fastening techniques of nails and bolts into blocking, the other figure uses proprietary fasteners for about \$20 per post (around \$140 for a 144 square foot deck using 7 guard posts).

On the other hand, a savings of time and money could be anticipated for the conscientious homeowner who might pay a professional designer to prepare his deck drawings.

Any extra cost has to be weighed against the increased safety and potential life savings that will occur across the country over many years.

Proposal # 4987

RB301-19

RB302-19

IRC®: Appendix (New), SECTION U101 (New), U101 (New), SECTION U102 (New), U102.1 (New), SECTION U103 (New), U103.1 (New), U103.2 (New), U103.3 (New), U103.4 (New), U103.5 (New), SECTION U104 (New), U104.1 (New), U104.2 (New), U104.3 (New), U104.4 (New), SECTION U105 (New), U105.1 (New), UL Chapter 44 (New)

Proponent: Jonathan Roberts, UL LLC, representing UL LLC (jonathan.roberts@ul.com)

2018 International Residential Code

Add new text as follows:

Appendix U 3D PRINTED BUILDING CONSTRUCTION

SECTION U101 General

U101 Scope. Buildings and structures fabricated in whole or in part using 3D printed construction techniques shall be designed, constructed and inspected in accordance with the provisions contained in this Appendix and other applicable requirements in this code.

SECTION U102 Definitions

U102.1 Definitions. The following words and terms shall, for the purposes of this appendix, have the meanings shown herein. Refer to Chapter 2 of this code for general definitions.

3D PRINTED BUILDING CONSTRUCTION. A process for fabricating buildings and structures from 3D model data using automated equipment that deposits construction material in a layer upon layer fashion.

ADDITIVE MANUFACTURING MATERIALS. Materials used by the 3D printer to produce the building structure or system components of the building.

PRODUCTION EQUIPMENT. The equipment, including 3D printer, its settings, nozzles and other accessories used in the fabrication process.

FABRICATION PROCESS. Preparation of the job site and construction material, and the deposition, curing, finishing, insertion of components and other methods used to build building elements such as walls, partitions, roof assemblies and structural components, and the means used to connect assemblies together.

SYSTEM COMPONENTS. Devices, equipment and appliances that are installed in the building elements as part of the wiring, plumbing, HVAC and other systems. These include, but are not limited to, electrical outlet boxes, conduit, wiring, piping, tubing, and HVAC ducts, each of which is covered by a product standard or Installation Code Requirement.

SECTION U103 Building Design

U103.1 Design organization. 3D printed buildings and structures shall be designed by an organization certified

in accordance with UL 3401 by an approved agency and approved by the building official based on this section.

U103.2 Engineered design. The plans included in the UL 3401 compliance report shall be used for determining compliance with the engineering design requirements in Section R301.1.3 of this code.

U103.3 Performance design. The requirements in Chapters 4 through 9 and Chapter 11 of this code shall be waived where the UL 3401 compliance report demonstrates that the 3D printed construction provides an equivalent level of performance as the prescriptive code requirements.

U103.4 Other Equipment and Systems. Where not covered by the UL 3401 compliance report, the following provisions of this code shall be used as a basis for determining compliance for the following equipment and systems:

1. Chimneys and fireplaces – Part III, Chapter 10.
2. Energy efficiency – Part IV.
3. Mechanical – Part V.
4. Fuel gas – Part VI.
5. Plumbing – Part VII.
6. Electrical – Part VIII.

U103.5 Ratings The building or structure ratings in the UL 3401 compliance report, including but not limited to fire-resistance, interior finish, roofing fire classification, insulation material R-value shall be suitable for the installation. The acceptability of material and system ratings not included in the compliance report shall be determined by the building official.

SECTION U104 **BUILDING CONSTRUCTION**

U104.1 Construction. 3D printed buildings and structures shall be constructed in accordance with this section.

U104.2 Construction method. The building construction method, consisting of the manufacturer's *production equipment* and *fabrication process* shall be in accordance with the UL 3401 compliance report. The unique identifier of the construction method used shall match the identifier in the UL 3401 compliance report.

U104.3 Additive manufacturing materials. Only the listed additive manufacturing materials identified in the UL 3401 compliance report shall be used to fabricate the building structure or system components. Containers of the additive manufacturing materials shall be labeled.

U104.4 Depositing of manufacturing materials. Manufacturing materials shall only be deposited where ambient temperature and environmental conditions at the job site are within limits specified in the UL 3401 compliance report. The maximum number of layers permitted, specified curing time and any surface preparation or finishing shall be performed as specified in the UL 3401 compliance report.

SECTION U105 **Special Inspections**

U105.1 Initial inspection An initial inspection of the production equipment, including 3D printer, and the fabrication process shall be performed after the production equipment is located onsite and before building fabrication has begun. The inspection shall be conducted by representatives of the organization that evaluated the fabrication process for compliance with UL 3401. The inspection shall verify that the fabrications process, including production equipment, 3D printing parameters and construction materials are in accordance with the UL 3401 compliance report, and proprietary information in the UL 3401 detailed report of findings.

Exception: Where approved by the building official, inspections of the production equipment, including 3D

printer, and the fabrication process used in a single housing tract shall be conducted on the first building to be constructed, and on a selected number of subsequent buildings, where the same equipment, equipment operators and fabrication process are used on all buildings. The number of inspections to be performed shall be determined by the building official.

Add new standard(s) as follows:

UL

UL LLC
333 Pfingsten Road
Northbrook IL 60062

UL 3401 -19: Outline of Investigation for 3D Printed Building Construction

Reason: 3D building construction has moved from a conceptual stage to reality, and projects are being proposed in an increasing number of jurisdictions. Unfortunately the prescriptive design and construction requirements in the IRC are not applicable to 3D printed fabrication techniques, so code officials have to approve this construction based on limited equivalency evaluations that may not take into account variations in material properties introduced by the 3D printing process, or variances in the physical characteristics of the construction materials used.

The UL 3401 Outline of Investigation for 3D Printed Building Construction was developed to evaluate critical aspects of this construction process, and level the playing field so that 3D printed building techniques comply with an equivalent level of safety and performance as legacy construction techniques currently in the code.

This proposal introduces an Appendix U, which is not mandatory unless specifically referenced in an adopting ordinance. The Appendix includes definitions, and requirements for 3D printed building design, construction and special inspections, which rely on the design being evaluated in advance by an approved agency for compliance with UL 3401. The resulting compliance report includes the information needed by the contractor and code official to verify compliance with applicable code requirements, and to verify that the 3D printing process and materials used on site are the same as those used during the UL 3401 evaluation and testing. The special inspection requirements are necessary because the portions of the fabrication process such as 3D printer settings, deposition rates and thickness, and curing processes, require special expertise to evaluate, especially when they include proprietary formulations, equipment and settings.

A companion proposal introduces revisions to R301.1.1 that also references UL 3401 and 3D printed building construction. These two proposals will work together, but each also stands on its own.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal will not increase the cost of construction because it covers a construction technique that is not currently addressed in the code.

Proposal # 4836

RB302-19

CODE CORRELATION COMMITTEE

Daniel E. Nichols, PE, Chair
Asst. Director-Fire/Life Safety
MTA Metro-North Railroad
White Plains, NY

Jonathan Siu, PE, SE, Vice Chair
Principal Engineer/Building Official
City of Seattle Department of Constructions and
Inspections
Seattle, WA

Paul Armstrong, PE, CBO
Building Official, Signal Hill CA/Vice President
CSG Consultants, Inc.
Orange, CA

Ronald W. Clements, Jr.
Assistant Director
Chesterfield County
Chesterfield, VA

Wayne Jewell
Building Official
Charter Township of Green Oak
Brighton, MI

Shaunna Mozingo
Senior Plans Examiner
City of Westminster
Westminster, CO

Michael D. O'Brian
Fire Chief
Brighton Area Fire Authority
Brighton, MI

Jim Olk, CBO
Building Official
City of Garland
Garland, TX

Tim Ryan
Overland Park, KS

Michael L. Savage, Sr., MCP
Chief Building Official
City of Rio Rancho
Rio Rancho, NM

John N. Terry, CBO
Assistant Director
Department of Community Affairs
Division of Codes and Standards
Trenton, NJ

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Edward Wirtschoreck, RA
Director-Codes Development
International Code Council
Central Regional Office
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County Club Hills, IL 60478
888/422-7233, ext. 4317; FAX: 708/799-0320
EWirtschoreck@iccsafe.org

CCC-ADM1-19

IBC®: SECTION 101; IEBC®: SECTION 101; IFGC®: SECTION 101 (IFGC); IMC®: SECTION 101; IPC®: SECTION 101; IPSDC®: SECTION 101; IPMC®: SECTION 101; IRC®: SECTION R101; ISPSC®: SECTION 101; IZC®: SECTION 101; IGCC®: SECTION 101

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

2018 International Building Code

Revise as follows:

SECTION 101 SCOPE AND GENERAL REQUIREMENTS

2018 International Existing Building Code

SECTION 101 SCOPE AND GENERAL REQUIREMENTS

2018 International Fuel Gas Code

SECTION 101 (IFGC) SCOPE AND GENERAL REQUIREMENTS

2018 International Mechanical Code

SECTION 101 SCOPE AND GENERAL REQUIREMENTS

2018 International Plumbing Code

SECTION 101 SCOPE AND GENERAL REQUIREMENTS

2018 International Private Sewage Disposal Code

SECTION 101 SCOPE AND GENERAL REQUIREMENTS

2018 International Property Maintenance Code

SECTION 101 SCOPE AND GENERAL REQUIREMENTS

2018 International Residential Code

SECTION R101 SCOPE AND GENERAL REQUIREMENTS

2018 International Swimming Pool and Spa Code

SECTION 101 SCOPE AND GENERAL REQUIREMENTS

2018 International Zoning Code

SECTION 101 SCOPE AND GENERAL REQUIREMENTS

2018 International Green Construction Code

SECTION 101 SCOPE AND GENERAL REQUIREMENTS

Reason: The intent of this proposal is to match the section titles currently found in IFC, IECC (C&R) and IWUIC.
SECTION 101 SCOPE AND GENERAL REQUIREMENTS

The BCAC is working from the philosophy that ICC is a family of codes, so administrative requirements should be consistent across books. Most administrative and enforcement matters are the same for any code. Those matters unique for a specific code remain unchanged. This is one of a series of proposals being submitted relating to technical, editorial and organizational changes proposed for the Administrative chapters (Chapter 1) in all of the I-Codes.

While the Administrative Committee will consider each proposal independently, the proposals in this package are a correlated set of companion code change proposals.”

This proposal is submitted by the ICC Building Code Action Committee (BCAC) and the ICC Plumbing/Mechanical/Gas Code Action Committee (PMG CAC).

BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac>.

The PMG CAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance the International Codes or portions thereof that were under the purview of the PMG CAC. In 2017-2018, the PMG CAC held one face-to-face meeting and 11 conference call meetings. Numerous interested parties attended the committee meetings and offered their input. Related documentation and reports are posted on the PMGCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/pmg-code-action-committee-pmgcac/>

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is an editorial change that provides consistency between I-codes.

Proposal # 4028

CCC-ADM1-19

CCC-ADM2-19

IFC@: PART 2

Proponent: Michael O'Brian, representing FCAC (fcac@iccsafe.org)

2018 International Fire Code

Revise as follows:

PART 2 **ADMINISTRATIVE PROVISIONS ADMINISTRATION AND ENFORCEMENT**

Reason: This change to the title will bring consistency with title of Part 2 for all the codes except Performance Code. Currently the IFC is the only code that is different.

PART 2—ADMINISTRATIVE PROVISIONS

The BCAC is working from the philosophy that ICC is a family of codes, so administrative requirements should be consistent across books. Most administrative and enforcement matters are the same for any code. Those matters unique for a specific code remain unchanged. This is one of a series of proposals being submitted relating to technical, editorial and organizational changes proposed for the Administrative chapters (Chapter 1) in all of the I-Codes.

While the Administrative Committee will consider each proposal independently, the proposals in this package are a correlated set of companion code change proposals.”

The following is the template utilized to create this code change proposal. There may be some differences depending on the unique applications of each code – such as “building/fire/code official”.

This proposal is submitted by the ICC Fire Code Action Committee (FCAC). The FCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes with regard to fire safety and hazardous materials in new and existing buildings and facilities and the protection of life and property in wildland urban interface areas. In 2018 the Fire-CAC has held 3 open meetings. In addition, there were numerous conference calls, Regional Work Group and Task Group meetings for the current code development cycle, which included members of the committees as well as any interested parties, to discuss and debate the proposed changes. Related documentation and reports are posted on the FCAC website at: <https://www.iccsafe.org/codes-tech-support/cs/fire-code-action-committee-fcac/>

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is an editorial change that provides consistency between I-codes.

Proposal # 4031

CCC-ADM2-19

CCC-ADM3-19

IFC®: SECTION 101, SECTION 102, SECTION 103, SECTION 104, SECTION 105, SECTION 106, SECTION 107, SECTION 108, SECTION 113, SECTION 109, SECTION 110, SECTION 112, SECTION 111; IPC®: SECTION 101, SECTION 102, SECTION 103, SECTION 104, SECTION 105, SECTION 106, SECTION 110, SECTION 107, SECTION 109, SECTION 108; IMC®: SECTION 101, SECTION 102, SECTION 103, SECTION 104, SECTION 105, SECTION 106, SECTION 110, SECTION 107, SECTION 109, SECTION 108; IPSDC®: SECTION 101, SECTION 102, SECTION 103, SECTION 104, SECTION 105, SECTION 106, SECTION 110, SECTION 107, SECTION 109, SECTION 108; IFGC®: SECTION 101 (IFGC), SECTION 102 (IFGC), SECTION 103 (IFGC), SECTION 104 (IFGC), SECTION 105 (IFGC), SECTION 106 (IFGC), SECTION 110 (IFGC), SECTION 107 (IFGC), SECTION 109 (IFGC), SECTION 108 (IFGC); ISPSC®: SECTION 101, SECTION 102, SECTION 103, SECTION 104, SECTION 105, SECTION 106, SECTION 108, SECTION 107; IPMC®: SECTION 101, SECTION 102, SECTION 103, SECTION 104, SECTION 105, SECTION 111, SECTION 106, SECTION 107, SECTION 112, SECTION 108, SECTION 109, SECTION 110; IWUIC®: SECTION 101, SECTION 102, SECTION 103, SECTION 104, SECTION 105, SECTION 107, SECTION 108, SECTION 112, SECTION 109, SECTION 110, SECTION 111, SECTION 113, SECTION 106, SECTION 114; IZC®: SECTION 101, SECTION 102, SECTION 103, SECTION 104, SECTION 105, SECTION 110, SECTION 111, SECTION 106, SECTION 107, SECTION 108, SECTION 109; IECC: SECTION C101, SECTION C102, SECTION C103, SECTION C104, SECTION C105, SECTION C106, SECTION C107, SECTION C109, SECTION C108, SECTION R101, SECTION R102, SECTION R103, SECTION R104, SECTION R105, SECTION R106, SECTION R107, SECTION R109, SECTION R108; IGCC®: SECTION 101, SECTION 102, SECTION 103, SECTION 105, SECTION 106, SECTION 104, SECTION 107, SECTION 109, SECTION 108

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org); Pennie Feehan, representing Plumbing, Mechanical, and Fuel Gas Code Action Committee (pmgcac@iccsafe.org); Michael O'Brian, representing FCAC (fcac@iccsafe.org); David Collins, representing SEHPCAC (sehpcac@iccsafe.org)

2018 International Fire Code

Revise as follows:

SECTION 101 SCOPE AND GENERAL REQUIREMENTS

SECTION 102 APPLICABILITY

SECTION 103 DEPARTMENT OF FIRE PREVENTION

SECTION 104 GENERAL AUTHORITY AND RESPONSIBILITIES

SECTION 105 PERMITS

SECTION 106 FEES

SECTION 107 INSPECTIONS

SECTION 108 MAINTENANCE

SECTION ~~113~~ 109 SERVICE UTILITIES

SECTION ~~109~~ 110 BOARD OF APPEALS

SECTION ~~110~~ 111 VIOLATIONS

SECTION 112 STOP WORK ORDER

**SECTION ~~111~~ 113
UNSAFE BUILDINGS**

2018 International Plumbing Code

**SECTION 101
GENERAL**

**SECTION 102
APPLICABILITY**

**SECTION 103
DEPARTMENT OF PLUMBING INSPECTION**

**SECTION 104
DUTIES AND POWERS OF THE CODE OFFICIAL**

**SECTION 105
APPROVAL**

**SECTION 106
PERMITS**

**SECTION ~~110~~ 107
TEMPORARY EQUIPMENT, SYSTEMS AND USES**

**SECTION ~~107~~ 108
INSPECTIONS AND TESTING**

**SECTION 109
MEANS OF APPEAL**

**SECTION ~~108~~ 110
VIOLATIONS**

2018 International Mechanical Code

**SECTION 101
GENERAL**

**SECTION 102
APPLICABILITY**

**SECTION 103
DEPARTMENT OF MECHANICAL INSPECTION**

**SECTION 104
DUTIES AND POWERS OF THE CODE OFFICIAL**

**SECTION 105
APPROVAL**

**SECTION 106
PERMITS**

**SECTION ~~110~~ 107
TEMPORARY EQUIPMENT, SYSTEMS AND USES**

SECTION ~~107~~ 108

INSPECTIONS AND TESTING

**SECTION 109
MEANS OF APPEAL**

**SECTION ~~108~~ 110
VIOLATIONS**

2018 International Private Sewage Disposal Code

**SECTION 101
GENERAL**

**SECTION 102
APPLICABILITY**

**SECTION 103
DEPARTMENT OF PRIVATE SEWAGE DISPOSAL INSPECTION**

**SECTION 104
DUTIES AND POWERS OF THE CODE OFFICIAL**

**SECTION 105
APPROVAL**

**SECTION 106
PERMITS**

**SECTION ~~110~~ 107
TEMPORARY EQUIPMENT, SYSTEMS AND USES**

**SECTION ~~107~~ 108
INSPECTIONS**

**SECTION 109
MEANS OF APPEAL**

**SECTION ~~108~~ 110
VIOLATIONS**

2018 International Fuel Gas Code

**SECTION 101 (IFGC)
GENERAL**

**SECTION 102 (IFGC)
APPLICABILITY**

**SECTION 103 (IFGC)
DEPARTMENT OF INSPECTION**

**SECTION 104 (IFGC)
DUTIES AND POWERS OF THE CODE OFFICIAL**

**SECTION 105 (IFGC)
APPROVAL**

**SECTION 106 (IFGC)
PERMITS**

**SECTION ~~110~~107 (IFGC)
TEMPORARY EQUIPMENT, SYSTEMS AND USES**

**SECTION ~~107~~108 (IFGC)
INSPECTIONS AND TESTING**

**SECTION 109 (IFGC)
MEANS OF APPEAL**

**SECTION ~~108~~110 (IFGC)
VIOLATIONS**

2018 International Swimming Pool and Spa Code

**SECTION 101
GENERAL**

**SECTION 102
APPLICABILITY**

**SECTION 103
DEPARTMENT OF BUILDING SAFETY**

**SECTION 104
DUTIES AND POWERS OF THE CODE OFFICIAL**

**SECTION 105
PERMITS**

**SECTION 106
INSPECTIONS**

**SECTION ~~108~~ 107
MEANS OF APPEAL**

**SECTION ~~107~~ 108
VIOLATIONS**

2018 International Property Maintenance Code

**SECTION 101
GENERAL**

**SECTION 102
APPLICABILITY**

**SECTION 103
DEPARTMENT OF PROPERTY MAINTENANCE INSPECTION**

**SECTION 104
DUTIES AND POWERS OF THE CODE OFFICIAL**

**SECTION 105
APPROVAL**

**SECTION ~~111~~ 106
MEANS OF APPEAL**

SECTION ~~106~~ 107

VIOLATIONS

SECTION ~~107~~ 108
NOTICES AND ORDERS

SECTION ~~112~~ 109
STOP WORK ORDER

SECTION ~~108~~ 110
UNSAFE STRUCTURES AND EQUIPMENT

SECTION ~~109~~ 111
EMERGENCY MEASURES

SECTION ~~110~~ 112
DEMOLITION

2018 International Wildland-Urban Interface Code

SECTION 101
SCOPE AND GENERAL REQUIREMENTS

SECTION 102
APPLICABILITY

SECTION 103
ENFORCEMENT AGENCY

SECTION 104
AUTHORITY OF THE CODE OFFICIAL

SECTION 105
COMPLIANCE ALTERNATIVES

SECTION ~~107~~ 106
PERMITS

SECTION ~~108~~ 107
PLANS AND SPECIFICATIONS

SECTION ~~112~~ 108
TEMPORARY STRUCTURES AND USES

SECTION 109
FEEES

SECTION 110
INSPECTION AND ENFORCEMENT

SECTION 111
CERTIFICATE OF COMPLETION

SECTION ~~113~~ 112
SERVICE UTILITIES

SECTION ~~106~~ 113
APPEALS

SECTION 114

STOP WORK ORDER

2018 International Zoning Code

**SECTION 101
GENERAL**

**SECTION 102
EXISTING BUILDINGS AND USES**

**SECTION 103
PLANNING COMMISSION**

**SECTION 104
DUTIES AND POWERS OF THE ZONING CODE OFFICIAL**

**SECTION 105
COMPLIANCE WITH THE CODE**

**SECTION ~~110~~ 106
PERMITS AND APPROVALS**

**SECTION ~~111~~ 107
FEES**

**SECTION ~~106~~ 108
BOARD OF ADJUSTMENT**

**SECTION ~~107~~ 109
HEARING EXAMINER**

**SECTION ~~108~~ 110
HEARINGS, APPEALS AND AMENDMENTS**

**SECTION ~~109~~ 111
VIOLATIONS**

2018 International Energy Conservation Code

**SECTION C101
SCOPE AND GENERAL REQUIREMENTS**

**SECTION C102
ALTERNATIVE MATERIALS, DESIGN AND METHODS OF CONSTRUCTION AND EQUIPMENT**

**SECTION C103
CONSTRUCTION DOCUMENTS**

**SECTION C104
FEES**

**SECTION C105
INSPECTIONS**

**SECTION C106
VALIDITY**

**SECTION C107
REFERENCED STANDARDS**

~~SECTION C109~~ C108
BOARD OF APPEALS

~~SECTION C108~~ C109
STOP WORK ORDER

SECTION R101
SCOPE AND GENERAL REQUIREMENTS

SECTION R102
ALTERNATIVE MATERIALS, DESIGN AND METHODS OF CONSTRUCTION AND EQUIPMENT

SECTION R103
CONSTRUCTION DOCUMENTS

SECTION R104
FEES

SECTION R105
INSPECTIONS

SECTION R106
VALIDITY

SECTION R107
REFERENCED STANDARDS

~~SECTION R109~~ R108
BOARD OF APPEALS

~~SECTION R108~~ R109
STOP WORK ORDER

2018 International Green Construction Code

SECTION 101
GENERAL

SECTION 102
APPLICABILITY

SECTION 103
DUTIES AND POWERS OF THE AUTHORITY HAVING JURISDICTION

~~SECTION 105~~ 104
APPROVAL

~~SECTION 106~~ 105
PERMITS

~~SECTION 104~~ 106
CONSTRUCTION DOCUMENTS

SECTION 107
INSPECTIONS

~~SECTION 109~~ 108
CERTIFICATE OF OCCUPANCY

SECTION ~~108~~ 109 BOARD OF APPEALS

Reason: This proposal re-orders the sections in Part 2 to be consistent with the order currently in the IBC, IEBC and IRC
IBC

101 General

102 Application

103 Department of Building Safety

104 Duties and Powers of Building Official

105 Permits

(IBC only) 106 Floor and Roof Design Loads

107 Submittal Documents

108 Temporary Structures and Uses

109 Fees

110 Inspections

111 Certificate of Occupancy

112 Service Utilities

113 Board of Appeals

114 Violations

115 Stop Work Order

116 Unsafe Structures and Equipment

The BCAC is working from the philosophy that ICC is a family of codes, so administrative requirements should be consistent across books. Most administrative and enforcement matters are the same for any code. Those matters unique for a specific code remain unchanged. This is one of a series of proposals being submitted relating to technical, editorial and organizational changes proposed for the Administrative chapters (Chapter 1) in all of the I-Codes.

While the Administrative Committee will consider each proposal independently, the proposals in this package are a correlated set of companion code change proposals.”

This proposal is submitted by the ICC Building Code Action Committee (BCAC), the ICC Fire Code Action Committee (FCAC), the ICC Sustainable, Energy and High Performance Code Action Committee (SEHPCAC) and the ICC Plumbing/Mechanical/Gas Code Action Committee (PMG CAC)

The BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac/>.

The FCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes with regard to fire safety and hazardous materials in new and existing buildings and facilities and the protection of life and property in wildland urban interface areas. In 2018 the Fire-CAC has held 3 open meetings. In addition, there were numerous conference calls, Regional Work Group and Task Group meetings for the current code development cycle, which included members of the committees as well as any interested parties, to discuss and debate the proposed changes. Related documentation and reports are posted on the FCAC website at: <https://www.iccsafe.org/codes-tech-support/cs/fire-code-action-committee-fcac/>

The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance International Codes with regard to sustainability, energy and high performance as it relates to the built environment included, but not limited to, how these criteria relate to the International Green Construction Code (IgCC) and the International Energy Conservation Code (IECC). In 2018-2019, the SEHPCAC has held five two- or three-day open meetings and numerous workgroup calls, to discuss and debate proposed changes and public comments. Attendees at the meetings and calls included members of the SEHPCAC as well as any interested parties. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx> (<http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>)

The PMG CAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance the International Codes or portions thereof that were under the purview of the PMG CAC. In 2017-2018, the PMG CAC held one face-to-face meeting and 11 conference call meetings. Numerous interested parties attended the committee meetings and offered their input. Related documentation and reports are posted on the PMGCAC website at: <https://www.iccsafe.org/codes-tech-support/codes/code-development-process/pmg-code-action-committee-pmgcac/>

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is an editorial change that provides consistency between I-codes.

Proposal # 4047

CCC-ADM3-19

CCC-ADM4-19

IFC@: SECTION 104

Proponent: Michael O'Brian, representing FCAC (fcac@iccsafe.org)

2018 International Fire Code

Revise as follows:

SECTION 104 **GENERAL AUTHORITY AND RESPONSIBILITIES DUTIES AND POWERS OF THE FIRE CODE** **OFFICIAL**

Reason: The change to the title in the IFC is for coordination with the same section in the IBC, IRC, IPC, IMC, IEBC, IPSDC, IFGC, IPMC, ISPSC. The BCAC is working from the philosophy that ICC is a family of codes, so administrative requirements should be consistent across books. Most administrative and enforcement matters are the same for any code. Those matters unique for a specific code remain unchanged. This is one of a series of proposals being submitted relating to technical, editorial and organizational changes proposed for the Administrative chapters (Chapter 1) in all of the I-Codes.

While the Administrative Committee will consider each proposal independently, the proposals in this package are a correlated set of companion code change proposals.”

This proposal is submitted by the ICC Fire Code Action Committee (FCAC). The FCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes with regard to fire safety and hazardous materials in new and existing buildings and facilities and the protection of life and property in wildland urban interface areas. In 2018 the Fire-CAC has held 3 open meetings. In addition, there were numerous conference calls, Regional Work Group and Task Group meetings for the current code development cycle, which included members of the committees as well as any interested parties, to discuss and debate the proposed changes. Related documentation and reports are posted on the FCAC website at: <https://www.iccsafe.org/codes-tech-support/cs/fire-code-action-committee-fcac/>

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is an editorial change that provides consistency between I-codes.

Proposal # 4050

CCC-ADM4-19

CCC-IBC1-19

IBC@: 1704.2.1

Proponent: Gregory Robinson, representing National Council of Structural Engineers Associations (NCSEA) (grobinson@lbyd.com)

2018 International Building Code

Revise as follows:

1704.2.1 Special inspector qualifications. Prior to the start of the construction, the *approved agencies* shall provide written documentation to the *building official* demonstrating the competence and relevant experience or training of the *special inspectors* who will perform the *special inspections* and tests during construction. Experience or training shall be considered to be relevant where the documented experience or training is related in complexity to the same type of *special inspection* or testing activities for projects of similar complexity and material qualities. These qualifications are in addition to qualifications specified in other sections of this code.

The *registered design professional in responsible charge* and engineers of record involved in the design of the project are permitted to act as ~~the~~ an *approved agency* and their personnel are permitted to act as special inspectors for the work designed by them, provided they qualify as special inspectors.

Reason: Several agencies and special inspectors may be responsible for providing quality assurance on a project. There is a misperception among some engineers that if they provide special inspections for one particular scope of work, that they must provide special inspections for all scopes of work because they would be recognized as "the" approved agency per section 1704.2.1. This proposal clarifies that there can be more than one approved agency on a project.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is a clarification only. No change in cost of work.

Proposal # 4383

CCC-IBC1-19

CCC-IBC2-19

IBC@: 1504.8

Proponent: Edwin Huston, representing National Council of Structural Engineers' Associations (NCSEA (huston@smithhustoninc.com))

2018 International Building Code

Revise as follows:

1504.8 Surfacing and ballast materials in hurricane-prone regions. For a building located in a hurricane-prone region as defined in Section 202, or on any other building with a mean roof height exceeding that permitted by Table 1504.8 based on the exposure category and basic wind speed at the site, the following materials shall not be used on the roof:

1. Aggregate used as surfacing for roof coverings.
2. Aggregate, gravel or stone used as ballast.

Reason: This section applies to a much braoded area than hurricane prone regions. The current title may cause a RDP to miss that fact.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
It only clarifies the affected areas.

Proposal # 5462

CCC-IBC2-19

CCC-IBC3-19

IBC@: H106.1.1 (New)

Proponent: Marcelo Hirschler, representing GBH International (gbhint@aol.com)

2018 International Building Code

Revise as follows:

H106.1.1 Internally illuminated signs. Except as provided for in Section 2611, where internally illuminated signs have facings of wood or of ~~approved a plastic material~~ material complying with the requirements of Section 2606.4, the area of such facing section shall be not more than 120 square feet (11.16 m²) and the wiring for electric lighting shall be entirely enclosed in the sign cabinet with a clearance of not less than 2 inches (51 mm) from the facing material. The dimensional limitation of 120 square feet (11.16 m²) shall not apply to sign facing sections made from flame-resistant-coated fabric (ordinarily known as "flexible sign face plastic") that weighs less than 20 ounces per square yard (678 g/m²) and that, when tested in accordance with NFPA 701, meets the fire propagation performance requirements of both Test 1 and Test 2 or that, when tested in accordance with an approved test method, exhibits an average burn time of 2 seconds or less and a burning extent of 5.9 inches (150 mm) or less for 10 specimens.

Reason: This is simply editorial. It replaces the words "approved plastic" by the words "a plastic material". Other apparent changes are caused by the web site.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Editorial change

Proposal # 169

CCC-IBC3-19

CCC-IBC5-19

IBC®: 1504.1, 1504.1.1, TABLE 1504.1.1

Proponent: Mike Fischer, Kellen Company, representing The Asphalt Roofing Manufacturers Association (mfischer@kellencompany.com)

2018 International Building Code

Revise as follows:

1504.1 Wind resistance of roofs. Roof decks and roof coverings shall be designed for wind loads in accordance with Chapter 16 and Sections 1504.2, 1504.3, 1504.4 and 1504.5.

~~1504.1.1~~ **1504.2 Wind resistance of asphalt shingles.** Asphalt shingles shall be tested in accordance with ASTM D7158. Asphalt shingles shall meet the classification requirements of Table ~~1504.1.1-1504.2~~ for the appropriate maximum basic wind speed. Asphalt shingle packaging shall bear a label to indicate compliance with ASTM D7158 and the required classification in Table ~~1504.1.1-1504.2~~.

Exception: Asphalt shingles not included in the scope of ASTM D7158 shall be tested and labeled in accordance with ASTM D3161. Asphalt shingle packaging shall bear a label to indicate compliance with ASTM D3161 and the required classification in Table ~~1504.1.1-1504.2~~.

TABLE ~~1504.1.1-1504.2~~
CLASSIFICATION OF STEEP SLOPE ROOF SHINGLES TESTED IN ACCORDANCE WITH ASTM D316 OR D71581

MAXIMUM BASIC WIND SPEED, V, FROM FIGURES 1609.3(1)-(8) OR ASCE 7(mph)	MAXIMUM ALLOWABLE STRESS DESIGN WIND SPEED, V_{asd} , FROM TABLE 1609.3.1 (mph)	ASTM D7158 ^a CLASSIFICATION	ASTM D3161 CLASSIFICATION
110	85	D, G or H	A, D or F
116	90	D, G or H	A, D or F
129	100	G or H	A, D or F
142	110	G or H	F
155	120	G or H	F
168	130	H	F
181	140	H	F
194	150	H	F

For SI: 1 foot = 304.8 mm; 1 mph = 0.447 m/s.

- a. The standard calculations contained in ASTM D7158 assume Exposure Category B or C and building height of 60 feet or less. Additional calculations are required for conditions outside of these assumptions.

Reason: The current numbering hierarchy in Section 1504 is incorrect. The proposal resets the order to read more consistently.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The proposal is strictly editorial.

Proposal # 5631

CCC-IBC5-19

CCC-IRC2-19

IRC@: R502.11.1

Proponent: Steven Mickley, representing American Institute of Building Design (steve.mickley@aibd.org)

2018 International Residential Code

Revise as follows:

R502.11.1 Design. Wood trusses shall be designed in accordance with *approved* engineering practice. The design and manufacture of metal-plate-connected wood trusses shall comply with ANSI/TPI 1. The truss design drawings shall be prepared by a registered design professional where required by the statutes of the *jurisdiction* in which the project is to be constructed in accordance with Section R106.1.

Reason: It appears that the word "design" was mistakenly omitted from the title, "registered design professional." There is a reference to Section R106.1 which uses the title, "registered design professional." "Design professional" and "registered design professional" are two titles used within the IRC and defined in Section 202, but "registered professional" is not.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This item should be considered a housekeeping item.

Proposal # 5222

CCC-IRC2-19

CCC-IRC6-19

IRC@: R603.3.2

Proponent: Stephanie Young, representing National Council of Structural Engineers Associations (stephanie@mattsonmacdonald.com)

2018 International Residential Code

Revise as follows:

R603.3.2 Minimum stud sizes. Cold-formed steel walls shall be constructed in accordance with Figure R603.3.1(1), R603.3.1(2) or R603.3.1(3), as applicable. Exterior wall stud size and thickness shall be determined in accordance with the limits set forth in Tables R603.3.2(2) through R603.3.2(16). Interior load-bearing wall stud size and thickness shall be determined in accordance with the limits set forth in Tables R603.3.2(2) through R603.3.2(16) based on an ultimate design wind speed of 115 miles per hour (51 m/s), Exposure Category B, and the building width, stud spacing and ground snow load, as appropriate. Fastening requirements shall be in accordance with Section R603.2.5 and Table R603.3.2(1). Top and bottom tracks shall have the same minimum thickness as the wall studs.

Exterior wall studs shall be permitted to be reduced to the next thinner size, as shown in Tables R603.3.2(2) through R603.3.2(16), but not less than 33 mils (0.84 mm), where both of the following conditions exist:

1. Minimum of $\frac{1}{2}$ -inch (12.7 mm) gypsum board is installed and fastened on the interior surface in accordance with Section R702.
2. Wood structural sheathing panels of minimum $\frac{7}{16}$ -inch-thick (11.1 mm) oriented strand board or $\frac{15}{32}$ -inch-thick (12 mm) plywood are installed and fastened in accordance with Section R603.9.1 and Table R603.3.2(1) on the outside surface.

Interior load-bearing walls shall be permitted to be reduced to the next thinner size, as shown in Tables R603.3.2(2) through R603.3.2(16), but not less than 33 mils (0.84 mm), where not less than $\frac{1}{2}$ -inch (12.7 mm) gypsum board is installed and fastened in accordance with Section R702 on both sides of the wall. The tabulated stud thickness for load-bearing walls shall be used where the attic load is 10 pounds per square foot (480 Pa) or less. A limited attic storage load of 20 pounds per square foot (960 Pa) shall be permitted provided that the next higher snow load column is used to select the stud size from Tables R603.3.2(2) through R603.3.2(16).

For two-story buildings, the tabulated stud thickness for walls supporting one floor, roof and ceiling shall be used where the second-floor live load is 30 pounds per square foot (1440 Pa). Second-floor live loads of 40 psf (1920 Pa) shall be permitted provided that the next higher snow load column is used to select the stud size from Tables R603.3.2(2) through R603.3.2(11).

For three-story buildings, the tabulated stud thickness for walls supporting one or two floors, roof and ceiling shall be used where the third-floor live load is 30 pounds per square foot (1440 Pa). Third-floor live loads of 40 pounds per square foot (1920 Pa) shall be permitted provided that the next higher snow load column is used to select the stud size from Tables R603.3.2(12) through R603.3.2(16).

Reason: The IRC does not recognize nor define the term 'snow load'. The information which is available to the user is that of 'Ground Snow Load'. This is provided through the information contained in Table R301.2(1) which is completed by the local jurisdiction, or through the use of Figure R301.2(6) labeled 'Ground Snow Loads'. The equations involved in the adjustment of 'ground snow load' to a usable design 'snow load' are found in ACSE7 and are used to develop the tables in the IRC, but are not, however, found in the IRC nor are they available to the general user of this code.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The modified language is only intended to clarify the use of a term.

Proposal # 4612

CCC-IRC6-19

CCC-IRC7-19

IRC@: TABLE R610.5(1), TABLE R610.5(2)

Proponent: Stephanie Young, representing National Council of Structural Engineers Associations (stephanie@mattsonmacdonald.com)

2018 International Residential Code

Revise as follows:

TABLE R610.5(1)

MINIMUM THICKNESS FOR SIP WALL SUPPORTING SIP OR LIGHT-FRAME ROOF ONLY (inches)^a

Portions of table not shown remain unchanged.

BUILDING WIDTH (ft)																				
ULTIMATE DESIGN WIND SPEED V _{ult} (mph)		GROUND SNOW LOAD (psf)	24			28			32			36			40					
Exp. B	Exp. C		Wall Height (feet)			Wall Height (feet)			Wall Height (feet)			Wall Height (feet)			Wall Height (feet)					
			8	9	10	8	9	10	8	9	10	8	9	10	8	9	10			

TABLE R610.5(2)

MINIMUM THICKNESS FOR SIP WALL SUPPORTING SIP OR LIGHT-FRAME ONE STORY AND ROOF ONLY (inches)^a

Portions of table not shown remain unchanged.

BUILDING WIDTH (ft)																				
ULTIMATE DESIGN WIND SPEED V _{ult} (mph)		GROUND SNOW LOAD (psf)	24			28			32			36			40					
Exp. B	Exp. C		Wall Height (feet)			Wall Height (feet)			Wall Height (feet)			Wall Height (feet)			Wall Height (feet)					
			8	9	10	8	9	10	8	9	10	8	9	10	8	9	10			

Reason: The IRC does not recognize nor define the term 'snow load'. The information which is available to the user is that of 'Ground Snow Load'. This is provided through the information contained in Table R301.2(1) which is completed by the local jurisdiction, or through the use of Figure R301.2(6) labeled 'Ground Snow Loads'. The equations involved in the adjustment of 'ground snow load' to a usable design 'snow load' are found in ACSE7 and are used to develop the tables in the IRC, but are not, however, found in the IRC nor are they available to the general user of this code.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The modified language is only intended to clarify the use of a term.

Proposal # 4613

CCC-IRC7-19

CCC-IRC8-19

IRC@: TABLE R610.8

Proponent: Stephanie Young, representing National Council of Structural Engineers Associations (stephanie@mattsonmacdonald.com)

2018 International Residential Code

Revise as follows:

TABLE R610.8

MAXIMUM SPANS FOR 11⁷/₈-INCH OR DEEPER SIP HEADERS (feet)^{a, c, d}

Portions of table not shown remain unchanged.

LOAD CONDITION	GROUND SNOW LOAD (psf)	BUILDING ^b width (feet)				
		24	28	32	36	40

Reason: The IRC does not recognize nor define the term 'snow load'. The information which is available to the user is that of 'Ground Snow Load'. This is provided through the information contained in Table R301.2(1) which is completed by the local jurisdiction, or through the use of Figure R301.2(6) labeled 'Ground Snow Loads'. The equations involved in the adjustment of 'ground snow load' to a usable design 'snow load' are found in ACSE7 and are used to develop the tables in the IRC, but are not, however, found in the IRC nor are they available to the general user of this code.

Cost Impact: The code change proposal will not increase or decrease the cost of construction. The modified language is only intended to clarify the use of a term.

Proposal # 4614

CCC-IRC8-19

CCC-IRC10-19

IRC@: R802.10.2

Proponent: Steve Mickley, American Institute of Building Design, representing American Institute of Building Design (steve.mickley@aibd.org)

2018 International Residential Code

Revise as follows:

R802.10.2 Design. Wood trusses shall be designed in accordance with accepted engineering practice. The design and manufacture of metal-plate-connected wood trusses shall comply with ANSI/TPI 1. The truss design drawings shall be prepared by a registered design professional where required by the statutes of the *jurisdiction* in which the project is to be constructed in accordance with Section R106.1.

Reason: It appears that the word "design" was mistakenly omitted from the title, "registered design professional." There is a reference to Section R106.1 which uses the title, "registered design professional." "Design professional" and "registered design professional" are two titles used within the IRC and defined in Section 202, but "registered professional" is not.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This item should be considered housekeeping.

Proposal # 5217

CCC-IRC10-19

CCC-IRC12-19

IRC@: R602.3.1

Proponent: Stephanie Young, representing National Council of Structural Engineers Associations (stephanie@mattsonmacdonald.com)

2018 International Residential Code

Revise as follows:

R602.3.1 Stud size, height and spacing. The size, height and spacing of studs shall be in accordance with Table R602.3(5).

Exceptions:

1. Utility grade studs shall not be spaced more than 16 inches (406 mm) on center, shall not support more than a roof and ceiling, and shall not exceed 8 feet (2438 mm) in height for exterior walls and load-bearing walls or 10 feet (3048 mm) for interior nonload-bearing walls.
2. Where ground snow loads are less than or equal to 25 pounds per square foot (1.2 kPa), and the ultimate design wind speed is less than or equal to 130 mph (58.1 m/s), 2-inch by 6-inch (38 mm by 140 mm) studs supporting a roof load with not more than 6 feet (1829 mm) of tributary length shall have a maximum height of 18 feet (5486 mm) where spaced at 16 inches (406 mm) on center, or 20 feet (6096 mm) where spaced at 12 inches (305 mm) on center. Studs shall be No. 2 grade lumber or better.
3. Exterior load-bearing studs not exceeding 12 feet (3658 mm) in height provided in accordance with Table R602.3(6). The minimum number of full-height studs adjacent to openings shall be in accordance with Section R602.7.5. The building shall be located in Exposure B, the roof live load shall not exceed 20 psf (0.96 kPa), and the ground snow load shall not exceed 30 psf (1.4 kPa). Studs and plates shall be No. 2 grade lumber or better.

Reason: The IRC does not recognize nor define the term 'snow load'. The value which is available to the user is that of 'Ground Snow Load'. This is provided through the information contained in Table R301.2(1) which is completed by the local jurisdiction, or through the use of Figure R301.2(6) labeled 'Ground Snow Loads'. The equations involved in the adjustment of 'ground snow load' to a usable design 'snow load' are found in ACSE7 and are used to develop the tables in the IRC, but are not, however, found in the IRC nor are they available to the general user of this code.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The modified language is only intended to clarify the use of a term.

Proposal # 4610

CCC-IRC12-19